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The development and applications of a child-centred Well-Being Index

Findings from a longitudinal project using data from the Growing Up in Ireland study

A dissertation submitted to the University of Dublin for the Degree of Doctor of Philosophy

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2017

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Declaration

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Summary

The children of today are the adults of tomorrow. Therefore, children's well-being is relevant for the current and future society. In this context, the study of well-being of children and young people has received great national and international interest over the last decade and several studies aiming to develop a measure, or index, of child well-being at an individual or population level have emerged. Such well-being indices may be used by child advocacy groups, policy makers, researchers, the media, and service providers to describe the condition of children, to monitor or track child outcomes and to set goals for the future. In line with the national and international trends the overarching aim of this project was to construct a child-centred Well-Being Index for Irish children. A "whole child" perspective was adopted and well-being was viewed as an expression of a child's physical, social, emotional and intellectual functioning, and was investigated in relation to developmental determinants reflecting aspects from a child's life known to influence early development.

This PhD project is a longitudinal study concerned with constructing a Well-being Index at two pivotal time-points in children's lives (9 months and 3 years). The Well-Being Index is child-centred and summarizes outcomes relating to three developmental domains: health and physical development, socio-emotional and cognitive-motor domain. For each time-point, three Domain Scales were developed. These were then used to construct corresponding Well-Being Indices. The structural and construct validity of the Domain Scales and the Well-Being Indices were examined. Using individual scores children were ranked based on their domain development and well-being. Additionally, children were classified on each Domain Scale and Well-Being Index in four categories: Very poor (lowest 5% of the sample), Poor (above the 5th percentile and below or equal to the 15th percentile), Good (above the 15th percentile and lower than the 85th percentile) and Very good outcomes (highest 15% of the sample).

This project used pre-collected data from the Infant Cohort of the Growing Up in Ireland Study (GUI). Primary Caregivers were first interviewed when the infants were 9 months old (Wave 1, N=11,134), and followed up when children were 3 years old (Wave 2, N=9,793). Comprehensive data on child functioning and factors that may influence early development were collected using general questionnaire items and standardised instruments. Participants' height and weight were measured. Only GUI variables with a frequency of endorsement of 90% and standardised instruments with adequate reliability were considered for this project. The GUI variables selected were reflective of: *domain outcomes*, used to derive the *indicators of development* for the purpose of index construction; and pre-established *developmental determinant,* used for *index validation* and to investigate *predictors of early development*. *A domain outcome* was seen as an attribute of the child strictly limited to quantifying development at a particular point in time, an observable manifestation of the underlying domain trait. The developmental determinants were selected according to the bio-ecological model of human development and the Barker hypothesis and represented the following five groups: individual characteristics, child's interactions, primary caregiver and family factors, socio-demographic and economic factors and pre-natal factors.

The *indicators of development* were considered in their numeric format (ordinal, count or continuous) as individual scores. These were first combined into Sub-Domain Scales measuring similar aspects of the domain concept (two ***sub-domains*** were identified for each domain).

This PhD project developed Domain Scales and Well-Being Indices with sound structure and demonstrated validity ensuring good discrimination between children with differing outcomes and life context. Findings from the applications of the Domain Scales and the Well-being Index showed that domain development and well-being results from 9 months are predictors of child scores 3 years. This suggests that early interventions could improve future outcomes for children at risk of poor development. Additionally, we observed that development is *not necessarily uniform across domains*, reinforcing the importance of the Domain Scales as stand alone instruments. The Domain Scales and Well-Being Index offer scope for more in-depth cross-sectional or longitudinal analysis. Findings from the applications of the Domain Scales and Well-Being Index inform researchers, various stakeholders (e.g. public policy makers at a national and regional level, physical and mental health professionals etc.) and are also relevant for present and future parents.

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Glossary

Term	Definition
Index	A measurement instrument that synthesizes a large amount of information into a single useful number or category.
Construct	A state that cannot be measured directly and is the cause of a range of observable manifestations. The statistical equivalent term for this is latent trait.
Domain	An important dimension from a child's life. For this project, each domain corresponds to a construct representing a significant area of childhood development.
Outcome	An attribute of the child strictly limited to quantifying development at a particular point in time. For this project, an outcome is a measurable manifestation of the domain's construct.
Indicator	A variable corresponding to an outcome or resulted by combining two or more outcomes. Each domain has several specific indicators that are the effect of the domain's construct.
Developmental determinant	An aspect from a child's live (e.g. child's weight at birth, type of childcare attended etc.) that could play a determinant role and influence their life trajectory predisposing to good or bad outcomes.
Scale	A measurement instrument used to categorize or rank certain entities or individuals. It describes a relationship between composing entities.
Reliability	A widely accepted quality criterion of a measurement scale. It refers to repeatability or the ability of the scale to measure something consistently.
Validity	A second criterion assessing the quality of a measurement scale. It helps to determine if one can draw accurate conclusions about the presence and degree of the measured construct for an individual. Ensures that the scale measures what it is believed to be measuring.

Chapter 1 Introduction

1.1 Background

1.1.1 Well-being

The concept of well-being is generally understood as an all-encompassing notion that regards the quality of life experienced by an individual. Achieving well-being is an active and dynamic process characterized by the interaction of the individual with the world around them[1].

While research in the area of well-being has been increasing in recent decades, this commonly used term is inconsistently defined[2, 3]. **Table 1** below outlines some of the meanings associated to the term across time.

Table 1:1 Definitions of well-being

Authors (Year)	Well-being definition
World Health Organization (WHO, 1948)	Well-being is part of the holistic definition of health as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity."
Columbo, S.A. (1986)	"A multidimensional construct incorporating mental/ psychological, physical, and social dimensions".[2, 4]
Weisner, T.S. (1998)	"The ability to successfully, resiliently, and innovatively participate in the routines and activities deemed significant by a cultural community. Well-being is also the state of mind and feeling produced by participation in routines and activities"[2, 5]
Schor, E.L. (1995)	"Children's health and well-being is directly related to their families' ability to provide their essential physical, emotional, and social needs"[2, 6]
Keith, K.D. and R.L. Schalock (1994)	"General view of the person's feelings regarding his/her life circumstances, including personal problems and some questions about family"[2, 7]
Martinez, R.O. and R.L. Dukes (1997)	"As self-esteem, purpose in life, and self-concept of academic ability (self-confidence)"[2, 8]
Bornstein et al. (2003)	"Well-being is a state of successful performance throughout the life course integrating physical, cognitive and socio-emotional function that results in productive activities deemed significant by one's cultural community, fulfilling social relationships and the ability to transcend moderate psychosocial and environmental problems"[9]
Andrews et al. (2002)	"Healthy and successful individual functioning (involving physiological, psychological and behavioural levels of organisation), positive social relationships (with family members, peers, adult caregivers, and community and societal institutions, for instance, school and faith and civic organisations), and a social ecology that provides safety (e.g., freedom from interpersonal violence, war and crime), human and civil rights, social justice and participation in civil society" [10].
Dodge R., Daly A.P., Huyton J. and Sanders L.D. (2012)	Well-being is seen as the dynamic equilibrium between psychological, social and physical challenges and resources: "In essence, stable wellbeing is when individuals have the psychological, social and physical resources they need to meet a particular psychological, social and/or physical challenge. When individuals have more challenges than resources, the see-saw dips, along with their wellbeing and vice-versa."[3]
Ben-Arieh and Frones (2007)	"Child well-being encompasses quality of life in a broad sense. It refers to a child's economic conditions, peer relationships, political rights, and opportunities or development"[11]

According to the definitions above, well-being is consistently seen as multidimensional and incorporates physical, social, emotional and mental functioning. Well-being is dynamic and individual characteristics and contextual factors can influence it.

1.1.2 Early childhood development

Biologically, *a child* is defined as a human being between birth and the age of puberty or legal majority[12]. According to the United Nations Convention on the Rights of the Child, *a child* is "a human being below the age of 18 years unless under the law applicable to the child, majority is attained earlier"[13]. Infancy and early childhood are important developmental periods and experiences that occur during this time have a major impact on development and can modify the risk of numerous outcomes in later life.

Developmental theories have previously identified four key domains of development: the physical, the intellectual/educational, the psychological and the social domain[2, 14-16]. Human development is a bidirectional relational process between the individual and his/her life context[17]. According to Bronfrenbrenner et al., this is particularly important during the early life stages[18]. Development is achieved over time through regular and progressively more complex interactions between an active individual and their immediate environment (i.e. persons, objects, and symbols)[18]. These interactions are also known as "proximal processes" and some examples are: feeding, comforting or playing with a child, participation in reading, learning, athletic activities, etc. Proximal processes are recognized as the primary engines of development[18]. Therefore, early participation in progressively more complex interactions enables the individual to act as an agent in their own development[18]. The characteristics of the developing individual, the proximal factors (immediate environment) and distal factors (society, economy etc.) analysed over time are the four main elements influencing the content and direction of the proximal processes at the core of development[18].

The above theories were transposed in an operational research design forming the bio-ecological model: Process-Person-Context-Time.
The *Bio-ecological model of human development* proposed by Bronfenbrenner positions the child at the centre of the ecology of human life, receiving multiple influences which shape development and life outcomes[18, 19]. This model represents the layers of influence as concentric rings extended outwards from the child. The greatest impact on children's wellbeing comes from *the microsystem* represented by immediate family, friends, childcare arrangements, health professionals and peers. Interactions between components of the microsystem can influence child development indirectly and form the second layer, *the mesosystem*. Development is also influenced by the *exosystem* representing the societal context in which families live, the local community, access and quality of services, parents' workplace and the media. The exosystem affects the child mainly indirectly by influencing the different structures within the microsystem. Finally, the child development environment suffers indirect influences from *the macrosystem* representing social, political and economic systems and cultural attitudes and ideologies. The passing of time has both direct (individual's lifetime) and indirect (historical time) influences on children's well-being. The different systems are dynamic and interdependent, influencing each other and changing over time[20, 21].

Therefore, according to the bio-ecological model, a child's life suffers influences from many levels and a child's individual characteristics play a dual role. First, they exert an indirect effect on development by influencing proximal processes. Second, they are the result of previous proximal processes and act as developmental outcomes. Therefore, current developmental outcomes act as indirect producers of development at a subsequent point in time.

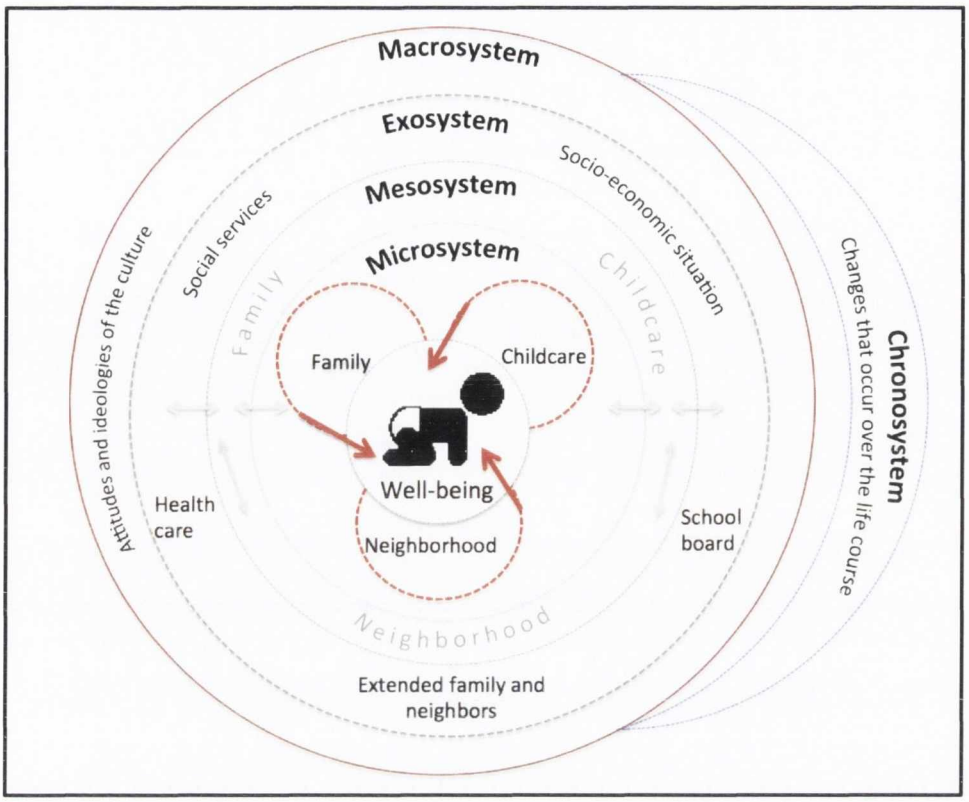

Figure 1.1 The Bio-ecological model of human development

(microsystem: child's closest environment, mesosystem: the layer of interactions between elements of the microsystem, exosystem: the context, macrosystem: social, political and economic systems)

In addition, theories regarding the developmental origins of chronic disease also known as the Barker hypothesis, suggest that exposures to adverse effects during pre-natal and post-natal times can affect developmental outcomes. The proposed mechanism is that adverse influences, particularly during intrauterine life, can modify the programming of intracellular signals, cell-to-cell interactions and metabolic pathways resulting in adaptations of the human genome and increased risk of both adult and childhood disorders[22, 23].

1.1.3 Child well-being

From a developmental theory perspective, child well-being can be assessed as a point-in-time summary of developmental outcomes on the physical, intellectual/educational, psychological and social dimensions of individual functioning. Childhood is a period of rapid and important change and assessment of well-being during this time is a dynamic process. The number and nature of child outcomes and developmental dimensions considered may vary across the age spectrum within childhood to account for progressively more complex child-functioning statuses. Characteristics of the individual child and contextual factors that can promote or constrain development should be investigated in relation to well-being. Intuitively, current well-being should be treated as contextual factor when investigating well-being at a subsequent point in time.

This approach to well-being differs from that used for the adult population. Adult well-being is mostly seen as a measure of quality of life and it includes the presence of positive feelings (e.g., contentment, happiness), a sense of fulfilment and satisfaction with life, good physical health and positive functioning[24-26]. It is mainly perceived as a subjective notion, investigated

with the help of self-report instruments and several subjective measures are included (e.g. Feeling happy in the past 30 days). Researchers from different backgrounds have examined different aspects of adult well-being including: physical, economic, social, development and activity, emotional, psychological well-being, life satisfaction and engaging activities and work.

1.1.4 Assessing child well-being. Previous experience

According to Fernandez et al. there are at least three reasons for continuous child well-being research. First, it was acknowledged that child well-being is not restricted to their present lives but is also reflective of their future development. Second, studies have shown children's vulnerability to poverty, prompting the need for continuous monitoring of their well-being. Third, improvement on "direct" data treating the children as a stand alone societal group (with particular characteristics and needs requiring implementation of specific policies) is necessary[27].

In this context it is not surprising that the study of well-being of children and young people has received a great interest over the last two decades. This interest can also be explained by increased focus on accountability-based public policy at international level[14]. Additionally, it is largely acknowledged that child well-being assessment can help plan, develop, change and examine targeted services effectively[14].

In 2002, a systematic review of the child well-being literature between 1991 and 1999 reemphasised that the definition of well-being was highly variable and the instruments used to measure the construct were inconsistent[2]. Most of the research was oriented towards child deficit, disregarding the potential to promote and identify children's strengths[2].

More recent, three trends in child well-being research were highlighted: 1. Increased child centred focus; 2. Well-being assessment from a multidimensional perspective and 3. The use of single composite indices to summarize children's condition[27-30]. The first two trends were mainly inspired by the Convention on the Rights of the Child (1989) and the bio-ecological model of human development (Bronfenbrenner and Morris in 1998). These frameworks emphasized the need to consider the child as the unit of analysis instead of focusing on their family or the household they lived in. Furthermore, they underlined the need to consider several dimensions of child development and factors that can influence the context of their lives. The multidimensional approach to children's well-being and the consequent increase in data on the lives of children led to the third trend: the development of single indices to summarize children's conditions[27].

At the same time, over the last decade, researchers begun to focus more on the role of the child as agents in their own development and in assessment of their own well-being[27]. This trend was also inspired by the Convention on the Rights of the Child (1989) and the bio-ecological model of human development (Bronfenbrenner and Morris in 1998)[27]. Some authors focused on understanding children's perspectives on issues like poverty and deprivation[27, 31, 32], others looked at children's coping mechanism when faced with hardship (e.g. economic adversity)[27, 33-36] or children's role as agents for their own social exclusion[27, 31, 32, 34, 35]. It has also been highlighted that children should be included in the definition and measurement of their own well-being[32, 34, 36]. Their perspective on their own well-being should be heard[27]. The importance of adding a subjective dimension to the study of children's well-being is reinforced by studies showing that children know what is important to them[27].

1.1.5 Well-being indicators

Well-being is best explored and quantified by social indicators[14, 37]. Statistically, indicators are markers used to describe populations and monitor patterns or change across time[38]. According to previous studies of well-being, these are used primarily to describe current status, monitor change across time, set goals and evaluate progress. In a broader sense, indicators can be viewed as be-directional connectors between theoretical concepts and statistics[39]. They support theories and give meaning to data[39]. Two types of social indicators can be identified: macro- and micro-level indicators. Macro-level indicators are relevant at a population level, and are represented by aggregate data describing for example the proportion of individuals in a population with a certain characteristic. Micro-level indicators are focused on an individual level offering an individual-centred perspective.

The use of indicators to monitor social trends can be dated back to 1933, when the report "Recent Social Trends" was published in the United States[14]. The interest in child well-being indicators, however, was prompted in the 1960s by the Social Indicators Movement suggesting that government should offer corrective response to social problems[29]. Later, in the mid 1970s, researchers from the Foundation of Child Development highlighted the need for a comprehensive set of social indicators to explore the "state of the child" across life domains and ecological contexts[40]. They suggested that the ecology of child development should be explored in terms of micro-structural (i.e. family, schools, communities, friends groups) and macro-structural (i.e. economy, culture, sociology) influences. Moreover, they called for surveys with subjective dimensions allowing for children to speak for themselves[40]. Since the 1970s, the use of social indicators in monitoring children's well-being has increased significantly[41]. In the United States, child well-being indicators research showed sustained progress through the 1980s and 1990s. Two main research platforms can be identified: the Annie E. Casey Foundation's KIDS COUNT and the Foundation for Child Development (America's Children: Key National Indicators of Well-being). The launch of the "State of the World's Children" UNICEF annual reports in the early 1980s and ratification of the United Nation's Convention on the Rights of the Child (CRC) from 1990 also contributed to an increased interest in child indicators. Additionally, the increased interest in child well-being shown by researchers and stakeholders, supported by advancements in data collection and storage technologies, facilitated the evolution of the Child Indicators Movement[14].

Ben-Arieh identified *three normative and conceptual theories* as major contributors to the evolution of the child indicators field: the normative concept of children's rights, the new sociology of childhood as a life stage and the ecology of child development[29]. These are described in brief below.

The theory of the normative concept of children's rights is in accordance with the UN Convention on the Rights of the Child (CRC) and suggests that understanding children's well-being should include the following four principles[29]:

1. Non-discrimination: children with disabilities, refugees etc. should also be included
2. Best interest of the child: the child is a citizen in its own right, therefore should be the unit of analysis
3. Survival and development: promotes a holistic view of child development and well-being, and equal weights are given to children's rights (civic, social, political, economic and cultural rights). This suggests that concepts of child well-being should be multidimensional and ecological
4. The view of the child: calls for the voice of the child to be heard and respected. These principles led to an increased focus on children well-being data,

prompting development of new children indicators to assess new areas of their lives and monitoring of implementation and fulfilment of their rights.

The second normative and conceptual theory refers to recognising childhood as a life stage and led to a change in focus from future to present well-being. According to the United Nation's Convention of the Rights of the Child (CRC), children's immediate well-being is important in its own right[29]. Assessment of children's immediate well-being is relevant for their well-becoming[39]. Conceptualizations of well-being should consider children's present development and future life chances[29, 42]. Child outcomes in a range of domains and the conditions facilitating good development should be included[29, 42].

The third theory regards the ecology of child development refers to the bio-ecological model of human development, which suggests that child capabilities must be understood in light of their life context[18]. Recognising the importance of children's present outcomes forms an ecological interactive perspective and had a great contribution to the Child Indicators Movement and its development[29].

The three normative and conceptual theories presented above led to the development of three new methodological perspectives contributing to a rapid evolution of the Child Indicator Movement over the last 30 years[29, 43]. The three methodological perspectives are outlined below.

First, the importance of incorporating a subjective dimension of child well-being was identified. In accordance with the theoretical foundations that promoted the child indicators movement, several researchers underlined the need of acknowledging the subjective view of the children when assessing their well-being[44]. Including children's perspective respects their rights, enhances their legal and political socialization, provides a platform for child advocacy and informs policy makers. Accordingly, new efforts were made to develop indicators capturing children's view on their lives and living conditions. Indicators of mental well-being or social relations capturing children's subjective view proved to be particularly useful[29, 43].

Second, an increased focus on the child as the unit of analysis was observed and in line with the normative and theoretical trends, child-centred indicators, investigating the child separately from his/her family, were developed. Focusing on the child as the unit of observation offers a more accurate picture of children's lives and experiences[29, 43].

Third, the appearance of richer administrative data and the increased number of data sources available had a great contribution to the evolution of the Child Indicator Movement. To account for the richness of children's lives three sources of information can be used: administrative data, census data and social research studies (longitudinal/ ad hoc). The technological improvements during the second half of the twentieth century led to increased use of administrative data to develop child indicators, further promoting the child indicators movement[29, 43].

From a Public Policy Context, the increased demand and focus on child indicators that could serve to inform new child-centred policies and programmes contributed to further development of the Child Indicators Movement. The need for better policy-orientated indicators led to a thorough review of existing work, enhancing child life domains considered and improving on data collection[29, 43].

Based on the considerations noted above, Ben-Arieh identified nine major changes marking the evolution of the Child Indicators Movement[29, 43]. Table 1.2 presents a summary of these changes.

Table 1:2 Changes driving the evolution of the Child Indicators Movement

Changes	Brief description
"From a survival to a well-being perspective"	In the past, the focus of child research was oriented on threats to their survival and basic needs. During the late 1990s, researchers underlined the need for indicators to promote development and children quality of life came into focus[29, 43].
"From negative to positive"	Researchers acknowledged that the absence of problems or failures does not necessarily imply adequate development[45, 46]. To change the focus from children's deficit and identify and promote children's strengths positive indicators of child well-being should be developed[2]. This led to an increased interest in including positive children's lives aspects when assessing their well-being and new positive child indicators started to emerge[29].
"Toward an inclusion of a children's rights perspective"	Ben-Arieh (2007) found that the UN Convention on the Rights of the Child (CRC principles are widely accepted and the vast majority of indicators incorporated children's rights concepts[29].
"From well-becoming to well-being"	During the late 1990s researchers emphasised the need to change the conventional focus on the child's development toward adulthood suggesting that this implied a grater preoccupation in the next generation rather then childhood well-being. According to Ben-Arieh (2007), well-becoming is no longer the only child indicators perspective and attention is also placed on children's current status[29].
"From traditional to new domains of children's well-being"	Traditionally, well-being domains were aligned with different professions (i.e. health, education, demography etc.). The first four changes contributed to the development of new child-centred domains of well-being like social skills, children's activities, cognitive development etc[29].
"From an adult to a child perspective"	Recent child well-being studies have the child as the unit of analysis. Child indicators are now focused around the child and extend outwards making a clear distinction between children and their parents. Assessment of child's subjective perspectives (using both quantitative and qualitative data) is gradually increasing[29, 43].
"Toward a greater variety of geographical units"	Ben-Arieh (2007, 2012) observed an increased number of local and regional child well-being reports toward the end of the first decade of the 21st century[29, 43].
"Toward the inclusion of indices of children's well-being"	Similarly to the previous trend, an increased number of studies develop composite well-being indices. Some focus on more sophisticated index development methods, indicating a growing interest in the field [38, 41, 47, 48].
"Toward a policy relevance"	Growing demand from policymakers and other stakeholders for relevant research led to a grater emphasis on developing indicators that are policy oriented. The opinion of community workers or policymakers is often considered during the early stages of the indicators development process[29, 43].

1.1.6 Well-being indices

The increase of children social indicators led to higher interest in developing summary children well-being indices. An index is a composite measure constructed from multiple simple indicators[49]. Well-being cannot be measured directly using a single instrument, instead indices are used to combine a large amount of data into a single or reduced set of numbers[38,49]. Using indices to assess well-being allows a holistic approach that accounts for the multidimensionality of the concept[14].

Children well-being indices assist in drawing conclusions about the status of the children and in comparing how different groups are faring. Trends of well-being can be assessed across cohorts, demographic sub-groups or geographic areas[49]. From a policy perspective, an index calculated as a single number is easier to report and present to the general public and policy makers[14, 38, 49]. They are easily tracked across time and can signal potential detrimental issues and inform targeted policy changes[14, 38, 49].

Types of Child Well-being indices

Based on the type of data used, existent children well-being indices can be grouped in micro-level and macro-level indices. The field of child well-being research is dominated by **macro-level indices**[14, 41]. These use indicators aggregated to population groups to *describe the proportion of children with certain outcomes*[14, 38]. Vandevier et al. identified two main development methods for macro-level well-being indices[49]. These are described below.

First, the Standard Score Method can be used for comparisons between well-being trends across regions. A comparable set of indicators is used for each population group. Indicators are standardized by differences across a set of population groups and then averaged (Bradshaw et al.) or summed (Anne E. Casey Foundation) within the group[38, 50-52]. At a European level, this method was first used in 2007 by Bradshaw et al. to rank the 25 countries in terms of children well-being. This work evaluated 51 indicators from 23 domains of child's life grouped in eight clusters of well-being: Health, Economic situation, Household, Emotional development, Relationships, Education, Civic participation, Risk and Safety. The indicators were first transformed to z-scores and averaged to calculate domain scores. The clusters' scores were derived as the average of domain z-scores and clusters z-scores were averaged to calculate *The Index of child well-being in the EU*[27, 51]. Later in 2009, given the availability of new data the index was updated and expanded to also include Norway and Iceland resulting in *The Index of child well-being in Europe*[27, 50]. Based on these efforts, in 2007, UNICEF Innocenti Research Centre launched Report Card 7[53] that aimed to give an overview of child well-being in economically rich countries. UNICEF country representative well-being indices were constructed on 50 indicators, grouped in 13 "subcomponents" and 5 "components" including: safety and physical status, personal life, civic life, economic resources and contribution and children's activities. More recently, using similar data and methods, UNICEF Report Card 11 (April 2013)[54] examined the changes in children well-being over the first decade of this century. Ireland was assigned an overall rank of 12 out of the 29 economically rich participant countries. In the USA, the Standard Score Method was used annually since 1990 by the Anne E. Casey Foundation to generate the KIDS COUNT well-being index across the 50 states[38, 49, 52]. Ten indicators were included: percentage of low birth-weight, child mortality rate, child death rate, teen death rate, teen birth rate, high-school drop-out rate, percentage of teens neither working nor in school, percentage of children with no parents employed full-time for a full year, child poverty rate and percentage of children with single parents[38, 49, 52]. The indicators were not combined in domains. Indicators z-scores were summed to generate the *KIDS COUNT Index*[38, 49, 52]. In a separate study, the same method and 11 similar indicators were used to calculate a "social well-being" index for Minnesota county[49].

Second, the Average Percentage Change Method can be used to assess changes in well-being compared to a base year[49]. For each indicator, its base year value is assigned a score of 100. Indicators are then scored as a percentage difference between the base year and the subsequent year value for each indicator. The indicators scores for each domain are averaged into domain scores, and the composite index is generated as the mean of domain scores[27, 49]. This method was first used by Land et al. to track changes in American children well-being from 1975 through 1998 and *The Child and Youth Well-being Index in the US* was generated in 2001[27]. The following 7 domains: material well-being, health, safety and behavioural concerns, educational attainment, community connectedness, social relationship and emotional and spiritual wellbeing comprised of a total of 28 indicators were considered. Later, in 2007, Land et al. expanded the index to include 16 additional indicators and *The Expanded Child and Youth Well-being Index in the US* was generated[27]. Similar to the standard score method, trends across time can be investigated on a domain-to-domain or overall well-being basis[49]. It has

been noted that the index results were affected by the base year selected. This method was also applied with the KIDS COUNT data and similar trends were observed[49].

Micro-level well-being indices have the child as the unit of observation. They use indicators specific to individual children and *a separate index score is calculated for each child* in the sample[49]. This facilitates contemporaneous assessment of the child's condition and understanding of developmental pathways related to individual functioning[14, 27, 41]. Using micro-level data to assess child well-being offers a child-centred perspective. Additionally, micro-level index scores can be further aggregated to population levels (i.e. determine the mean well-being score for a geographic region) and used to calculate macro-level indicators (the reverse is not true). Four methods of developing micro-level well-being indices were identified and these are outlined below.

In 2008, in the United States, Moore et al used the Micro-data Tally Method to count the number of negative outcomes and separately the number of negative context experienced by an individual child. Similar methods were initially used in a cumulative risk approach. It has been shown that a higher number of problems or obstacles is multiplicatively harmful for children. Building on this approach, Moore et al. used data from the National Survey of American Families (NSAF) to create *An index of the condition of the children (NSAF)*. This comprised of 28 items across *three child well-being domains*: child health and safety, child educational achievement and cognitive attainment, child social and emotional development, *and two condition-of-children domains*: family processes and family demographic, social and economic status. The first step in index development was to assign each child a value of 1 for each problem indicator or 0 otherwise. Next, a domain score was calculated by summing corresponding problem indicators (counts of 1). For standardization, domain scores were multiplied by 10 and divided by the number of corresponding indicators. The maximum possible score for each domain was 10. Higher scores indicated more problems. Two indices were calculated: first, the child well-being index score was generated as the sum of the three well-being domains; second, a composite condition-of-child index was derived as the sum of family processes and family demographic, social and economic status domains. A population-level index score was derived as the mean of children's index scores[40].

In Canada, using data from the National Longitudinal Survey of Children and Youth (NLSCY) a similar scoring approach (problem/no problem) was employed to construct *The NLSCY Vulnerability Index*[55]. The aim was to capture the individual child's behavioural and cognitive development by assigning dichotomized scores (problem /no problem) on a variety of domains like: motor and social development, mathematics, temperament and behavioural problems.

Later, in 2008, Moore et al. employed the Micro-data tally method to count positive outcomes and contexts for the individual child using data from the 2004 National Survey of Children's Health (USA)[38]. *The Micro-data child well-being index (NSCH)* was developed on 69 indicators representing four child well-being domains (physical health, educational achievement and cognitive development, psychological health and social health domain) and two condition-of-child domains (family domain and community and socio-demographic context domain)[38]. The same methods were employed with data from the 2007 NSCH to develop a *Positive Index of Child Well-being* using the same four domains (physical health, psychological health, social health and educational achievement and cognitive development domain) to combine 30 indicators for children aged 6-11 and 32 indicators for adolescents aged 12-17[37].

In Australia, *The Outcome Index* was constructed using a Standard Score Method and considered child outcomes from the Longitudinal Study of Australian Children (LSAC)[56]. Life context factors were not included. The index was intended as a direct measure of

development and the aim was to summarize children's well-being on three developmental domains: physical health, social and emotional functioning and educational attainment domain. Initially, the scoring method used for the NLSCY Vulnerability Index was employed. However, LSAC researchers felt that dichotomizing outcomes reduced the accuracy of the information and limited the range of analyses to be performed with the data. Additionally, they acknowledged that the decision on problem/no problem cut-offs was arbitrary. Similar limitations of the NLSCY Vulnerability Index had been previously noted by Willms et al.[57]. Therefore they decided to retain child outcomes in their ordinal or continuous form. These were first transformed to standard scores (z-scores). Measures where higher scores reflected lower functioning were reversed, for this corresponding standard scores were multiplied by -1 so that higher scores reflect better outcomes. Sub-domain scores were calculated as the average of outcomes standard scores. Domain scores were generated as the average of corresponding sub-domain standard scores. The domain scores were standardized to a mean of 100 and a standard deviation of 10. The Outcome Index was calculated as the average of standard domain scores and further standardized to a mean of 100 and a standard deviation of 10. For increased flexibility of use, categorical versions of the domain scores and the Outcome Index were also created. Cut-offs were applied to identify children performing best (top 15%) and worst (bottom 15%) in terms of their physical, social/emotional and learning outcomes and overall well-being[41]. The authors noted, however, that these cut-offs were statistically based (the opinion was that one standard deviation below the mean represents signs of difficulty and similarly, one standard deviation above the mean represents signs of success). The predefined cut-offs were not intended to be clinically meaningful and their main purpose was to allow for comparisons between population sub-groups relative to each other[47]. The construct validity of the LSAC Outcome Index was demonstrated by examining associations between the domain scores and overall index scores and factors known to have influence on infancy and early childhood developmental outcomes[41]. The LSAC Outcome Index (with the two versions provided) allows flexibility of use and ease of reporting and understanding by stakeholders and relevant policy makers[41, 47]. The index and the domain scores provide an account of children's development and well-being in relation to the conditions of their lives.

In Europe (Portugal), Bastos et al. developed a *Multidimensional Measurement of Poverty,* which measured *child poverty* based on family income and "child deprivation". According to the authors, a child suffered from "income poverty" if he/she was a member of a family with scarce income, and a child was "deprived" if he/she did not have a normal consumption pattern[27, 58, 59]. *The Child Deprivation Index* was computed using variables from the following five categories: family living conditions (number of family members, education level of parents, subjective perception of the family's economic resources), housing (physical conditions of the house, infrastructures and neighbourhood), health (nutrition, medical care and child's perception of his/her own health conditions), education (school success, family support and child's perception of school) and social integration (extra-curricular activities, playtime, holidays, mobility, favourite games and child's perception of the urban space)[27, 59]. The index was a count variable with a range of 0 to 12, higher values indicating more deprivation. Equal weights were applied to each variable. Child deprivation was then investigated in relation to income poverty[27, 59].
Later, in 2009, the authors redefined "child deprivation" as well-being deficit in the following four domains considered essential for child functioning: education, health, housing and social integration[27, 58]. Each indicator included in the four domains of deprivation was quantified in terms of degree according to a membership function[27, 58]. A new weighting system (log of an inverse function of the average deprivation level) was applied. More emphasis was placed on indicators where deprivation was not widespread[27, 58]. *A Composite Index Of Deprivation* with a range of 0 to 1 was developed. This was generated as a weighted sum of the membership average value for each indicator, allowing for the evaluation of the deprivation intensity[27, 58].

The studies carried out by Bastos et al. used data from surveys applied directly to children enrolled in the third or fourth year of the primary cycle in public schools in Lisbon. Indicators of children's subjective perspective about their well-being were included[27, 58, 59].
Although developed on the background of child deprivation, the work presented above is worth mentioning here as it improves on child quality of life literature by including children's own view as indicators and applying a weighting system (method employed is still an imperfect approximation to real weights) in index development[27].

Finally, in 2013, Fernandes et al presented work regarding the development of a Weighted Multidimensional Index of Child Well-being. This was generated for a total of 1,246 children aged 8 to 13 years from the Northern region of Portugal[60]. The index was developed from 41 indicators forming 8 domains: Material well-being, Housing context, Neighborhood context, Health behaviors, School, Leisure and recreation, Social relations and Psychobiological well-being. The researchers collected domain-specific indicators from the parents and child. The objective indicators, reported by parents, considered in binary form (with 1 for a positive and respectively 0 for a negative domain outcome) were used in conjunction with subjective opinion of the impact of having or not having an item reported by each individual child as well as subjective report regarding the degree of importance (rated on a five-point scale from "Not important" to "Extremely important") that the child attributed to each indicator. First, domain indices were developed using simple additive methods and indicators were assigned different weights resulted from the ranking of domain items. Next, the overall well-being index was constructed as the sum of domain indices and each index was multiplied by the weight attributed by the individual child to each particular developmental dimension[60]. The authors estimated OLS models for determinants of child well-being and tested the performance of the overall well-being index against other three approaches (1. No weights, no degree of importance; 2. No weights, with degree of importance; 3. With weights no degrees of importance). They concluded that regardless of the method the determinants of the overall well-being are similar (the significant determinants were age, school cycle, mother's and father's education and professional level, nationality and type of school attended). However, they highlighted the fact that when including children's subjective report the impact of parental education and professional status almost doubles[60, 61]. This work was later completed by investigation of the inter-domain relationships and significant determinants (from OLS models) for each one of the eight domains[61].

1.1.7 Well-being indicators and indices in Ireland

In accordance with the international trend in children well-being research, in 2000, the Department of Children and Youth Affairs published The National Children's Strategy[62]. This report set out a vision for Irish children recognizing the valuable contribution they make to society. The National Children's Strategy follows key principles set by the United Nations Convention on the Rights of the Child (1989): non-discrimination, best interests of the child, survival and development, and respect for the voice of the child[62]. Similar to the bio-ecological model of child development, a "whole child perspective"[a] was adopted. This perspective comprised of three broad domains: children's own capacity, children's relationships, and formal and informal supports. The report identified nine interlinked dimensions of children's own capacity: physical and mental well-being, emotional and behavioural well-being, intellectual capacity, spiritual and moral wellbeing, identity, self-care, family relationships, social and peer relationships, and social presentation[62]. Children are seen as young citizens that should be respected, cherished and supported by family and wider society. They should be ensured a fulfilling childhood and should be allowed to make their own contribution to

[a] The 'whole child' perspective regards the child as an active agent who has the capacity to shape their own lives as they grow and develop while also being shaped and supported by the world around them.

their lives. The importance of giving young people a voice of their own is highlighted. The National's Children Strategy report also highlighted that understanding of children's lives could be advanced by the development of a national set of child well-being indicators[62, 63].

Children macro-level data in Ireland

Later, in 2005, The National Children's Office published a report on the development of a National Set of Child Well-Being Indicators in Ireland. In line with The National Children's Strategy, a holistic approach to children's life was adopted and efforts were made to identify indicators from all three domains: children's own capacity, children's relationships, and formal and informal supports. The proposed indicators set comprised of forty-two child well-being indicators and seven socio-demographic indicators used to contextualize children's lives in Ireland. It was concluded that the set of indicators was a first step in measuring the complexity of Irish children's lives in an accurate and comprehensive way.

Based on these efforts, in 2006, The Office of the Minister for Children published the State of the Nation's Children, the first of a biennial series of reports describing how Irish children are faring. From 2010, The Department of Children and Youth Affairs became the authority responsible for publishing these biennial reports. The State of the Nation's Children reports are important child well-being monitoring instruments in monitoring bringing a policy focus on child well-being[14]. In addition, macro-level data from Ireland was used by Bradshaw et al. and UNICEF to develop composite indices of child well-being serving for international comparisons[51, 53, 54].

Children micro-level data in Ireland

In April 2006, The Irish Department of Health and Children in association with the Department of Social Protection and the Central Statistics Office commissioned the project "Growing up in Ireland"[64] (GUI). This is a national longitudinal study of children that provides a comprehensive image of the lives of two cohorts of children: The Infant Cohort (baseline at 9 months) and The Child Cohort (baseline at 9 years). Their development is charted over time with follow-ups approximately every two years. The data collected is reflective of individual child development and contextual factors. The GUI study is described in detail in Chapter 3.

Using data from Wave 1 of the Child Cohort (9 years-old), Cheevers et al. employed the methods used for the LSAC Outcome Index to develop *The Index of Well-being for 9-year-old Irish Children*. The authors used the same three domains of child development (physical health, social and emotional functioning and educational attainment domain) and the same steps of index development as those employed by Sanson et al[14, 47]. Similar to LSAC Outcome Index, the domain scores and the overall index were presented in a continuous and a categorical form. These were presented in relation to socio-demographic characteristics. The validity of the index was investigated by verifying correlations between domain scores and a forced one-factor Principal Components Analysis was conducted. The authors concluded that the child well-being index developed is an efficient summary of the multidimensional nature of child well-being and reinforced its ease of use and understanding by relevant stakeholders[14].

1.1.8 Challenges in developing child well-being indices

Previous research identified six main challenges encountered when developing overall indices of child well-being: 1. Conceptualization of well-being; 2. Selecting domains and corresponding indicators for inclusion in the index; 3. Setting the weights assigned to the index components; 4. The sensitivity of the index to items included/omitted; 5. Dealing with lack of data; 6. Deciding on the variable coding and cut-offs representing good or poor outcomes[14, 40]. These are discussed below.

Well-being is a widely researched topic; however, it is inconsistently defined and conceptualized. The ways adult and child well-being are perceived differ significantly. Adult well-being is mostly seen as a subjective, quality of life measure and specific aspects of well-being (e.g. psychological well-being, social well-being, economic well-being etc.) are generally investigated separately. Child well-being on the other hand is mostly understood as a construct with multiple dimensions[2, 14, 37, 38, 40, 41, 47, 51, 65]. While several studies conceptualize child well-being on main developmental domains considered to be relevant throughout the entire life course, from childhood into adulthood, no consensus regarding the number, the boundaries or the name of the dimensions exist [14, 38, 41, 47, 66]. Selecting a concise set of domains and indicators to account for the entire childhood period is difficult for three main reasons. First, there are major differences in what constitutes good functioning across the age spectrum within childhood. Second, children are involved in progressively more complex developmental tasks from infancy into early childhood and adolescence and aspects from these should be included when investigating well-being[38]. Third, in line with previous recommendations, child-reported measures should be also considered when investigating child well-being and this is only possible for children from older age groups. Therefore, it is not surprising that a review of child well-being literature conducted by Pollard et al. observed an increase in the number of domains and subjective measures used in the studies assessing the well-being of older children[2].

According to O'Hare et al. (2012), the definition of child well-being is best understood from its operationalization and measurement by different researchers. The authors suggest that, often, well-specified measures and indicators of well-being facilitate a clearer understanding of the concept than rhetorical presentation[11]. In a systematic review of child well-being literature, Pollard et al. (2003) found that well-being has been studied across a range of disciplines, age groups, cultures and countries, resulting in a variety of definitions[2]. It was suggested that well-being could be defined at an individual level incorporating domains like physical, social, cognitive or psychological or at environmental level incorporating life context[2]. The authors considered useful the multidimensional conceptualization of adolescent wellbeing[b] used by Colombo et al. 1986[2].

[b] Adolescent well-being was seen as a construct composed by three dimensions: mental/psychological, physical and social dimension.

When considering the three normative and conceptual theories identified by Ben-Arieh as promoters of the Child Indicators Movement the following conclusions regarding child well-being conceptualization can be reached:

Child well-being should

1. Be defined for all groups of children without gender, age, disabilities or other discriminations
2. Consider the child as the unit of analysis
3. Be multidimensional and ecological (include considerations from the Bio-ecological model of human development)
4. Consider present child outcomes and conditions affecting development
5. Include child's subjective perspective on their life in particular in relation to mental status and social relationships.

The first four child well-being aspects presented above are included, at least partially, in most of the macro and micro-level data studies[14, 47, 50, 51, 67, 68]. Due to reduced data availability, child's own views were not properly considered in the existent macro-level indices[27, 50, 51, 67, 68]. This was also the case for three of the micro-level indices[14, 38, 40, 47] mentioned previously. The parents were the main respondents in the surveys used to construct the Micro-data Child Well-being Index[38]. Therefore, the child's own view on their well-being was disregarded. The LSAC Outcome Index was derived for children aged 5 or younger and this could explain the lack of a subjective well-being dimension[47]. On the other hand, two indices developed in Portugal, the Multidimensional Measurement of Poverty (including approximately 5,000 children) and the Weighted Multidimensional Index of Child Well-being (including 1,236 children) used data directly collected from the child and children's own view on various aspects of their well-being was considered[58, 60].

One major difference in establishing the development framework for well-being indices can be observed. Researchers interested in macro-level well-being indices combine child functioning with life context measures into an overarching index[50, 51, 67, 68]. This was also the case for Bastos et al. when the Multidimensional Measurement of Poverty was developed. Most micro-level researchers on the other hand, recommend a framework of well-being that makes a clear distinction between child functioning or capabilities and child's life context[14, 37, 38, 40, 41, 47, 62]. According to Moore et al. (2012) combining child's outcomes with contextual measures would result in confounding determinants that could facilitate or impede well-being and actual development[37]. Similarly, Cheevers et al. (2013) suggests that including child outcomes and contextual measures in one index results in implicit assumptions that the child inherits the parents circumstances, overlooking the complex modulating mechanism of risk/ protective factors, vulnerability and resilience[14]. Therefore, the developers of micro-level child well-being indices consistently understand well-being as a multidimensional construct of individual functioning or developmental outcomes[14, 38, 47, 69]. They suggest that the influence of various life context aspects should be then tested empirically on child well-being[14, 38, 47].

Similar to conceptualization of well-being, a lack of consensus regarding key domains and indicators of child well-being emerges from pre-published literature[2, 11, 14, 27]. A systematic review of child well-being literature published between 1991 and 1999 conducted by Pollard et al. (2002) resulted in identification of distinct domains of well-being: physical, psychological (including mental health, emotions or mental illness indicators), cognitive (including intellectual or school related indicators), social and economic. A wide variety of indicators were identified and the following themes were observed: the number of indicators used increased with children's age, the physical, cognitive social and economic domains are generally assessed using more positive indicators, while the psychological domain is measured

mainly by negative indicators[2]. Research by Fernandes et al. (2012), concluded that there are no definite rules for establishing the number, meaning and boundaries of dimensions used in the development of child well-being indices. This lack of consistency between studies might be explained by differences in conceptualizing child well-being. The authors call for establishing a "common and consensual framework" to inform definition of domains and indicators, allowing development of well-being indices that can be applied locally, nationally and internationally and facilitate accurate comparisons[27].
In a review of 18 composite indices of child well-being O'Hare et al. (2012) concluded that the numbers of domains included a range from two to seven with an average of five domains, a total of 100 different domains' names of which 60 unique names were identified[11]. Half of the studies reviewed had six or seven domains including: health, material well-being and education. O'Hare et al. (2012) identified theoretical framework and data availability as the two main factors that influence the selection of domains of child well-being[11]. Additionally, differences of opinion regarding the inclusion or exclusion of child's life context when constructing a composite index of well-being influences the numbers of well-being domains considered. Most micro-level data studies excluded contextual measures from the actual well-being index and used three or four well-being domains[14, 38, 41, 49]. Some of these studies constructed a separate index of child's context. This is further merged with the well-being index to account for the child's overall condition[38, 49].
According to recommendations from previous micro-level child wellbeing studies, when selecting indicators for index development, three aspects regarding their theoretical meaning should be considered. First, child well-being indicators should be representative of current functioning or well-being but also relevant for well-becoming or development into healthy, functional citizens (e.g. general health, emotional indicator, cognitive indicator etc.)[14, 47]. Second, the indicators selected should be representative of both positive and negative aspects of development[46]. Third, to best represent child-wellbeing the following three types of indicators should be included: objective, subjective and observable indicators[40].

The process of developing child well-being indices is relatively new and so far most of the micro- and macro-level studies have weighted domains and constituent indicators equally[14, 27]. According to Hagerty et al. (2007) equal weighting is the desired approach in the absence of an appropriate statistical and theoretical weighting mechanism[14, 70]. Moore et al (2008) considered that equally weighing the domains allowed for a holistic approach to child well-being avoiding instances where one domain or functioning aspect drives the overall index[38]. On the other hand, Fernandes et al (2012) underlined the need for improved methods of indicators aggregation that would account for the importance of each indicator considered[27]. This is consistent with previous research of Hagerty et al. (2007) concluding that whenever possible weights should be derived from purposely built surveys generating estimates of the importance given by individuals to certain life aspects[27, 70].

While aggregating well-being indicators into summary indices has grate benefits by facilitating progress monitoring and comparisons of trends across time and space, it can lead to some opacity and mask critical areas of well-being[27, 53]. Moore et al. underlined that some might question the validity of such summary statistics as they can mask trends within the composing indicators[14, 38, 40]. However the authors went on to explain that similarly to economic indices, the averaging effect of creating such measures reduces the volatility within the data[14, 38].

Gaps in available child well-being data can affect the way researchers conceptualize well-being and influence the number of domains and indicators used[11]. Although, using multiple types of indicators and reporting findings for additional domain-specific index scores can offer valuable insight about the various dynamics of the child's status Vandivere et al. (2008) acknowledges that this is not always feasible due to data limitation[49].
Most child well-being indices are derived from pre-collected administrative (for macro-level indices) or social research (micro-level indices) data. Most macro-level researchers acknowledge data availability limitations in particular in relation to: indicators directly reported by the child including subjective perspective on own well-being and number of indicators representing positive measures of development[27, 46, 50, 51, 67]. Micro-level researchers also highlight limitations in indicator availability arising from the use of pre-collected data from studies designed for purposes other that of well-being index development[38]. At an indicator level, using high response rate as selection criteria was recommended[41, 47] and different missing data imputation methods had been used[14, 38, 41, 47].

The type of the variables (dichotomous, ordinal or continuous) representing the indicators can influence domain/ overall well-being scores.
Macro-level researchers use standard score (z-scores) transformations to make indicators reported on different metrics comparable and prepare them for aggregation in domain/index scores[50-52]. Similar z-scores transformations were also employed in micro-level studies carried-out by Sanson et al. and Cheevers et al. to generate *The LSAC Outcome Index* and *The Index of Well-being for 9-year-old Irish Children,* respectively. Other micro-level researchers dichotomised variables to scores of 1 or 0. In most cases a score of 1 represented a poor status: negative well-being (*An index of the condition of the children (NSAF)*, child deprivation (*The Child Deprivation Index* and *The Composite Index Of Deprivation*- Bastos et al.) or a behavioural/cognitive developmental problem (*The NLSCY Vulnerability Index*). A reverse scoring method with a score of 1 coding positive status was used for *The Micro-data child well-being index (NSCH, 2004)* and *The Positive Index of Child Well-being (NSCH, 2007)* developed by Moore et al (2009, 2012)[37, 38]. For most of the previously mentioned studies researchers selected a threshold to dichotomize indicators based on expert opinion and pre-published research studies and [37, 38, 40], others used the median as a cut-off point[58, 59]. Sanson et al. found that dichotomising variables involves several "essentially arbitrary decisions", suggesting that an approach where variables are retained in their continuous or categorical format is desirable[41, 47, 66]. Moore et al. recognized identifying and deciding on cut-off points as "the most challenging aspect" of index development however the author explained that most of NSCH indicators selected at both time points (2004 and 2007) were investigated using "yes/no" type of questions[38].

1.2 Paper statement

This research project will develop a micro-level Well-Being Index for a nationally representative sample of children investigated at two important developmental time-points: baseline at 9 months and follow-up at 3 years. The Well-Being Index is seen as a multidimensional concept, an expression of how the child is faring on three main developmental domains: **1. Health and Physical Development; 2. Socio-Emotional; and 3. Cognitive-Motor domain**.

Well-being and the three corresponding domains are latent traits that cannot be measured directly. Domain outcomes will be identified and summarised to construct Domain Scales. Next, these will be used to generate the Well-Being Index. Children will be ranked based on their Domain and Well-Being scores. For increased flexibility of use, the Domain Scales and the

Well-Being Index will also be presented in an ordinal version, classifying children in four groups: very poor, poor, good and very good domain development and well-being. The structure of the Domain Scales and Well-Being Indices will be investigated. Sound structure will ensure that components within each domain and the index measure what they are thought to be measuring and are relevant for the domain and index trait. The construct validity of the Domain Scales and Well-Being Indices will be verified by investigating associations with pre-established determinants of development. The determinants will be selected according to the bio-ecological model of human development and other relevant studies and will represent the **child's own characteristics** (e.g. birth-weight, delivery mode, gestational age etc.) and his/her **life context** (e.g. relationship with parents, economic status, type of childcare, neighbourhood safety, home learning environment etc.).

To exemplify applications of the two versions (interval and ordinal) of the Domain Scales and Well-Being Indices, these will be employed in further cross-sectional or longitudinal analysis. It is anticipated that the Domain Scales and the Well-being Indices will be able to discriminate well between children with differing outcomes or backgrounds. Therefore, these could be used to investigate differences between certain children sub-groups (e.g. regions, gender, birth-weight groups and others) or they could be analysed together with complete sets of developmental determinants to highlight significant factors with positive or negative effect on children's development and well-being. It is believed that current well-being of the child should be indicative for his/her well-becoming or subsequent development into healthy, able and active members of society. Availing of the longitudinal nature of this project, the predictive ability of the baseline domain and well-being scores for follow-up results will be tested empirically.
The conclusions of this study will have national relevance and could be of interest for researchers, policy maker and parents. Findings from this study could reveal the factors that promote and hinder early life development in Ireland.

1.3 Guiding principles

Based on previous research, the following ten guiding principles were adopted to structure the index development and validation process[29, 37, 38, 47, 71]:
The Well-being Index should

1. Be based on a well-established theory
2. Be developed on domains and sub-domains that encompass subjective or objective developmental outcomes that can be measured throughout childhood and into adulthood
3. Be developed on domains that have a positive, negative or neutral effect on the overall index that would allow identification of the groups of children with good and poor functioning
4. Be reported as a single number but that can be broken down into components (domains) that are relevant in their own right and can be further investigated
5. Be as parsimonious as possible given the population and data used
6. Have validity by demonstrating associations with proximal and distal factors that are known to be predictively related to child outcomes
7. Allow construction of nationally representative parsimonious statistical models to assess significant determinants of child well-being
8. Be predictive of later childhood outcomes
9. Have policy relevance
10. Have research relevance

1.4 Definition of terms

For the purpose of this project the notion of *construct* is used to express a state that cannot be measured directly but that can cause a range of observable manifestations, which can in turn be used to summarise the construct. The statistical equivalent term for this is *latent trait*.

Outcome was defined as an attribute of the child strictly limited to quantifying development at a particular point in time, an observable manifestation of the underlying well-being domain construct[47, 72, 73]. In methodological terms, an outcome is an effect indicator of the construct; consequently *indicator of development,* or simply *indicator* replaced the term outcome when discussing the project materials and methodological aspects. Statistically, this is the variable corresponding to an outcome and was either directly available from large national data set (Growing Up In Ireland Study) or derived by combining variables from this. *Individual item, scaled measure* or *derived variables* describe the types of GUI data converted to indicators.

Developmental determinants represent aspects from children's lives (e.g. child's biological characteristics, primary caregiver and family factors, child's interactions etc.) that could play a causal role and could influence their life trajectory predisposing to good or bad outcomes.

1.5 Dissertation overview

This PhD thesis is organized as follows:

Chapter 2 outlines the conceptual framework adopted in this research.

Chapter 3 presents the characteristics of the study participants and data used, and describes the study materials employed for Domain Scale and Index development.

Chapter 4 gives a general overview of the methods used for Domain Scale and Index development.

Chapters 5, 6 and 7 describe the development and present results for each of the three Domain Scales. The methodological particularities of each domain are highlighted. Next, **Chapter 8** is dedicated to describing the development of the Well-Being Index and presenting results for this.

Chapter 9 presents the methods employed and results from the analysis carried out to verify the structure and the validity of the Domain Scales and Well-Being Index.

Chapter 10 is dedicated to illustrating some of the applications of the Domain Scales and the Well-Being Index.

Chapter 11 presents a summary of this PhD project, a discussion of the Domain Scales and Index development experience and findings from it, and the strengths and limitations of this research. Some future directions are given and final conclusions are outlined.

Chapter 2 Framework

2.1 Introduction

This chapter presents the conceptual framework and guiding principles used for the development and validation of the Well-being Index. The conceptualization of the Well-Being Index was informed by previous studies of micro-level child well-being indices carried out by Sanson et al, Cheveers et al. and by Moore et al[14, 37, 38, 40, 41, 47, 66]. Child well-being does not occur in isolation and in line with developmental theories (the bio-ecological model of child development, the Barker hypothesis) factors contributing to children's lives context are investigated in relation to their well-being.

2.2 Conceptual framework

While many definitions of child well-being exist (Table 1.1), most researchers agree that this is a broad concept involving multiple dimensions[11]. Understanding infancy and childhood well-being, its determinants and interdependencies requires a holistic conceptual framework[9].

In line with the national and international trend and the bio-ecological model of child development, a "whole child perspective" was adopted in this project. This included the child and his/her well-being (manifested through developmental outcomes) and investigated inter-relationships with life aspects known to influence early life development (Figure 2.1).

Therefore, well-being is viewed as a summary of a child's own capacities, a comprehensive assessment of how he/she is faring. The child well-being framework adopted was based on three developmental domains: **1. Health and Physical development; 2. Socio-emotional;** and **3. Cognitive-motor domain** (Figure 2.1). In accordance with developmental theories, these three domains mirror the key child development dimensions: physical, intellectual/educational, psychological and social dimension. They reflect the areas of child well-being most prevalent in the research literature and are consistent with domains used in previous micro-level indices[14, 37, 38, 41]. Moreover, they are in line with the three aspects of well-being comprised in the WHO definition of health, further supporting their relevance from infancy to adulthood. Each domain is a **summary of developmental outcomes** assessing child functioning, hence three corresponding Domain Scales were developed. The **Well-being Index** was constructed as a **summary of the three Domain Scales** (Figure 2.1).

Achieving well-being is regarded as a dynamic process involving interactions between individuals and the world around them. Previous research suggests that a wide range of contextual aspects from children's lives[c] can influence development and implicitly well-being. Therefore, to gain a more complete understanding of child well-being the interdependencies of the Domain Scales and Well-Being Index with **pre-established developmental determinants** were also investigated. In line with the bio-ecological model of human development[18] and the Barker hypothesis[22], determinants accounting for: **1. the child as agent in his/her own life**, 2. **child's life context** and 3. **pre-natal life aspects** were considered in relation to well-being.

[c] Child's life aspects and literature supporting their influence on child development are presented in the first section of Chapter 9.

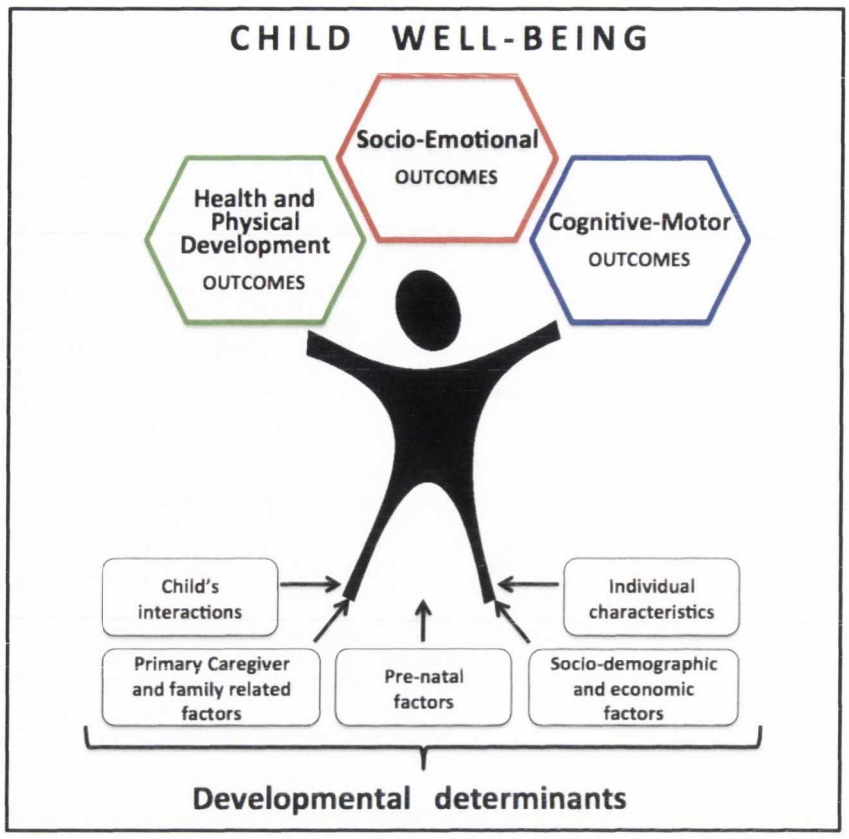

Figure 2.1 The "whole child perspective" adopted in this project

The **role of the child as an agent in his/her own** life was acknowledged by investigating the relationship between contemporaneous well-being and *individual characteristics* from previous time points (e.g. child characteristics at birth, previous well-being scores and others). **Child's life context** was expressed by determinants from three main groups: child's interactions, proximal and distal factors. *Child's interactions* were represented by relationships and activities with the immediate family and other caregivers. *Proximal factors* reflected child's immediate environment and included Primary and Secondary Caregiver characteristics and relationships within the home. Finally, the *distal factors* considered accounted for child's socio-demographic and economic aspects. Certain **pre-natal life aspects** can have long-term effects on child outcomes and the interrelationships between well-being and factors like *during pregnancy stress, smoking* and *alcohol* consumption were investigated.

Observing significant interdependencies between domain development or well-being and pre-established determinants would serve to: 1. validate the Domain Scales and the Well-being Index and 2. would allow to highlight aspects that can impact child development. Therefore, consistent with previous studies using micro-level data[14, 41], individual and contextual influences on domain development and child well-being are first investigated for a selected number of individual characteristics, interactions, proximal and distal factors and pre-natal life aspects.

Similar to other micro-level researchers, it is believed that developmental outcomes are the best representation of child well-being. Therefore, the Domain Scales and Well-Being Index were strictly developed on child outcomes and the influences of contextual factors (which can impact well-being in a positive or negative way) were analysed empirically. Macro-level researchers on the other hand combine outcomes and contextual factors to construct a well-being index.

Previous research suggests that due to complex interactions, the influence of developmental determinants on child well-being should not be perceived as additive[18, 27]. For this project, developmental determinants were combined in statistical models and the relationship between each Domain Scale and Well-Being Index with the complete set of determinants (analysed together) was investigated. This view is contrary to some micro-level researchers who combined child's life aspects in a contextual index and investigated this in relation to a child well-being index[37, 38].

The considerations presented above ensure a holistic framework of child well-being consistent with The National Children's Strategy. This included: children's own capacity, children's relationships, and formal and informal supports. These were also consistent with recommendations for a proper assessment of child well-being underlying that: 1. The child should be the unit of analysis, 2. A multidimensional approach is required, 3. Overall well-being should be adequately represented and 4. Interactions between aspects of well-being should be considered[27].

2.3 Aim and Objectives

This project **aims** to develop a child-centred Well-Being Index for an Irish cohort at two pivotal time points of their lives: baseline at 9 months and follow-up at 3 years. The Well-Being Index is seen as an overall summary of outcomes from three important developmental domains combined to form three corresponding scales: health and physical development, socio-emotional and cognitive motor scale. The Domain Scales and the Well-Being Index would allow to rank or classify children relative to each other and could be used to compare between sub-groups of children, highlight significant determinants of development and investigate the relationship between domain and well-being results across time (from baseline to follow-up).

The **first objective** of this study is to *develop* the Well-Being Index and corresponding Domain Scales. To achieve this:

- domain-specific outcomes are selected and indicators (representing child's scores for the outcome) are derived
- domain-specific indicators are first summarised in Sub-Domain Scales
- the Sub-Domain Scales are used to generate Domain Scales
- the Domain Scales are combined to construct the Well-Being Index.

The **second objective** is to *present* the Well-Being Index and corresponding Domain Scales in ways that would facilitate ranking and classification of the children. This is achieved by providing:

- an interval form and children are assigned individual scores for each Domain and the Well-Being Index
- an ordinal form for each Domain and the Well-Being Index children and children are assigned one of the following categories: Very poor, Poor, Good and Very good development.

The **third objective** is to verify the *structure* and *validity* of the Domain Scales and the Well-Being Index. The *structural validation* is carried out by examining relationships between:

- Indicators with the Domain Scales
- Sub-Domain Scales with the Domain Scales and the Well-being Index
- Domain Scales with the Well-being Index

The *construct validity* of the Domain Scales and the Well-being Index is established by assessing individual associations between each Domain Scale or Well-Being Index and a large set of pre-established developmental determinants.

The **fourth objective** is to *illustrate the flexibility of use* for the two forms (ordinal and interval) of the Domain Scales and Well-Being Index. The applications addressed vary in complexity. The Domain Scales could be used for simple descriptive and inferential analysis:

- to show and investigate differences in Domain and Well-Being Index scores across sub-groups of children (e.g. gender, region, income group, birth-weight and others)
- to identify well-being sample trends from baseline to follow-up or to generate socio-demographic profiles for extreme (Very poor, Poor and Very good) Domain and Well-Being categories of children

Additionally, building on the simple linear regression models used for validation purposes, complex fully adjusted statistical models can be used to highlight interdependencies between each Domain Scale and Well-Being Index and developmental determinants analysed together (outcome variables: Domain Scales or Well-Being Index and explanatory variables: a complete set of developmental determinants).

2.4 Summary

This chapter presents the concepts and framework used to develop the Well-Being Index. A "whole child perspective" is adopted. Well-being is seen as a multidimensional concept and the Well-Being Index is a comprehensive, point-in-time assessment of child functioning on three key developmental dimensions. Developmental outcomes are first grouped in three Domain Scales (representing the key dimensions of well-being): 1. Health and Physical Development, 2. Socio-Emotional and 3. Cognitive-Motor. The Domains Scales are then combined to generate the Well-Being Index. Next, this project investigates the interdependencies between each Domain Scale and Well-being Index with well-known developmental determinants from the following five groups: 1. Individual characteristics, 2. Child's interactions, 3. Primary Caregiver and family factors, 4. Socio-demographic and economic factors and 5. Pre-natal factors (Figure 2.2). This provides validity support while facilitating a better understanding of aspects from a child's life that can influence his/her development.

The conceptual framework established mirrors national and international trends. For consistency with the "whole child perspective" established by The National Children's Strategy:

The Domain Scales and the Well-Being Index

1. are a true expression of how well a child is faring (they are strictly derived from developmental outcomes) and would allow to classify children based on their development
2. help make meaningful comparison between different children sub-groups, investigate longitudinal sample trends (baseline to follow-up) and establish what are the significant life aspects with an impact on development within the national context.

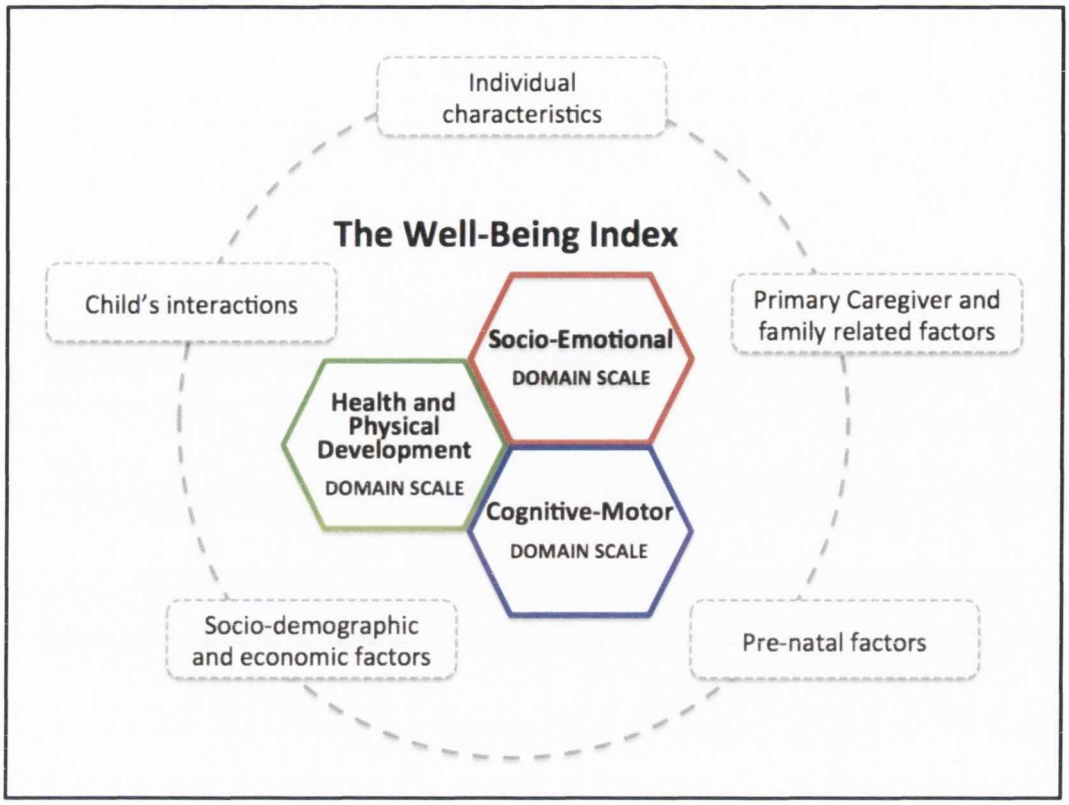

Figure 2.2 Schematic representation of the Well-Being Index and Domain Scales from a "whole child perspective"

Chapter 3 Study Participants and Materials

3.1 The Growing Up in Ireland Study

Growing Up in Ireland is the National Longitudinal Study of Children (GUI) commissioned by the Irish Government and funded by the Department of Health and Children through the Office of the Minister for Children and Youth Affairs, in association with the Department of Social Protection and the Central Statistics Office. The main objective of the GUI is to provide "evidence-based research into childhood and children's wellbeing" that can further support improvement of national services for children and their families in line with The National Children's Strategy set out by The Department of Health and Children in 2000. The study is concerned with the factors that determine and can undermine the development of two cohorts of Irish children, the Infant Cohort (starting at 9 months) and the Child Cohort (starting at 9 years). Being comprehensive by nature the GUI study investigates wide range of child outcomes and their development over time in the followings three broad domains: physical health and development, social/emotional/behavioural wellbeing and educational achievement and intellectual capacity[72].

3.2 Study Participants. The Infant Cohort

This PhD project involves secondary data analysis and is interested in two waves of data collection from the Infant Cohort of the GUI: Wave 1- 9 months and Wave 2- 3 years.
Data for the Infant Cohort was first collected when the children were 9 months old. This wave of data collection (Wave 1) took place between September 2008 and April 2009 and involved a total of 11,134 children born between 1st December 2007 and the 30th June 2008. The follow-up (Wave 2) took place between December 2010 and July 2011 and a total of 9,793 children were re-investigated within the first month following the children' third birthday (i.e. their 37th month). For the purpose of this project, data from Wave 1 is referred to as **baseline** and data from Wave 2 is referred to as **follow-up**.

3.2.1 Sampling process

For Wave 1 the children and their families were randomly selected from the Child Benefit Register. In Ireland, Child Benefit is paid on a monthly basis up to the age of 16 years to the Primary Caregiver (PCG) of the child who must be registered and have a Personal Public Service Number (PPSN). Child Benefit must be first claimed within a 6- month period from the birth of the child, or the child becoming a family member, or the family coming to reside in Ireland. The Child Benefit Register is a comprehensive and up-to-date electronic database considered to fulfil all of the desirable requirements of a sampling frame. This allowed for the sample to be selected on a systematic basis, pre stratifying by marital status, county of residence, nationality and number of children in the claim. The overall response rate for the Wave 1 sample was just over 64% and 11,134 children were included[74].
For follow-up, from the population of nine-month olds and their families, 10,790 (96.2%) children who continued to reside in Ireland at the age of 3 years were considered. The response rate was 91.4% of the overall number, and 94% of all those contacted (338 families of the 10,790 could not be contacted)[75].

3.2.2 Data Collection

Comprehensive data about the children and their families were collected from the Primary and Secondary Caregivers (if available) through interviewer-administered questionnaires. Physical measurements (i.e. weight and height/length) of the children and caregivers were recorded. At follow-up, data regarding development was also collected through direct assessment of the child[74, 75].

Two types of questionnaires were used: a Main questionnaire- investigating general aspects and a Supplementary questionnaire- investigating sensitive issues (e.g. alcohol consumption and smoking during pregnancy etc.). These were developed by the Study Team, in association with advisory groups, including: The Scientific and Policy Advisory Committee (SPAC) and Panels of experts made up of over 100 specialists who offered valuable information on the relative importance of questions about child health and development, functioning and relationships, parenting / family context, child education, community / neighbourhood and socio-demographic characteristics. The opinion of relevant stakeholders was also considered in the development of the instrument and the Study Team synchronized the questionnaires with other international longitudinal child cohort studies[74, 75].
The instrumentation and procedures were piloted and tested in three distinct phases: pre-pilot, pilot and dress rehearsal and further improvements of the questionnaires were made. The questionnaires consisted of a series of carefully selected *stand alone items* (i.e. general health, hours of sleep during the day and night, birth-weight etc.) with individual relevance for children's life and several *widely used standardized instruments* (i.e. Child Characteristics Questionnaire, Ages and Stages Questionnaire, Quality of Attachment scale and others) measuring more complex concepts like relationships, learning etc. The questionnaire items and instruments were organized into topics of interest (i.e. Household Composition; Child's Habits and Routines; Child's Physical Health and Development; Parental Health; Child's Play and Activities; Child's Functioning and Relationships; Childcare Arrangements; Parenting and Family Context)[74].

The data collection process was carried out in the home of the respondent, by trained interviewers who administered the questionnaires using the Computer-Assisted Personal Interview (CAPI) Procedure for the Main questionnaire. The Sensitive questionnaire was completed by the respondents using the Computer-Assisted Self Interview (CASI) Procedure[74].

Following data collection the information was cleaned, coded and recorded in a large data set. Data have been re-weighted to ensure that the structure of the completed sample is the same as that of the entire population initially considered for the GUI study[74]. The data included variables corresponding to:

- *Stand alone questionnaire items* (e.g. general health, mode of birth, other children in the household etc.)
- *Scaled measures* and *standardized instruments* (e.g. Ages and Stages Questionnaire, Child Characteristics Questionnaire, Parental Stress Scale, The Dyadic Adjustment Scale etc.) completed by the PCG (all baseline and most of follow-up instruments) or directly administered to the study child (British Ability Scale at follow-up)
- *Derived variables* generated by the Study Team from questionnaire responses (i.e. social class, equivalised household income, Primary Caregiver's BMI etc.) were included.

The data set was structured into groups of variables that mirrored the topics of interest from the questionnaires.

Two versions of the data files (with detailed data dictionaries) are available: The Anonymised Micro-data File (AMF), a publicly available data set containing information from the Main questionnaires and managed by the Irish Social Science Data Archive (ISSDA) and The Researcher Micro-data File (RMF), also including Sensitive questionnaires information. Access to the RMF is requested through the Department of Children and Youth Affairs and is obtained based on the Statistics Act, 1993 following appointment of the researcher as an Officer of Statistics by the Central Statistics Office.

3.3 Study Materials

This research project used baseline and follow-up Infant Cohort data from the Main and Sensitive Primary Caregiver Questionnaires (PCG Questionnaires). Access to the RMF versions of the two data sets was obtained in December 2014. The variables considered for this project represented:

1. **child outcomes**, used as **indicators of development** for Well-Being Index generation
2. **pre-established developmental determinants** (PCG factors, Socio-demographic factors, Child interactions, Individual Characteristics and Pre-natal factors), used for validation purposes and to establish predictors of early life development representative for Ireland.

3.3.1 Child Outcomes

3.3.1.1. Considerations for selecting outcomes at baseline and follow-up

First, baseline and follow-up PCG questionnaires were analysed and scaled measures or questionnaire items relating to health and physical, socio-emotional and cognitive-motor outcomes were identified. It was observed that health and physical development outcomes were assessed using questionnaire items and interviewer-recorded physical measures (i.e. weight, length or height). Baseline and follow-up socio-emotional outcomes and baseline cognitive-motor outcomes were investigated with standardized instruments completed by the PCG. Cognitive outcomes at follow-up were recorded using standardized instrument, through direct assessment of the child. Finally, to assess child's motor outcomes at follow-up, questionnaire items and task performance assessment (through direct observation) were used.

Variables from the GUI data sets (Wave 1 and Wave 2) were included in the initial set of **domain-specific outcomes** for this project if they respected the following criteria:

1. They were a *measure of development*, indicating how the child is functioning on the particular domain
2. Had *face validity,* meaning that the questionnaire item coded by the variable truly represented an aspect of the domain they were being considered for
3. Had a *high response rate* (over 90% desired)
4. Scaled measure variables were only considered if the corresponding standardized instrument demonstrated reliability and validity within the Child Cohort.

The domain-specific outcomes selected were re-coded (to numeric format) or combined (two variables measuring similar outcomes, for instance *existence of chronic condition* and *severity of chronic condition,* were combined into a single variable) to derive the **initial set of indicators of development**. The resulting indicators were ordinal, count or interval variables and indicators' values were seen as child's scores for the corresponding outcome. Ordinal indicators were coded so that higher indicators' values represent better outcomes. To comply with this consideration, some of the count and interval indicators (i.e. nights in hospital, number of conditions, fussiness score, psychological difficulties score etc.) were inversed

(multiplied by -1) in the early stages of index development and this will be described in more detail in later chapters. The process of generating the initial set of domain-specific indicators to be considered further for Domain Scale development is presented bellow.

3.3.1.2 Generating the initial sets of domain-specific indicators

The Health and Physical Development outcomes available were *stand-alone questionnaire items* represented by binary or ordinal variables. Most Socio-Emotional and Cognitive-Motor outcomes were represented by child scores (*scaled measures or derived variables)* from standardized instruments applied during the interview. Questionnaire items investigating outcomes of interest to this study were selected from the Primary Caregiver (PCG) baseline and follow-up questionnaires (available from the GUI website and presented in Appendix A and B) and are presented below together with the methods employed to derive the domain-specific indicators.

A. Health and Physical Development Domain

The initial set of Health and Physical development indicators and the questionnaire items considered to best represent domain-specific outcomes at baseline and follow-up are presented in Table 3.1.

Baseline Health and Physical development items and corresponding indicators

At baseline, The Infant's Physical Health and Development section from the PCG questionnaire and data set were analysed. The questionnaire items and corresponding variables measuring child's health and physical development and indicating how the child is functioning on this particular domain were identified. *Six health-related questionnaire items* and *two physical measures* were selected as Health and Physical Development outcomes. The resulting domain-specific preliminary indicator set comprised of **six health indicators** and **one physical development** indicator (the two outcomes were combined into a single indicator). These are described bellow.

1. General health

The following questionnaire item was used to generate an **Indicator of general health**:

> *"In general, how would you describe <baby's> current health?"* with response list of options: "Almost always unwell"; "Sometimes quite "; "Healthy, but a few minor problems" and "Very Healthy, no problems"

The responses were coded from 1 to 4 as follows: 1- "Almost always unwell"; 2-"Sometimes quite "; 3-"Healthy, but a few minor problems"; 4-"Very Healthy, no problems".

Table 3:1 Health and Physical Development indicators: questionnaire items and physical measures used

	Indicators and the questionnaire items used	
	Baseline	**Follow-up**
General health Questionnaire items used	**Indicator of general health** 1- Almost always unwell 2- Sometimes quite 3- Healthy 4- Very Healthy *In general, how would you describe <baby's> current health?* • Almost always unwell • Sometimes quite • Healthy, but a few minor problems • Very Healthy, no problems	**Indicator of general health** 1- Almost always unwell 2- Sometimes quite 3- Healthy 4- Very Healthy *In general, how would you describe <child's> current health?* • Almost always unwell • Sometimes quite • Healthy, but a few minor problems • Very Healthy, no problems
Chronic conditions Questionnaire items used	**Indicator of chronic conditions** 1- Severe 2- Moderate 3- Minor 4- None *Has a medical professional ever told you that <baby> has any of the following conditions?* (List of 15 medical conditions and "None of the above") *You said that <baby> has/or has had [Name of condition]. Would you describe his/her condition(s) as minor, moderate or severe?*	**Indicator of chronic conditions** 1- Severe 2- Moderate 3- Minor 4- None *Does child have any longstanding illness, condition or disability?* Yes /No (0) *Do any of these illnesses hamper <child'> in his/hers daily routine?* No (1); Yes, to some extent (2); Yes, severely (3).
Number of conditions Questionnaire items used		**Indicator of number of conditions** 0- No conditions 1- One condition 2- Two conditions 3- Three conditions *What longstanding illness, condition or disability does <child> have? (List of 21 medical conditions)* → derived variable (number of chronic conditions; range: 0-3)
GP contacts **Paediatrician contacts** **A&E contacts** Questionnaire items used	**Indicator of GP contacts** **Indicator of Paediatrician contacts** **Indicator of A&E contacts** *Since <baby> was born how many times have you seen or talked on the telephone with any of the following about <baby's> physical health? (List of 5)* • *"A General Practitioner (GP) or family physician"* • *"A Paediatrician"* • *"Accident and Emergency*	**Indicator of GP contacts** **Indicator of Paediatrician contacts** **Indicator of A&E contacts** *In the past 12 months, how many times have you seen or talked on the telephone with any of the following about <child's> physical or emotional health?" the following response categories:* • *"A General Practitioner (GP)"* • *"Paediatrician/consultant/hospital doctor"*
Nights in hospital Questionnaire items used	**Indicator of Nights in hospital** *Has <baby> ever been admitted to a hospital ward because of an illness or health problem? Yes/No* *Not including when he/she was born approximately how many nights has <baby> spent in hospital? (not outpatient or emergency department visits)*	**Indicator of Nights in hospital** *Since the time of the last interview in MM/YY, approximately how many nights has <child> spent in hospital?*
Antibiotic prescriptions Questionnaire items used		**Indicator of antibiotic prescriptions** *"Has <child> received a course of antibiotics in the past 12 months? "Yes"/"No"* *In total, how many courses of antibiotics has <child> received in the past 12 months?*
Episodes of wheezing Questionnaire items used		**Indicator of episodes of wheezing** *In the past 12 months has<child> had any periods when there was wheezing with whistling on his/her chest when he/she breathed? "Yes"/"No"* *How many separate episodes/bouts of wheezing with whistling on his/her chest has <child> had in the past 12 months?*
Weight-to-length (height) Physical measures used	**Indicator of Weight-to-length** Measured 1. Weight and 2. Length	**Indicator of Weight-to-height** Measured 1. Weight and 2.Height

2. Chronic conditions

The item:

> *"Has a medical professional ever told you that <baby> has any of the following conditions?"* with 16 possible responses: first 15 options referred to medical conditions most frequently diagnosed during the first nine months of life, with final option: "None of the above" was considered.

Each response option was recorded as a stand-alone variable coded "yes" or "no". This question was followed by the item:

> *"You said that <baby> has/or has had [Name of condition]. Would you describe his/her condition(s) as minor, moderate or severe?"* asked if the PCG's response identified one of the 15 medical conditions listed previously.

The two items were combined to generate an **Indicator of chronic conditions** with four ordered categories as follows: 4-"No chronic condition" assigned if PCG's reported no chronic condition (response "yes" for the category "None of the above" from the first item) 3-"Minor chronic condition"; 2-"Moderate chronic condition", 1-"Severe chronic condition"

3. GP contacts

4. Paediatrician contacts and

5. A&E contacts

The following questionnaire item was used to generate an **Indicator of GP contacts**, an **Indicator of Paediatrician contacts** and **Indicator of A&E contacts**

> *"Since <baby> was born how many times have you seen or talked on the telephone with any of the following about <baby's> physical health? (excluding at time of birth)"* with 5 response categories of which the following were considered for this project:
>
> - "A General Practitioner (GP) or family physician"
> - "A Paediatrician"
> - "Accident and Emergency Outpatient"

6. Nights in hospital

Two items were used to construct an **Indicator of nights in hospital**:

> *"Has <baby> ever been admitted to a hospital ward because of an ness or health problem?"* with response options "Yes"/"No" and
>
> *"Not including when he/she was born approximately how many nights has <baby> spent in hospital? (not hospital outpatient or emergency department visits)"* asked if the response to the previous item was "Yes", were used to construct (a score of 0 was assigned for all children identified as "No" on the first item).

7. Weight-to-length

The two physical measures selected as Physical development outcomes were *weight* and *length* of the 9 month-old children. Weight at baseline was measured using SECA 835 portable

electronic scales. These Class III medically approved scales have a capacity of 50kg and are graduated by 20g up to 20 kg and by 50g over 20kg. The length was recorded to the nearest millimetre with the help of SECA 210 measuring mat for babies and small children[74]. An **Indicator of weight-to-length** was generated as the ratio between the two measures.

Follow-up Health and Physical development items and corresponding indicators

Similarly to baseline, and The Child's Physical Health and Development section from the follow-up PCG questionnaire and data set were investigated and *ten questionnaire items* representing Health outcomes were identified. Physical development outcomes were selected from the Physical Measures section of the follow-up data set. *Two physical measures* were identified. The follow-up domain-specific preliminary indicator set comprised of **nine health indicators** and **one physical development indicator**. These are described bellow.

1. General health

Similar to baseline, an **Indicator of general health** coded from 1 ("Almost always unwell") to 4 ("Very Healthy, no problems") was developed from the item

> *"In general, how would you describe <child's> current health?"* with the following response options: "Very Healthy, no problems"; "Healthy, but a few minor problems"; "Sometimes quite " and Almost always unwell" was reinvestigated at follow-up.

2. Chronic conditions and

3. Number of conditions

Three items investigated chronic conditions at follow-up.

Similar to baseline, PCGs were asked

> *"Does child have any longstanding illness, condition or disability? (longstanding was explained as a long period of time)- "Yes"/"No"* and next the item:
>
> *"Do any of these illnesses hamper <child'> in his/hers daily routine?"* response options: "Yes, severely"; "Yes, to some extent"; "No" was used.

These two items were used to generate an **Indicator of chronic conditions** with four ordered categories and was encoded as described previously (for baseline). Additionally, a derived variable accounting for the number of chronic conditions a child suffered from (resulted from the item:

> *"What longstanding illness, condition or disability does <child> have?"* with 21 response options) was also available with the GUI data. This was considered as **Indicator of number of conditions.**

4. GP contacts,

5. Paediatrician contacts and

6. A&E contacts

Similarly to baseline, the following item was used to derive an **Indicator of GP contacts,** an **Indicator of Paediatrician contacts** and **Indicator of A&E contacts**:

"In the past 12 months, how many times have you seen or talked on the telephone with any of the following about <child's> physical or emotional health?" the following response categories:

- "A General Practitioner (GP)"
- "A Paediatrician/consultant/hospital doctor"
- "Accident and Emergency "

7. Nights in hospital

To construct an **Indicator of nights spent in hospital** the following item was used:

"Since the time of the last interview in MM/YY, approximately how many nights has <child> spent in hospital?"

Two additional indicators were generated for the children at 3 years:

8. Antibiotic prescriptions and
9. Episodes of wheezing

Both of these are limited to events from the 12 months previous to the interview. The items used to construct these two indicators were:

"Has <child> received a course of antibiotics in the past 12 months?" ("Yes"/"No") and if PCG's response was "Yes"

"In total, how many courses of antibiotics has <child> received in the past 12 months?"

and respectively

"In the past 12 months has<child> had any periods when there was wheezing with whistling on his/her chest when he/she breathed? ("Yes"/"No") and if PCG's response was "Yes",

"How many separate episodes/bouts of wheezing with whistling on his/her chest has <child> had in the past 12 months?"

In both instances if the PCG responded "No" to the first item the children were assigned a score of 0, else the children were assigned a score equal to the number of infections or episodes of wheezing reported by their PCG.

10. Weight-to-height

Follow-up Physical development outcomes were represented by the *weight* and *height* of the child collected at the time of interview. Similar to baseline, child's weight was measured using SECA 835 portable electronic scales[75]. A Leicester portable height stick was used to measure child's height. This gives readings in imperial and metric units; recording of child's height to the nearest millimetre were taken in the metric system[75]. An **Indicator of weight-to-height** was generated as the ratio between the two measures.

B. Socio-Emotional Domain

The initial set of Socio-Emotional indicators, the scaled measures and derived variables and corresponding standardized instruments used to assess domain-specific outcomes at baseline and follow-up are presented in Table 3.2.

Table 3:2 Socio-Emotional indicators: scaled measures and derived variables used (including corresponding standardized instruments)

Socio-emotional domain	Scaled measures and derived variables	
	Baseline	Follow-up
Communication ability	ASQ Total Communication score	
Personal/social ability	ASQ Total Personal/social score	
Pro-social ability		SDQ Pro-social behaviour score
Fussiness	ICQ-6 Fussy score	
Unadaptability	ICQ-6 Unadaptable score	
Unpredictability	ICQ-6 Unpredictable score	
Psychological difficulties		SDQ Total difficulties score by adding: 1. Emotional symptoms 2. Conduct problems 3. Hyperactivity/inattention 4. Peer relationship problems

Baseline Socio-Emotional standardized instruments and corresponding indicators

The Socio-Emotional outcomes of the 9 month-olds were assessed using sub-scales from *two standardized instruments*: The Ages and Stages Questionnaire (ASQ) and The Child Characteristic Questionnaire (ICQ). Two ASQ sub-scales assessing communication and personal/social ability and three ICQ sub-scales assessing child's fussiness, unadaptability and unpredictability were used to derive the initial set of domain-specific comprised of **five socio-emotional indicators**.

A brief description of the standardized instruments used and the preliminary set of Socio-Emotional indicators resulted from these is presented below.

11. Communication ability and
12. Personal/social ability

The *Ages and Stages Questionnaire (ASQ)* is an age-tailored, screening device developed to monitor child development through parental report[74]. This is constructed based on five sub-scales investigating the following domains of development:

1. Communication
2. Personal/social
3. Gross motor
4. Fine motor
5. Problem solving

The first two of these were used as Socio-Emotional indicators while the last three were considered as indicators for the baseline Cognitive-Motor Domain.

The ASQ is organized as separate questionnaires for 19 age intervals ranging from 4 months to 60 months; each questionnaire has a two-month "age suitability window" and there is considerable overlap from one age interval to the next (i.e. last questions in a sub-scale from the ASQ-6 months coincide with the first questions from same sub-scale in the ASQ-8 months)[74]. Each questionnaire is composed of 30 questions, structured in five six-question

sections corresponding to each area of development investigated. The **communication and personal/social sub-scales** were used to account for the social development of the 9 month-old children (baseline). In order to cover a wider developmental range, the GUI team adapted their administration procedure such as all children were assessed on all five domains from the ASQ-6, ASQ-8, ASQ-10 and ASQ-12 months. A total of 70 questions, 14 questions per developmental area, were asked[74]. The reduced number of total questions resulted after eliminating questions that coincided between the age intervals. The questions had three possible responses: "Yes", "Sometimes" and "No" with corresponding scores of 10, 5 and 0[74]. The points were added by the GUI team and age-specific domain (or sub-scale) scores were available with the GUI data. All respondents started with the 8-month questionnaire. All five sub-scales were investigated independently as follows. If an child failed on sub-scales' items asked at the beginning of the 8-month ASQ, indicating failure to achieve the age specific domain milestones, the PCG was asked to respond sub-scales' questions from the ASQ-6 month without progressing to ASQ-10 for that developmental domain. If a child passed all the early items on a developmental domain from ASQ-8 and at least one of the later items the interview was continued with ASQ-10 for that domain and then with ASQ-12 if suitable (the child passed ASQ-10 domain specific milestones)[74]. The GUI team also adapted the scoring technique and every child was assigned a domain score for each one of the four questionnaires: ASQ-6 month, ASQ-8 month, ASQ-10 month and ASQ-12 month. This was accomplished by changing the questionnaire administration procedure from self-completion booklets to CAPI administration. In this way "discontinue" rules were incorporated in the score generation process. Therefore, if a child failed to complete more difficult items (asked later in the questionnaires) on a domain from a certain age these and items from same domain at subsequent age were coded as "No" and a score of 0 was assigned. Similarly, "reversal" rules were also incorporated: if a child passed all 8-month milestones for a domain, he/she was deemed to have passed the domain specific 6-month milestones also. The methodology applied in the GUI was pre-approved by the ASQ publishers and it was subject to a rigorous pilot process[74]. Individual scores obtained on each age version of the five ASQ sub-scales used were available.

For each sub-scale, scores were available for the following four age tailored versions: 6, 8, 10 and 12 months. Child *communication and personal/social ability scores* from ASQ-6, ASQ-8, ASQ-10 and ASQ-12 months were summed to generate an **Indicator of Communication ability** and an **Indicator of Personal/Social ability**. It was believed that calculating total sub-scale scores across the four ages intervals investigated would capture aspects of development as comprehensively as possible. In this way extreme developmental outcomes on each sub-scale (i.e. very poor development for children that failed the 8-month milestones, very good development for children that passed the 12-month milestones) were also included.

13. Fussy
14. Unadaptable and
15. Unpredictable

The Infant Characteristics Questionnaire (ICQ) developed by Bates et al. in 1979 is a standardized screening device and it was used to investigate child difficult temperament[76]. The 6 month-old version of the questionnaire (ICQ-6) was chosen by the GUI team as this version is the most psychometrically developed[74]. ICQ-6 contains 24 items rated on the seven-point Likert scale (a value of 1 indicates a good temperamental trait, while a value of 7 indicates a more difficult temperament). The instrument generates scores for four different temperamental sub-scales: fussy (hard to soothe), unpredictable (how easy it is to predict child's needs), unadaptable (child's reaction to new events), dull (child's social responsiveness and activity level). Reliability of ICQ-6 in the GUI Child Cohort was similar to that found by

Bates et al for all sub-scales with the exception of dull[74]. Initial internal consistency coefficients (Cronbach-alphas), measured by Bates et al (1979) for the fussy, unadaptable, dull and unpredictable sub-scales were of 0.79, 0.75, 0.39 and 0.50, while the corresponding coefficients calculated in the GUI pilot study (2008) were of 0.69, 0.71, 0.13 and 0.56 respectively[74]. Total scores for each ICQ-6 sub-scale were available in the RMF data.

Three sub-scales investigating difficulty to soothe, predict child's needs and adapt to new events, from *The Infant Characteristic Questionnaire, 6 month-old version (ICQ-6)* were considered for this project. The Dull ICQ-6 sub-scale was not used due to its low internal consistency coefficient obtained within the sample of Irish children from the pilot study GUI (2008) and due to its poor performance in a confirmatory factor analysis model[74].

Child scores from the following ICQ-6 sub-scales: *Fussy/difficult, Unadaptable* and *Unpredictable* were used as **Indicator of fussiness, Indicator of unadaptability and Indicator of unpredictability**.

Follow-up Socio-emotional standardized instruments and corresponding indicators

The Strengths and Difficulties Questionnaire (SDQ) was identified as the standardized instrument reflecting follow-up socio-emotional outcomes. The resulting domain-specific initial indicator set comprised of **two socio-emotional indicators**.

1. **Pro-social behaviour** and
2. **Psychological difficulties**

The SDQ is a behavioural screening questionnaire designed to assess emotional health and problem behaviours in children aged 3-16 years[75]. This was completed by the PCG of the study child and consists of 25 items, generating scores for five sub-scales (five items correspond to each sub-scale)[75]:

1. Emotional symptoms:
   - Often complains of head-aches, stomach-aches or sickness
   - Many worries, often seems worried
   - Often unhappy, downhearted or tearful
   - Nervous or clingy in new situations, easily loses confidence
   - Many fears, easily scared
2. Conduct problems:
   - Often has temper tantrums or hot temper
   - Generally obedient usually does what adults request
   - Often fights with other children or bullies them
   - Often lies or cheats
   - Steels from home school or elsewhere
3. Hyperactivity/inattention:
   - Is restless, overactive, cannot sit still for long
   - Constantly fidgeting and squirming
   - Easily distracted concentration wanders
   - Thinks things out before acting
   - Sees tasks through to the end
4. Peer relationship problems:
   - Rather solitary, tends to play alone
   - Has at least one good friend
   - Generally liked by other children
   - Picked on or bullied by other children

- Gets on better with adults than with other children)

5. Pro-social behaviour:
   - Considerate of other people's feelings
   - Shares readily with other children
   - Helpful if someone is hurt, or filling upset
   - Kind to younger children
   - Often volunteers to help others

Responses are registered on a three-point scale indicating the level of agreement with the item: "Not true", "Somewhat true" or "Certainly true" with corresponding scores of 0, 1 or 2. The first four sub-scales (1. Emotional symptoms; 2. Conduct problems; 3. Hyperactivity/inattention; and 4. Peer relationship problems) can be added to generate a "Total Difficulties score" with a range from 0 to 40. The questionnaire takes approximately five minutes to complete. The SDQ has good psychometric properties with a reported mean internal consistency across all sub-scales of alpha=0.73 and test-retest reliabilities of r = 0.77 for hyperactivity; r = 0.65 for conduct problems; r = 0.71 for emotional symptoms; r = 0.61 for peer problems; and r = 0.64 for Pro-social dimension; the test-retest reliability for the total difficulties scores were of r = 0.77[75]. The SDQ has been also used with the Wave 1 of the Child Cohort GUI, the Millennium Children Study (UK) and Growing Up in Scotland Study. Child scores on each SDQ sub-scale as well as child Total Difficulties scores (derived by the GUI team) were available with the GUI data[75].
The Pro-social behaviour SDQ score and Total psychological difficulties SDQ score were used as **Indicator of Pro-social behaviour** and **Indicator of psychological difficulties**.

C. Cognitive-Motor

The initial set of Cognitive-Motor indicators, the scaled measures (with corresponding standardized instruments) and interviewer-observed tasks used to assess domain-specific outcomes at baseline and follow-up are presented in Table 3.3.

Table 3:3 Cognitive-Motor indicators: scaled measures (including corresponding standardized instruments) and Interviewer-observed tasks used

Cognitive development	Scaled measure variables and Individual item variables	
	Wave 1	Wave 2
Problem solving ability	ASQ problem solving ability subscales	
Non-verbal ability		BAS- Picture similarities
Verbal ability		BAS- Naming Vocabulary
Motor development		
Fine motor ability	ASQ fine motor subscales	Sum of scores: Interviewer-observed task performance (draw vertical line and pincer grip)
Gross motor ability	ASQ gross motor subscales	Sum of scores: Interviewer-observed task performance (throw a ball and one-leg stand)

Baseline Cognitive-Motor standardized instruments and corresponding indicators

Child's Cognitive-Motor development at baseline was investigated with *The Ages and Stages Questionnaire* (a standardized instrument described in section B. Socio-Emotional)[74]. The three ASQ sub-scales considered to best represent domain-specific outcomes were: Problem solving, Fine motor and Gross motor. *Twelve age-specific (6, 8,10 and 12 months) child scores* resulted from these were used to develop the domain-specific initial indicator set incorporating **three Cognitive-Motor indicators**.

1. **Problem solving ability**
2. **Fine motor ability** and
3. **Gross motor ability**

As for the Socio-Emotional Domain at baseline (using the other two ASQ sub-scales), Child scores from the four age tailored versions (6, 8, 10 and 12 months) of *ASQ Problems solving sub-scale* were summed to generate individual total scores representing the **Indicator of problem solving ability.** Similarly, results from the ASQ-6, ASQ-8, ASQ-10 and ASQ- 12 months *Gross motor sub-scale* and *Fine motor sub-scale* were summed to generate the **Indicator of Gross motor ability** and the **Indicator of Fine motor ability.**

Follow-up Cognitive-motor standardized instruments and corresponding indicators

The follow-up Cognitive-Motor outcomes were mostly investigated through direct assessment of the child. *The child-administered standardized instrument* used to investigate cognitive development was *The British Ability Scales (BAS)* developed by Elliot et al (1997)[75]. Two BAS sub-scales were used. *Six items*, four interviewer-observed and two PCG questionnaire items were used to assess fine and gross motor development. The *eight variables (two from BAS and the six items)* were considered and a domain-specific initial indicator set comprising **two cognitive indicators and two motor indicators** (gross and fine motor similar to baseline) was developed. First, all six motor items were transformed into corresponding indicators (numeric version). Next, these were collapsed into one gross and one fine motor indicator. The technique used is described in more detail in a subsequent section of this chapter.

1. **Picture similarities** and **2. Naming vocabulary**

The two BAS sub-scales used to account for cognitive development outcomes at follow-up were: BAS-Picture similarities and BAS-Naming Vocabulary.

Two of the core scales from the *Early Years Battery of BAS* were used by the GUI team to provide a measure of children's verbal and non-verbal ability[75]. The Naming Vocabulary test serves as a measure of expressive English language vocabulary. This test was administered to the children with sufficient English (as appreciated by the mothers) and they were asked to name a daily-use object from a picture. The Picture Similarities test measure reasoning capacity and problem-solving skills and children were asked to match a card with a shown image. A total of four images were used. For children aged less than 3 years and 6 months, the BAS yields raw scores that can be converted to ability scores, percentile ranks, T-scores or age equivalents. Elliot et al (1997) reported co-efficient alphas of .78 and .86 for the Naming Vocabulary test for children aged 2 years and 6 months to 2 years and 11 months and 3 years to 3 years and 5 months respectively[75]. The corresponding alphas for the Picture Similarities test were 0.87 and 0.82 for the respective age bands. The test-retest or inter-rater reliability estimates for the initial BAS Early Year scales were not reported. When tested in an American cohort the two BAS sub-scales showed similar internal consistency and good test-retest and inter-rater reliability. The Naming Vocabulary and Picture Similarities sub-tests showed

correlation coefficients of .68 and .47 with the verbal and performance IQ components of the WPPSI-R[d] respectively. The two cognitive tests were adapted and administered using CAPI Procedure. This method facilitated interviewer's decision of what cognitive items should be administered based on the child's responses pattern and helped to standardize the administration of tests[75].

The Naming Vocabulary and Picture similarities raw scores were available and were used as **Indicator of verbal ability** and **Indicator of non-verbal ability** respectively.

3. Gross motor ability and **4. Fine motor ability**

Six variables representing motor outcomes were used to derive an **Indicator of fine motor ability** and an **Indicator of gross motor ability**.
The six variables were[75]:

- *Interviewer-observed fine motor (line):* child-performed task- copy a vertical line drawn by the mother
- *Interviewer-observed fine motor (pincer grip):* child-performed task- hold a pencil in pincer grip (between thumb and index finger)
- *PCG-reported fine motor ability:* "Can your child assemble simple jigsaw puzzles OR assemble and break-up Lego/ Duplo pieces? (He/she can manipulate the pieces even if he/she does not solve the puzzle correctly) Response: "Yes", "No" and "Not sure"
- *Interviewer-observed gross motor (ball):* child-performed task- throw a ball over the head
- *Interviewer-observed gross motor (one-leg stand):* child-performed task- stand in one leg
- *PCG-reported gross motor ability:* "Can your child ride a tricycle or other similar toy vehicle with pedals?" Response: "Yes, they can use pedals to cycle", "Can sit on a tricycle and push but does not pedal properly", "No" and "Not sure"

Interviewer-observed outcomes (originally rated "Yes", for completion and "No" for failure) were recoded with 0 for "No" and 1 for "Yes". PCG-reported outcomes were recoded 0 for "No" and "Not sure" and 1 for "Yes". First, correlations between all gross motor and all fine motor variables were verified to establish if they represent similar aspects and can be added together in total scores. For both fine and gross motor variables very low correlations (point biserial[e] correlation coefficient below 0.15, Table 3.4) were observed between PCG-reported and interviewer-observed variables and it was decided that the PCG-reported variables should not be included in the motor indicators derived. The **Indicator of fine motor ability** was therefore calculated as the sum of the two interviewer-observed gross motor variables and the **Indicator of gross motor ability** was calculated as the variables and sum of the two interviewer-observed fine motor variables.

---

[d] The Wechsler Preschool and Primary Scale of Intelligence (WPPSI) is an intelligence test designed for children ages 2 years 6 months to 7 years 7 months developed by David Wechslerin 1967.

[e] The point biserial correlation coefficient (r_{pb}) is a correlation coefficient used when one variable (e.g. Y) is dichotomous;

Table 3:4 Point-biserial correlations between interviewer-observed task performance scores

Fine motor	*FM1*	*FM2*
FM1. Interviewer-observed fine motor (line)	-	
FM2. Interviewer-observed fine motor (pincer grip):	0.27	-
FM3. PCG-reported fine motor ability	0.12	0.03
Gross motor	*GM1*	*GM2*
GM1. Interviewer-observed gross motor (ball)	-	
GM2. Interviewer-observed gross motor (one-leg stand)	0.41	-
GM3. PCG-reported gross motor ability	0.08	0.09

3.3.2 Developmental determinants

3.3.2.1 Considerations for selecting developmental determinants

For a more complete image of child well-being and to establish the construct validity of the Domain Scales and the Well-Being Index associations with pre-established developmental determinants were investigated.

Several proximal and distal factors from children's lives known to have an influence on early development were investigated in the GUI. In line with the Barker hypothesis and Bio-ecological model of children developmental determinants from the following groups were identified: individual characteristics, child's interactions, primary caregiver (PCG) and family factors, socio-demographic and economic factors and pre-natal factors.

First, baseline and follow-up PCG questionnaires were analysed and scaled measures or questionnaire items reflective of the five groups of developmental determinants were selected. Next, the baseline and follow-up data sets were used to identify corresponding variables to be included as **developmental determinants**. The complete set of developmental determinants selected for each group is presented below. If variables were recoded the considerations and recoding process is described.

3.3.4 Generating developmental determinants

A. Individual characteristics

Baseline Individual characteristics

1. Child's gender was reported by the PCGs during the baseline interview.

2. Birth-weight was investigated with the following item: *"How much did <baby> weigh at birth?"* The answer was initially recorded in either pounds and ounces or kilograms and subsequently reported by the GUI team in grams.

3. Gestational age was assessed with the question: *"After how many weeks of pregnancy was <baby> born?"*

4. The **mode of delivery** was assessed at baseline using the following questionnaire item: *"What was the final mode of delivery?"* with seven response options:

- Normal delivery
- Emergency Caesarean
- Suction assisted birth
- Vaginal breech delivery

- Forceps assisted birth
- Other [please specify]
- Planned / Elective Caesarean.

For this project, a four level categorical version of the variable was generated:

- Normal delivery
- Assisted delivery (including Suction and Forceps birth and Vaginal breech)
- Emergency caesarean
- Planned/elective caesarean

5. Child nutrition was investigated at baseline with the following breastfeeding-related questions: *"Was <baby> ever breastfed? (include colostrum in first few days after birth)"; "Are you currently breastfeeding <baby> (include partial/complementary breastfeeding)?" "How old was <baby> when he/she completely stopped being breastfed? (accept answer in days or weeks or months: days weeks months)".*

These were used to generate a variable accounting for breastfeeding duration in days. If a "No" answer was recorded for the first question the child was assigned a breastfeeding duration of "0" and if PCG's answered "Yes" to the last question a value of "270" (days) was assigned.

6. Day and Night Sleep Duration was assessed by: *"Approximately how many hours sleep does your baby have during: a. the day; b. the night".*

Follow-up Individual characteristics

The first four baseline Individual characteristics (**1. Child's gender, 2. Birth-weight, 3. Gestational age** and **4. Mode of delivery**) were also used as developmental determinants at follow-up. To account for age-related influences, additional child nutrition aspects were included. Similarly, sleep patterns change from 9 months to 3 years therefore child sleep at follow-up only included night sleep.

5. Child nutrition at follow-up used an updated version of breastfeeding duration and included information about healthy foods intake. For breastfeeding duration, responses to the following two questions were used to generate a new breastfeeding duration variable (also accounting for the breastfeeding duration for children that were breastfed past the time of the previous interview):

- *"Are you currently breastfeeding <baby> (include partial/complementary breastfeeding)?"*
- *"How old was <baby> when he/she completely stopped being breastfed? (accept answer in days or weeks or months: days weeks months)"*

Additionally, the questionnaire item investigating the intake of vegetables and fruit: *"In the last 24 hours has had the following foods and drinks once, more than once, or not at all?"* with responses for 14 categories was considered. The following two categories were used:

- "Fresh fruit",
- "Raw vegetables or salad".

A complete set of developmental determinants representing Individual characteristics at baseline and follow-up is presented in Table 3.5. The questionnaire items used are included.

Table 3:5 Developmental determinants representing Individual characteristics of the child

A. Individual characteristics	Baseline	Follow-up
Gender	Record <baby> gender	
Birth-weight	How much did <baby> weigh at birth? (in grams)	
Gestational age	After how many weeks of pregnancy was <baby> born?	
Breastfeeding and nutrition Breastfeeding duration in days (Wave 1 and Wave 2) Nutrition (Wave 2)	Was <baby> ever breastfed? (include 40olostrum in first few days after birth) (Yes/No) Are you currently breastfeeding <baby> (include partial/complementary breastfeeding)? (Yes/No) How old was <baby> when he/she completely stopped being breastfed? (days or weeks or months)	Are you currently breastfeeding <baby> (include partial/complementary breastfeeding)? (Yes/No) How old was <baby> when he/she completely stopped being breastfed? (days or weeks or months) In the last 24 hours has <child> had the following foods and drinks once, more than once, or not at all? (Fresh fruit, Cooked vegetables and Raw vegetables or salad)
Sleep patterns Hour/day and night (Wave 1)	Approximately how many hours sleep does your baby have during: a. the day; b. the night	

B. Child's interactions

Baseline Child's interactions

1. Possible interactions with **Other children in the home** were accounted for by responses to: *"Does <baby> have brothers/sisters [include step, foster or adoptive siblings living in the household]"* with response options: "Yes" or "No".

2. The **Relationship with PCG** was assessed by the GUI team with *The Quality of Attachment sub-scale from the Maternal Postnatal Attachment Scale* developed by Condon and Corkindale in 1998[74, 75]. This accounts for PCG's feelings for their children (including patience and affection) and beliefs about themselves as parents. This sub-scale comprised of nine items from a total of nineteen items corresponding to the full scale. The available response categories varied between three and five and these were re-scored by the GUI team so they all range from one to five. A total Quality of Attachment Score was calculated and made available with the rest of the data for Wave 1 by the GUI team.

3. Contact with grandparents at baseline was investigated with the following question: *"Are you in regular contact with <baby's> grandparents?"* and the following response options were available: "Yes", "No", "All Grandparents are deceased" or "All Grandparents live abroad". As we were interested to verify the possible effects of regular contact with the grandparents on developmental outcomes we decided to use these responses and construct a two-level categorical variable: "Yes"- representing existence of regular contact and "No"- meaning no regular contact.

4. To account for **Home learning activities** for 9 month-old children we used responses from the item *"Do you talk to your baby while you are busy doing other things? (e.g. while you do housework)* Response options: "Never", "Rarely", "Sometimes", "Often", or "Always".

5. Childcare interactions at baseline were investigated with: *"Is <baby> currently being minded by someone else, other than you or your resident spouse / partner, on a regular basis each week?"* The response options available were: "Yes" and "No". PCGs, who responded "Yes", were asked a series of questions regarding the type of care, number of hours and childcare expenses. Responses to these items were used to construct a new categorical

variable with the following three levels: "Parental care", "Centre-based care" and "Other type of care".

Follow-up Child's Interactions

Similar to interactions at baseline, the same five developmental determinants were used at follow-up. Two differences can be noted.

To account for **Relationship with PCG,** scores from *The Pianta Child-Parent Relationship Scale* (short version), assessing the quality of the parent-child relationship were used. This scale is comprised of 15 items rated on a five-point Likert scale with following response categories: "Definitely does not apply", "Not really", "Neutral, not sure", "Applies somewhat" or "Definitely applies" and investigates both positive and negative aspects of the parent-child relationship. All PCGs who were not employed outside the home were assigned 'Not applicable' for the statement concerned with being at work. The 'Conflicts' sub-scale accounts for difficulties in the PCG's relationship with the child, while the 'Positive Aspects' sub-scale includes items relating to a harmonious parent-child relationship and optimal effectiveness as a parent. Little psychometric information is available for The Pianta Child-Parent Relationship Scale (short version). However, analysis of the GUI "Dress Rehearsal" data yielded alpha coefficients of 0.52 and 0.71 for the Conflicts and Positive Aspects of the scale respectively and we decided to only consider the Positive Aspects sub-scale in our analysis.

Home learning activities at follow-up were accounted for by the following item: *"Now I'd like to ask you about activities which <child> may do at home. a) On how many days in an average week does anyone at home read to <child>?"* and the response options were 0 to 7 days.

A complete set of developmental determinants representing Individual characteristics at baseline and follow-up is presented in Table 3.6. The questionnaire items used are included.

Table 3:6 Developmental determinants representing Child's interactions

B. Child's interactions	Baseline	Follow-up
Secondary Caregiver in the household Yes No	Do you have a resident spouse / partner? (Yes/No)	Do you have a resident spouse / partner? (Yes/No)
Parent-Child Relationship Quality of attachment (Wave 1) Quality of relationship (Wave 2)	Quality of Attachment sub-scale from the Maternal Postnatal Attachment Scale-derived total Quality of Attachment Score	The Pianta Child-Parent Relationship Scale (short version)- Positive Aspects sub-scale in our analysis
Regular contact with grandparents Yes No	Are you in regular contact with <baby's> grandparents? (Yes, No, All Grandparents are deceased, All Grandparents live abroad)	Are you in regular contact with <child's> grandparents? (Yes, No, All Grandparents are deceased, All Grandparents live abroad)
Childcare Parental care Centre-based care Other type of care	Is <baby> currently being minded by someone else, other than you or your resident spouse / partner, on a regular basis each week? (Yes/No) If "Yes"- series of questions regarding the type of care, number of hours and childcare expenses.	Is <child> currently being minded by someone other than you or your resident spouse / partner for 8 hours or more per week during the day? (Yes/No) If "Yes"- series of questions regarding the type of care, number of hours and childcare expenses.
Home learning environment *Talk to the child (Wave 1)* Never Sometimes Rarely Often Always *Days of reading to child (Wave 2)*	Do you talk to your baby while you are busy doing other things? (e.g. while you do housework) (Never/Rarely/Sometimes/Often/Always)	On how many days in an average week does anyone at home read to <child>?

C. PCG and family factors

Baseline and follow-up PCG and family factors

The primary caregiver and family factors considered were investigated at both time-points (baseline and follow-up).

1. The **PCG's age** was accounted for by age reported at first contact (baseline).

2. PCG's health was investigated with a questionnaire item (similar to child's general health) derived from the Short Form 12 Health Survey, which measured generic health concepts and health-related quality of life. Previous research, summarized in Blaxter (1989), suggest that such measures are close analogues of clinically assessed health status[74]. At both waves of data collection, PCGs were asked: "In general, how would you say your current health is?" with the following Likert-scale type response options: "Excellent"; "Very Good"; "Good"; "Fair" or "Poor".

3. PCG's education was investigated using the following question: *"What is the highest level of education (full-time or part-time) which you have completed to date?"* response options were:

- No formal education
- Primary education
- Second level: Lower Secondary (Junior/Intermediate/Group Certificate. 'O' Levels/GCSEs, NCVA Foundation Certificate, Basic Skills Training Certificate or equivalent)

- Second level: Upper Secondary (Leaving Certificate (including Applied and Vocational Programmes 'A' Levels, NCVA Level 1 Certificate or equivalent)
- Second level: Technical or Vocational qualification (Completed Apprenticeship, NCVA Level 2/3 Certificate, Teagasc Certificate/Diploma or equivalent)
- Second level: Both Upper Secondary and Technical or Vocational qualification
- Third Level: Non Degree (National Certificate, Diploma NCEA/Institute of Technology or equivalent, Nursing Diploma.)
- Third Level: Primary Degree (Third Level Bachelor Degree)
- Third Level: Professional qualification (of Degree status at least)
- Third Level: Both a Degree and a Professional qualification
- Third Level: Postgraduate Certificate or Diploma
- Third Level: Postgraduate Degree (Masters), Doctorate (PhD).

Responses from this question were used here to generate a **PCG's education** variable with four levels:

- Lower secondary education or less (includes "No formal education", "Primary education" and "Lower secondary");
- Post secondary (includes "Upper secondary", "Technical or vocational qualification" and "Both upper secondary and Technical or Vocational qualification";
- Non-Degree (includes all "Non Degree";
- Degree (includes: "Primary Degree", "Professional qualification (of Degree status at least)", "Both a Degree and a Professional qualification", "Postgraduate Certificate or Diploma", "Postgraduate Degree (Masters)" and "Doctorate"). This is in line with other studies using GUI data[77].

4. PCG's depression was accounted for by results from the following scale: *Centre For Epidemiological Studies Depression Scale (8-Item) (CESD-8)*[74, 75].

CESD is a widely used self-report measure developed as a screening instrument for depression in the general population. It was originally designed as an assessment of depression in adults and showing good discriminative ability between depressive disorders and other forms of psychopathology.

The short eight-item version of the CESD (CESD-8) used by the GUI team to assess depression in PCGs, proved a high correlation coefficient (r. = 0.93) when compared to the full 20-item version. The items used relate to the previous 7 days period and include statements like: "I felt that I could not shake off the blues even with help from my family and friends" and "I thought my life had been a failure", with answer options on a four-point Likert scale ranging from 0 (<1 day) to 3 (5–7 days)[74, 75]. The item responses are than added into a Total Depression Score with a range of 0 to 24. It is considered that a score equal or higher than 7 is significant for psychological distress. However, this does not imply that a respondent can be assigned a clinical diagnosis of depression. Being sensitive in nature, the CESD-8 was applied on a self-complete basis minimizing report bias. Using the CESD-8 scores would highlight psychological differences between respondents scoring above and below the cut-off points on the scale[74, 75].

5. PCG's parental stress was investigated with *The Parental Stress Scale* developed by Berry and Jones in 1995. This scale was employed by the GUI team to assess both positive and negative aspects of parenthood. The scale is intended to be used for parents without diagnosed clinical problem and is constructed on 18 Likert rated (Strongly Agree to Strongly Disagree) items grouped in four sub-scales: Parental Rewards (6 items); Parental Stressor (6 items); Lack of Control (3 items) and Parental satisfaction (3 items). A Total Stress Score of between 18 and 90 was calculated based on responses, higher scores indicating higher levels of stress[74, 75].

6. PCG's BMI was accounted for by the *BMI derived variable* calculated by the by GUI team using measures of weight and height recorded by the interviewer with SECA 761 flat mechanical scales and Leicester portable height measure respectively[74, 75].

7. The presence of a **Secondary Caregiver in the household** *was accounted for by response from the* following item: *"Do you have a resident spouse / partner?"* Response options: "Yes" or "No".

8. Relationship satisfaction was accounted for by total relationship satisfaction scores generated from the *short version of the Dyadic Adjustment Scale (DAS-7)*[74, 75].

DAS-7 was developed by Spanier in 1976, to assess the satisfaction between the partners (Primary and Secondary Caregivers of the child) categorizing marriages or partnerships as adjusted or distressed. The short version of DAS has proven reliability, validity and consistent context coverage[74, 75]. DAS-7 comprises of three sub-scales: three items assessing dyadic consensus on issues like "time spent together" or "philosophy of life"; three items assessing dyadic cohesion covering items like "calmly discuss something together" or "have a stimulating exchange of ideas" and finally one item assessing global marital satisfaction where respondents are asked to rate their "real life" relationship. A six-point Likert scale is used to rate the items (scale extremes: always agree- always disagree and all the time-never). A general satisfaction score was calculated based on answers give to the seven items[74, 75]. We used Primary Caregiver's total relationship satisfaction score.

9. To account for perceived levels **Overall support from family and friends** we used the following item: *"Overall, how do you feel about the amount of support or help you get from family or friends living outside your household?"* response options were

- I get enough help
- I don't get enough help
- I don't get any help at all
- I don't need any help.

The complete set of developmental determinants representing PCG and family factors at baseline and follow-up is presented in Table 3.7. The questionnaire items used are included.

Table 3:7 Developmental determinants representing PCG and family factors

C. PCG and family factors	Baseline	Follow-up
Age	What age are you? (baseline reported age was considered as reference for both time-points)	
Health Excellent Very Good Good Fair or Poor	In general, how would you say your current health is? (Excellent; Very Good; Good; Fair or Poor)	In general, how would you say your current health is? (Excellent; Very Good; Good; Fair or Poor)
Education Lower secondary or less Post secondary Non-Degree Degree	What is the highest level of education (full-time or part-time) which you have completed to date	What is the highest level of education (full-time or part-time), which you have completed to date?
Depression Total score	Centre For Epidemiological Studies Depression Scale (8-Item) (Cesd-8)- total depression score	Centre For Epidemiological Studies Depression Scale (8-Item) (Cesd-8)- total depression score
Stress Total score	The Parental Stress Scale- total stress score	The Parental Stress Scale- total stress score
BMI	Derived BMI	Derived BMI
Relationship satisfaction Total score	Short version of the Dyadic Adjustment Scale (DAS-7)-derived PCG's total relationship satisfaction score	Short version of the Dyadic Adjustment Scale (DAS-7)-derived PCG's total relationship satisfaction score
Overall support I get enough help I don't get enough help I don't get any help at all I don't need any help	Overall, how do you feel about the amount of support or help you get from family or friends living outside your household? (I get enough help/I don't get enough help/I don't get any help at all/I don't need any help)	Overall, how do you feel about the amount of support or help you get from family or friends living outside your household? (I get enough help/I don't get enough help/I don't get any help at all/I don't need any help)

D. Socio-demographic and economic factors

Baseline and follow-up Socio-demographic and economic factors

The socio-demographic and economic factors considered were first investigated at baseline and re-investigated at follow-up. These are presented below.

1. The **Economic status** was accounted for by *Equivalised Family income*. This variable was derived by GUI team using PCG reported household income and accounted for the differences in size and composition (number of adults and children) of households. This was generated by the GUI team by assigning weights to each household member in the following sequence: a weight of 1 was assigned to the first adult in the household, every other person over 14 years of age was assigned a weight of 0.66 while each child was assigned a weight of 0.33. The equivalized size of the household corresponds to the sum of these weights. Household equivalised income was calculated as disposable household income (after deduction of income tax and social insurance contributions) divided by equivalised household size.

2. The **Social class** was represented by a four-level GUI derived variable.

A seven-level family *Social class* is available in the GUI data (Professional managers; Managerial and technical; Non-manual; Skilled manual; Semi-skilled; Unskilled; All others gainfully occupied and unknown). Both mothers and father's social class derived from the most recent occupation (if currently unemployed or retired) were considered with the higher of the two being assigned to the household[74, 75]. The classificatory system used is that of The Irish Central Statistics Office's, based on the UK Standard Occupational Classification. This also

factors in whether a person is an employee or self-employed and whether they employ others. For the purpose of this project *the derived aggregated four-level version* of this variable from the RMF data was used: Professional/Managerial (e.g. lecturers, doctors, accountants); other non-manual/Skilled manual (e.g. accounts technicians, carpenters); Semiskilled/Unskilled manual (e.g. factory operatives, cleaners) and All others gainfully occupied and unknown (describing households with no working caregiver contemporaneously or in the past) [14].

3. Ethnicity was using the following question and corresponding responses:" *Can you tell me what is your ethnic or cultural background?* Response options:

- Irish
- Irish Traveller
- Any other white background
- African
- Any other Black background
- Chinese
- Any other Asian background,
- Other – incl. mixed background (specify)".

These data was used to generate a new two-category *(Irish and Non-Irish)* ethnicity variable.

4. To account for the **Neighbourhood** the child lived in results from the following item were used: *"To what extent do you agree or disagree with these statements about your local area?"* the statements were:

- It is safe to walk alone in this area after dark
- It is safe for children to play outside during the day in this area
- There are safe parks, playgrounds and play spaces in this area
- As a family we are settled in and part of this community

PCGs were asked to express their level of agreement on a four point Likert-scale (from Strongly Agree to Strongly Disagree) with a series of four statements regarding the local area where they lived. The interest of this study was in possible effects on child development and the following statement was selected as a proxy for the type of neighbourhood: *It is safe for children to play outside during the day in this area* (response options: Strongly Agree, Agree, Disagree or Strongly Disagree).

6. To account for the presence of **Family member on Social welfare benefits** in the child's home responses from the following item were used: "Anyone in your household receive any Social Welfare payments?" the response options were "yes" and "no".

The complete set of developmental determinants representing PCG and family factors at baseline and follow-up is presented in Table 3.8. The questionnaire items used are included.

Table 3:8 Developmental determinants representing Socio-demographic and economic factors

D. Socio-demographic and economic factors	Baseline	Follow-up
Equivalised family income	Derived equivalised family income	Derived equivalised family income
Social class Professional/Managerial Non-manual/Skilled manual Semi or un-skilled manual All others	Derived social class (Professional managers; Managerial and technical; Non-manual; Skilled manual; Semi-skilled; Unskilled; All others gainfully occupied and unknown)	Derived social class (Professional managers; Managerial and technical; Non-manual; Skilled manual; Semi-skilled; Unskilled; All others gainfully occupied and unknown)
Ethnicity Irish Non-Irish	Can you tell me what is your ethnic or cultural background? (Irish, Irish Traveller, Any other, Any other white background, African, Any other Black background, Chinese, Any other Asian background, Other – incl. mixed background)	Can you tell me what is your ethnic or cultural background? (Irish, Irish Traveller, Any other, Any other white background, African, Any other Black background, Chinese, Any other Asian background, Other – incl. mixed background)
Neighbourhood Safe for children play Yes No	To what extent do you agree or disagree with these statements about your local area? It is safe for children to play outside during the day in this area? (Strongly Agree, Agree, Disagree or Strongly Disagree)	To what extent do you agree or disagree with these statements about your local area? It is safe for children to play outside during the day in this area? (Strongly Agree, Agree, Disagree or Strongly Disagree)

Baseline and follow-up Pre-natal factors

The prenatal factors considered as developmental determinants were investigated at baseline. These were analysed as possible determinants of development at both time-points.

1. Intake of folic acid *and* **2. Intake of iron during pregnancy** *were considered.* These were assessed using the following two questions: *"Did you take any Folic acid during the first three months of pregnancy?"* and *"Did you take any Iron during the pregnancy with <baby>?"* with answer options "Yes" or "No".

2. Pregnancy stress, 4. Pregnancy smoking and 5. Pregnancy alcohol consumption were also included as possible determinants. These aspects were investigated as sensitive data. The following questionnaire items were used here: *"At any time during the pregnancy did you feel under any stress?"* with response options: A great deal; Some; Not much or None at all; *"Did you smoke at all during the pregnancy?"* and *"Did you consume alcohol during your pregnancy?"* both with response options: "Yes" or "No".

The complete set of developmental determinants representing PCG and family factors at baseline and follow-up is presented in Table 3.9. The questionnaire items used are included.

Table 3:9 Developmental determinants representing Pre-natal factors

E. Pre-natal factors	Baseline and Follow-up
Intake of **folic acid** and **iron**	Did you take any Folic acid during the first three months of pregnancy? (Yes/No) Did you take any Iron during the pregnancy with <baby>? (Yes/No)
Mode of delivery Normal delivery Assisted delivery Emergency caesarean Planned/elective caesarean	What was the final mode of delivery? (Normal delivery; Emergency Caesarean; Suction assisted birth; Vaginal breech delivery; Forceps assisted birth; Other [please specify]; Planned / Elective Caesarean.)
Maternal **stress, smoking** and **alcohol consumption**	At any time during the pregnancy did you feel under any stress? (A great deal; Some; Not much or None at all) Did you smoke at all during the pregnancy? (Yes/No) Did you consume alcohol during your pregnancy? (Yes/No)

3.4 Characteristics of the baseline and follow-up samples

Characteristics of the baseline and follow-up samples are presented in the Tables 3.10-3.14. Descriptive statistics (number and percentage for categorical variables and mean and standard deviation or median and interquartile range for numeric variables) for developmental determinants from each one of the five groups were used to create sample profiles at 9 months and later at 3 years.

Table 3:10 Baseline and follow-up sample statistics using Individual characteristics variables

Individual characteristics	Baseline (N=11,134)	Follow-up (N=9,793)
Gender		
Male	5679(51%)	4967(51%)
Female	5455(49%)	4826(49%)
Birth-weight	3469.28(602.27)	
Gestational age	39.48(2.09)	
Mode of delivery		
Normal delivery	6604(59%)	5796(59%)
Assisted delivery	1642(15%)	1453(15%)
Emergency caesarean	1478(13%)	1288(13%)
Planned/Elective caesarean	1406(13%)	1244(13%)
Breastfeeding duration	7(0:120)	8(0:120)
Fresh fruit (weekly)		
Not at all		968(10%)
Once		2882(29%)
More than once		5936(61%)
Raw vegetables (weekly)		
Not at all		7165(73%)
Once		1933(20%)
More than once		682(7%)
Number of sleep hours/ night	2(2:3)	
Number of sleep hours/ day	11(10:12)	

Table 3:11 Baseline and follow-up sample statistics using Child's interactions variables

Child's interactions	Baseline (N=11,134)	Follow-up (N=9,793)
Other children in the home		
Yes	6625(60%)	7858(80%)
No	4509(40%)	1932(20%)
Relationship with PCG		
Quality of attachment score	43.6(40.9:45)	
Pianta positive scale		35(33:35)
Contact with grandparents		
Yes	9918(89%)	8799(90%)
No	277(3%)	228(2%)
All grandparents live abroad	933(8%)	762(8%)
Talk to the child		
Never	269(2%)	
Rarely	40 (0.3%)	
Sometimes	848(8%)	
Often	2634(24%)	
Always	7341(66%)	
Read to the child (days/week)		7(4:7)
Childcare interactions		
Parental childcare	6714(60%)	4783(49%)
Small setting childcare	3198(29%)	2344(24%)
Centre childcare	1222(11%)	2666(27%)

Table 3:12 Baseline and follow-up sample statistics using Primary Caregiver and family factors variables

Primary Caregiver and family factors	Baseline (N=11,134)	Follow-up (N=9,793)
PCG age at baseline	26.93(5.71)	27.12(5.68)
PCG's health		
Poor	88(1%)	92(1%)
Fair	645(6%)	551(6%)
Good	2582(23%)	2266(23%)
Very Good	4414(40%)	3870(40%)
Excellent	3404(31%)	3012(31%)
Education		
Lower secondary or less	1306(12%)	867(9%)
Post secondary	3633(33%)	2875(29%)
Non Degree	2154(19%)	2114(22%)
Degree	4031(36%)	3918(40%)
Parental stress score	32(27:36)	12(9:12.35)
PCG's depression score	1(0:2.45)	1(0:3)
BMI	25.56(5.3)	25.89(5.06)
Partner living in the house		
No	1359(12%)	1217(12%)
Yes	9775(88%)	8576(88%)
Dyadic adjustment scores	23.25(4.89)	16.02(3.31)
Overall support (family, friends)		
I get enough help	7919(71%)	6979(71%)
I don t get enough help	1069(10%)	1167(12%)
I don t get any help at all	604(5%)	933(10%)
I don t need any help	609(5%)	705(7%)
Family not in the country	919(8%)	Missing level

Table 3:13 Baseline and follow-up sample statistics using Socio-demographic and economic factors variables

Socio-demographic and economic factors	Baseline (N=11,134)	Follow-up (N=9,793)
Equivalised family income	18,840(12,060: 27,210)	15,850 (10,790: 23,280)
Social class		
Professional/managerial	5426(49%)	4854(50%)
Semi-skilled/ skilled manual	831(9%)	955(10%)
Other non-/skilled manual	3427(31%)	887(9%)
Never worked-no designation	1020(9)	3097(32%)
Ethnicity		
Irish	8810(79%)	7924(81%)
Other background	2280(21%)	1862(19%)
Neighbourhood safe for play		
Strongly agree	3337(30%)	3421(35%)
Agree	6269(56%)	5094(52%)
Disagree	1109(10%)	969(10%)
Strongly disagree	391(4%)	294(3%)
Region		
Border	1203(11%)	1060(11%)
Dublin	2607(23%)	2212(23%)
Mid-East	1521(14%)	1332(14%)
Midland	737(7%)	651(7%)
Mid-West	1131(10%)	1005(10%)
South-East	1168(10%)	1042(11%)
South-West	1643(15%)	1479(15%)
West	1123(10%)	1012(10%)
Household member on SW benefits		
Yes	2383(21%)	3624(37%)
No	8721(79%)	6160(63%)

Table 3:14 Baseline and follow-up sample statistics using Pre-natal factors variables

Pre-natal factors	Baseline (N=11,134)	Follow-up (9,793)
Intake of folic acid		
Yes	10135(93%)	8942(93%)
No	771(7%)	648(7%)
Intake of iron		
Yes	7761(71%)	6568(71%)
No	3144(29%)	2672(29%)
PCG smoking		
Yes	1831(17%)	1512(17%)
No	8927(83%)	7626(83%)
PCG alcohol consumption		
Yes	2198(20%)	1982(21%)
No	8561(80%)	7489(79%)
PCG stress		
A great deal	1000(9%)	836(9%)
Some	3922(36%)	3490(37%)
Not much	3338(31%)	2939(31%)
None at all	2492(23%)	2199(23%)

3.5. Dealing with missing data

All children (including twin birth, severe chronic conditions foreign ethnicity and others) that participated in the GUI study were considered for this project. The number of GUI study participants, at baseline and follow-up, were large and the outcomes used to develop the Domain Scales (and implicitly the Well-Being Index) were represented by questionnaire components with a high response rate (>90%). In order to avoid manipulation and data imputation, only participants with complete responses for all the domain outcomes selected were considered in the development of each Domain Scale. The exclusion of participants with incomplete data for any of the outcomes was carried out on a domain-to-domain basis (number of participants excluded for each domain, from each wave are presented in later chapters). Consequently, the baseline and follow-up Domain Scales derived had a different number of participants and the corresponding Well-Being Index was only generated for children who were assigned a score for each of the three domains.

Chapter 4 Methods

4.1 Introduction

The methods used to develop and present the Domain Scales and the Well-Being Index and to verify their structure and validity were largely informed by previous research in the field of micro-level child well-being indices. The preferred approach was that used for the LSAC Outcome Index, that was also adopted by Cheevers et. al. in developing the Index of Well-being for 9-year-old Irish Children[14, 47]. Both of these indices were constructed of child developmental outcomes and used similar data from the Growing up in Australia and the Child Cohort of the GUI, respectively.

4.2 The development of the Well-being Index

4.2.1 The role of indicators

Well-being and the three composing domains cover broad life concepts, which cannot be measured directly. Statistically, these are considered to be **latent traits**. Developmental outcomes are the *effect* of health and physical, socio-emotional and cognitive-motor functioning. Domain-specific outcomes are measurable manifestations of the concept covered by the domain. Consequently, the **indicators of development**, derived from the domain-specific outcomes selected, can be viewed as **effect indicators** and were used to assess the corresponding latent traits (i.e. health and physical development, socio-emotional or cognitive-motor traits). The initial list of effect indicators for each domain at baseline and follow-up is shown in Figure 4.1 (the indicators are presented separately for baseline and follow-up and are grouped by the main aspect of the domain-trait reflected).

4.2.2 Grouping domain-specific indicators. Sub-Domains

The easiest way to construct a scale that is based on a number of indicators that assess different characteristics of a construct, is by adding the individual indicators' scores[73]. Applying this here would imply that all indicators should be summed to generate the respective Domain Scales. However, the three well-being domains were broad with one or more indicators measuring different aspects of each domain trait (for instance, the baseline Health and Physical development Domain comprised of 6 indicators assessing health and 1 indicator for physical development). Simply summing the indicators' scores might have resulted in "subtle" weighting caused by having a disproportionate number of indicators measuring different aspects of the domain-trait. As suggested by Streiner et. all (2008), this was avoided by further grouping the domain indicators in sub-domains[73]. Consequently, the Well-being Index was constructed on the three Domain Scales and these in turn were constructed on Sub-Domain Scales. For each developmental time-point, two sub-domains were identified for each domain (Figure 4.2). Each sub-domain comprised of indicators *measuring similar aspects of the domain trait* (Figure 4.1- the grouping of the indicators is consistent with the sub-domains identified for each domain). This approach was previously used by Sanson et al. (2005, 2010) and Cheevers et al. (2013)[14, 41, 47].

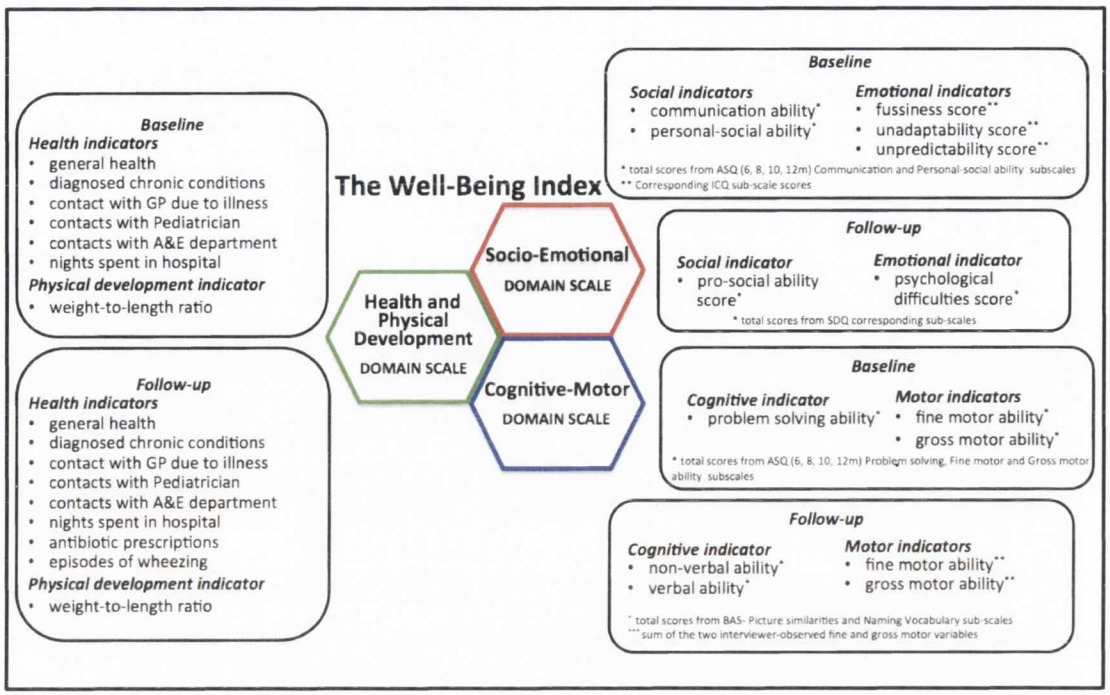

Figure 4.1 Initial list of domain-specific indicators considered for each Domain Scale

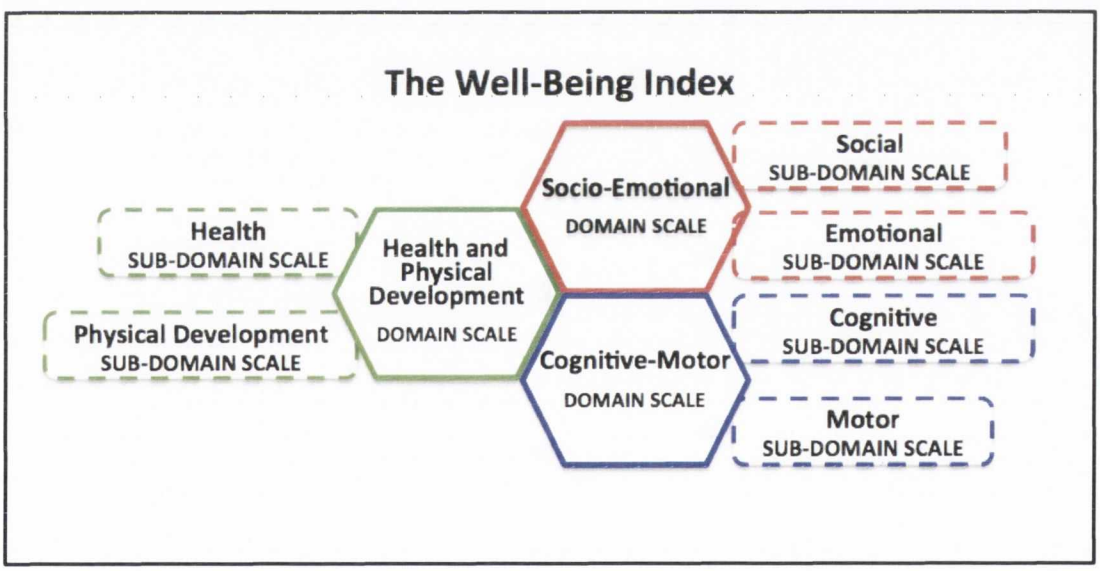

Figure 4.2 Sub-Domains corresponding to each Domain Scale

4.2.3 Consideration for developing Sub-Domain Scales

The main methodological approach employed in this project involved **Classical Test Theory (CTT)** scale development considerations. CTT has dominated the field of psychometrics for over a century and it has also been widely used in the development, characterization, and sometimes selection of outcome measures in clinical trials. CTT operates on the summary of items ("overall level", average of responses) and the focus is on total scores expressing the outcomes[78]. CTT-derived scales are specific to the sample they are derived from and perform best when a single factor underlies the total score.

CTT methods were first employed to develop **Sub-Domain Scales**; these were next summarized in **Domain Scales** and then in the **overall Well-Being Index** (Figure 4.3). Overall, the indicators of development selected were variables with four or more ordinal levels (i.e. General health, Severity of chronic condition etc.), while others were count (i.e. Contacts with GP, Number of antibiotic prescriptions etc.) or continuous variables (i.e. Fussiness score, Problem solving ability score, Weight-to-length ratio etc.). Unlike Moore et al (2007, 2008, 2012)[37, 38, 40], regardless of their type the sub-domain indicators were considered as continuous data[14, 47]. The **indicator's value** was taken as the **child's score** for the outcome measured by the indicator and these were summarized to generate sub-domain scores. This approach was preferred because it avoids loss of information and subjective cut-off point selection that could result from dichotomizing variables[14, 47]. Furthermore, this approach allows generating sub-domain, domain and overall well-being scores with "closer" to interval properties resulting in scales with a distribution closer to the normal curve[73].

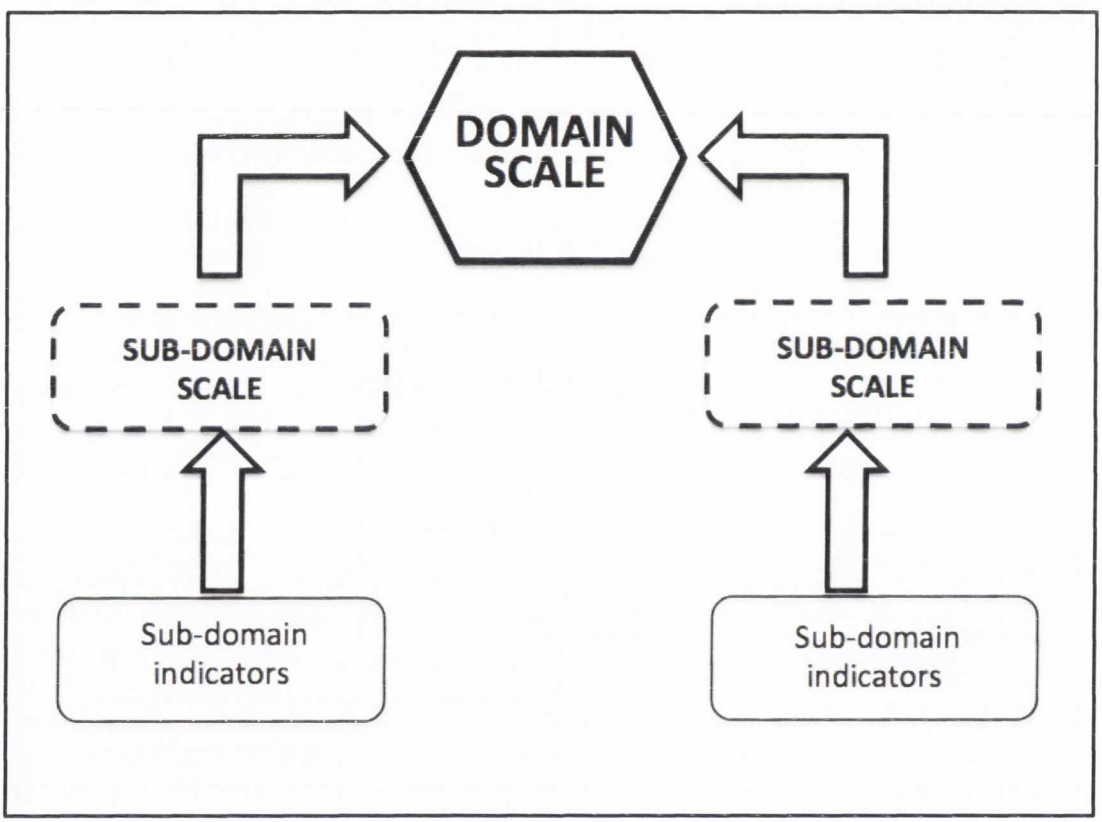

Figure 4.3 From indicators to Sub-Domain and Domain Scales

4.2.4 Reliability of the Sub-Domain Scales

One of the important and widely accepted criteria for the quality of a measurement instrument (scale) is its **reliability**, meaning repeatability or the ability to measure something consistently[73]. Previous research suggests that when constructing multidimensional scales, comprised of a number of sub-scales, *reliability considerations* should be applied to the individual sub-scales during the early stages of development[73].

Scale *reliability* is an expression of the interaction between the scale and the population this is derived from[73]. This cannot be measured exactly and three main types of reliability estimates can be used to describe the amount of random or systematic error of the scale:

- Internal consistency
- Test-retest reliability and
- Inter-rater reliability

4.2.4.1 Sub-Domain Scale reliability estimation: Internal consistency

Of these, the **internal consistency** reliability estimation has the advantage of being able to be derived from a single application of the test. This was best suited for the type of data used in this project, as retests were not possible. Internal consistency estimates the reliability of a scale by showing how well items (i.e. indicators) that *should* reflect the same construct yield similar results. It is expected that an instrument (used to measure a trait, behaviour or functional status) is comprised of items that are *homogenous* (measuring different aspects of the same concept). When constructing a multidimensional scale, comprised of a number of sub-scales, measures of homogeneity (or internal consistency) should be applied to the individual sub-scales only, as it does not make sense to expect homogeneity across different sub-scales[73].

4.2.4.2 Inter-indicator correlations, total and partial Cronbach's alphas

Therefore, in this study, the reliability of the Sub-Domain Scales was estimated through measures of *internal consistency* or *indicators homogeneity* before moving on with the Well-Being Index developing process. Three measures of internal consistency, each having its own relevance to the project, were employed and the relationship between sub-domain indicators was examined:

- First, the interactions between indicators were analysed through **inter-indicator correlations** for each Sub-Domain. Pearson's correlation coefficients between sub-domain indicators were generated (except for the follow-up Motor Sub-Domain; the corresponding indicators for this were binary and Point biserial correlation coefficients were employed instead). This enabled us to establish if the Sub-Domain Scales were *homogenous*, indicating if the Sub-Domain indicators were truly tapping into different attributes of the same Sub-Domain instead of reflecting aspects of completely different traits. According to Henson (2001) some level of homogeneity between the items comprised in a scale is desirable in order for the composite score to adequately reflect what the items measure (a high degree of homogeneity "speaks directly to the ability of the clinician or researcher to interpret the composite score as a reflection of the test's items")[73, 79]. It is not indicated to combine items that are not correlated with one another; equally high correlations between items would imply that some items carry little additional information, resulting in increased redundancy[73]. In line with this Sub-Domain indicators should show correlations of Pearson's r: 0.20-0.40[73].

- Second, **total Cronbach's alpha**, for the complete Sub-Domain Scale including all initial indicators**,** was calculated. This is a widely used internal consistency measure showing the average of all possible split-half (all items are randomly divided in two sub-scales which are then correlated with each other) total scores correlations. Cronbach's alpha is dependent on the number of scale items and magnitude of correlations amongst them (hence it was analysed in conjunction with inter-indicator correlations). It can take values from 0 (no reliability) to 1 (perfect reliability). It is considered that a Cronbach's alpha of about 0.70 demonstrates good internal consistency and this was adopted as the desired standard for the Sub-Domain Scales[73]. However, given the

nature of the project and inherent limitations regarding indicators' availability when pre-collected data is used, a Cronbach's alpha of as low as 0.50 was considered acceptable.

- Third, **partial Cronbach's alphas** for each Sub-Domain Scale omitting one indicator at the time were calculated. The purpose of this was to investigate if removing any indicators would increase the Sub-Domain Scale's internal consistency.

The three internal consistency measures presented above were calculated for all Sub-Domain Scales containing more than one indicator. Results were used to verify if all Sub-Domain indicators selected initially should be included in the Sub-Domain Scale development. The decision process that enabled us to establish the final Sub-Domain indicator sets is presented below:

1. **IF**
   a very high/low **inter-indicator correlation coefficient** (Pearson's r or Point biserial r) between two Sub-Domain indicators was observed
2. **THEN**
   the **partial Cronbach's alphas** for the Sub-Domain Scale (after removing each one of the indicators separately) were compared to the **total Cronbach's alpha** for the Sub-Domain Scale
3. **IF**
   any partial Cronbach's alpha was higher than the Sub-Domain Scale's total Cronbach's
4. **THEN**
   the theoretical importance of the outcome, without which an improvement in partial Cronbach's alpha was observed, was considered to help decide if the indicator should be discarded from the Sub-Domain before scale generation.

   NOTE: Most Sub-Domain Scales developed in this project were *congeneric*. This means that the Sub-Domain indicators were correlated with each other (therefore measuring the same aspect of the Domain trait) but differed in terms of their variance (or number of response options) and measurement error. According to previous studies, the Cronbach's alpha for a congeneric scale is the lower limit of its reliability estimation[73, 80, 81]. Therefore, the theoretical meaning of the outcome as a measure of child's functioning on the domain weighted more in the decision to keep or discard indicators than improvements observed in the partial Cronbach's alpha.

All indicators were considered to be of equal importance to early development and were equally weighted when combined into corresponding Sub-Domain Scales. Furthermore, the Sub-Domain Scales had an equal contribution to the corresponding Domain Scales and these, in turn, contributed equally to the Well-Being Index. The equal weighting was optimal because, in the instance of child well-being, no dominant domain could be identified theoretically or statistically[14, 38, 70].

4.2.5 Developing Sub-Domain, Domain Scales and the Well-being Index

The Well-Being Index development process consisted of four steps[14, 47] (Figure 4.4). In brief, the first step ensures that all domain indicators are comparable and that higher values represent better development, the second step combines indicators into Sub-Domain Scales, third Domain Scales are developed using Sub-domain scores and in the fourth step, the Domain Scales are combined to form the Well-Being Index. Complying with missing data considerations presented in Chapter 3, only children with complete information for all domain-specific indicators were included in the calculation process of each Domain Scale and only children that were assigned a score on all three domains were included in the final step for Well-Being Index development.

Step 1- Standardization of the indicators

As previously noted, all indicators were taken in their numeric format and were seen to represent child's scores for the corresponding developmental outcomes. Often, indicators had different ranges and were not directly comparable. For instance, for the baseline Health Sub-Domain, values for *child's General health indicator* ranged from 1 to 4 while the *Contacts with GP* ranged from 0 to 50. Therefore, to make Sub-Domain indicators comparable, these were conversed to corresponding standard scores (z-scores). Generating z-scores scaled each indicator to a mean of 0 and a standard deviation of 1, and indicator scores were expressed in standard deviation units. Intuitively, a higher indicator value (score) should imply a better outcome, and some indicators had to be reversed. Consequently, if necessary indicators were multiplied by -1 to achieve this (a special reversal method was used in the case of the Physical development indicator and this is described in Chapter 5).

Step 2- Sub-domain scores calculation

The Sub-Domain scores were generated as the mean of the corresponding indicators' z-scores. The totality of scores for the sample (baseline or follow-up) represented the Sub-Domain Scales.

Ideally, for good discrimination and to allow classification of the children based on their developmental outcomes, the Sub-Domain Scales developed should present *interval properties*. This implies that each value on the Sub-Domain Scale has a unique meaning; values are in ordered relationship with each other and the difference between two adjacent values is equal.

The type of the Sub-Domain Scales constructed was directly dependent on the type of indicators available. Therefore, given that the indicators available for the Health Sub-Domain were ordinal or skewed count variables, it was anticipated that the Health Sub-Domain Scales resulted by employing Classical Test Theory (*CTT Health Sub-Domain approach*) methods will not comply fully with the third criteria: the difference between two adjacent values is equal.

In an attempt to overcome this deficiency, *Item Response Theory methods* (IRT) were also tested when developing the Health Sub-Domain Scales (baseline and follow-up). IRT methods include latent trait models for ordinal data. One of their main functions is to develop scales with interval properties improving score distribution[73]. For the *IRT Health Sub-Domain* approach, all health indicators were first converted to four-level ordinal variables, with a score of 4 representing best outcomes. Next, similar to the CTT approach, the reliability of IRT Health Sub-Domain Scale was investigated using the following three internal consistency measures: Inter-item polychoric correlations (specific for ordinal data), total Cronbach's alpha and partial Cronbach's alphas. Finally, Graded response IRT models specific for ordinal data were

developed. In this model Health was seen as a latent trait that explains the variation in indicators' values. The model proving the best fit for the data was used to generate the IRT Health Sub-Domain scores (ability estimates for Health) for each participant. This process is described in detail in Chapter 5. A more detailed description of the IRT methods and comparisons with CTT methods are presented later in this chapter.

All Sub-Domain scores generated were then transformed to z-scores (Mean=0 and SD=1). To decide which version of the Health Sub-Domain Scales should be considered in the following step of index development: 1. the internal consistency of the two scales and 2. their distribution was compared (a higher total Cronbach's alpha coefficient and a distribution closer to the Normal Curve Distribution were desired).

Step 3- Domain scores calculation

For each child, the three Domain Scores were calculated as the mean of corresponding Sub-Domain z-scores. The Domain Scores were further standardized to corresponding t-scores[73] with Mean of 100 and SD of 10 and the totality of Domain Scores represented the Domain Scale for the sample.

Step 4- Baseline and Follow-up Well-Being Index development

The Well-Being score for each child was calculated as the mean of the three standardized domain scores. Similar to the Domain Scales, the Well-Being Index is also presented in a standardized (Mean of 100 and a SD of 10) version.

4.3 Presenting the Domain Scales and the Well-being Index

Following the 4-step index development process, three Domain Scales and a Well-Being Index were developed for each time-point (baseline and follow-up) that children were investigated at. The scales and the index are first presented in a standardized (Mean 100 and SD of 10) *interval form* ranking children based on their scores.

Next, to gain meaningful insight into the lives of children with detrimental development and those that are thriving, **negative and positive development cut-offs** were applied and *ordinal versions* Domain Scales and Well-being Index were derived. Previous researchers, employed bottom and top 15th cut-offs[14, 47]. The 15th percentile was chosen based on the general statistical view that a score of less than one standard deviation below the mean (approximately 15% of participants) is indicative of difficulties[47]. This project used a similar positive cut-off (scores above or equal to the 85th percentile) and two negative cut-offs (1. scores bellow or equal to the 5th percentile and 2. scores higher than the 5th percentile but below or equal to the 15th percentile). Therefore, children were classified as: 1. Very poor (lower or equal to the 5th percentile), 2. Poor (higher than the 5th to lower or equal then the 15th percentile), 3. Good (higher 15th percentile to lower then 85th percentile) and 4. Very good (equal or higher then the 85th percentile) on each Domain and Well-Being Index.

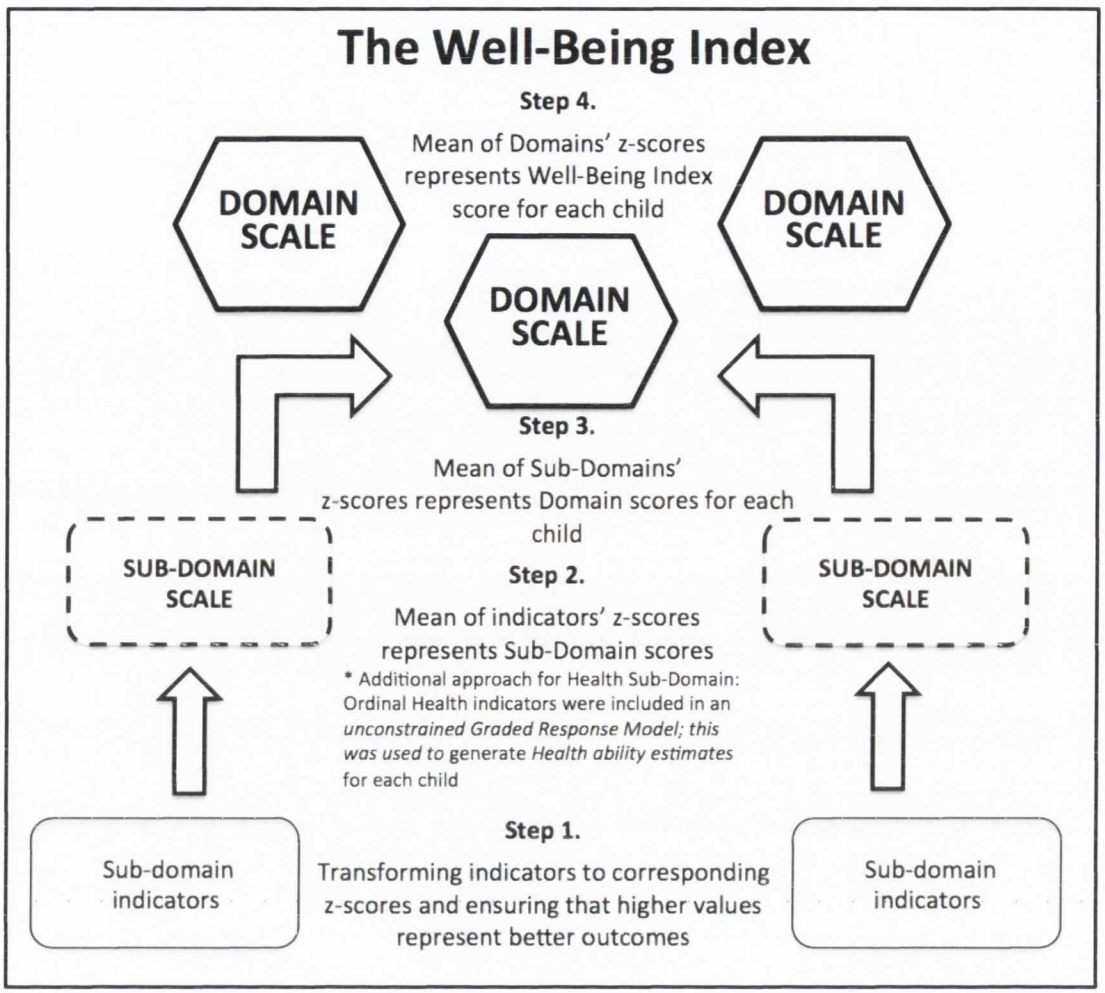

Figure 4.4 Schematic representation of the Well-Being Index development process

4.4 The structure and validity of the Domain Scales and the Well-Being Index

Following scale and index development, the next phase of this project was concerned with verifying the structure and the validity of the Domain Scales and the Well-Being Index. Demonstrating adequate structure ensures that all indicators are measuring what they are believed to be measuring and are reflective of the domain trait and implicitly of the index. Proving validity of the Domain Scales and Well-Being Index ensures that the Domain or Index scores assigned to a child truly represent their development status in relation to the rest of the children in the sample.

Each Domain covered a broad concept of child development and the corresponding Sub-Domains reflected aspects of the domain-concept with many possible manifestations (outcomes). Therefore, the structure of each Domain Scale was verified to ensure that all domain-specific indicators were most relevant for the domains they were considered for. First, for each time-point, the correlations between each indicator in its final form (after z-score transformation and reversal if necessary) and the Sub-Domain and Domain Scales were examined. It was expected that indicators would show higher, significant correlations with the Sub-Domain and the Domain Scales they were included in. Next, The correlation between each Sub-Domain Scale and all Domain Scales were investigated. It was expected that the Sub-Domain Scales would correlate significantly higher with the corresponding Domain Scale.

Well-being was defined as measure of child functioning on three broad dimensions (domains) and the Well-Being Index was a summary of scores on the three Domain Scales. The structure of the Well-being Index was investigated through Pearson's correlation coefficients with the three Domain Scales. It was expected to observe at least moderate correlations (Pearson's r= 0.5-0.7) between the index and all three domains.

Similar to reliability (discussed in section 4.2.4 of this chapter), the **validity** of a measurement instrument is another important criteria of quality assessment. While reliability shows how reproducible the results of a scale are, validity helps determine if we can draw accurate conclusions about the presence and degree of the measured trait for an individual[73]. The understanding and assessment of validity suffered many changes over time. In 1986, Landy et al divided validity into the "three Cs": content, criterion and construct validity[82]. Later, Messick et all (1988) conceptualized construct validity to include all forms of validity testing[83, 84]. Similarly, Streiner et al considers that validity should be referred to as a unitary concept and that validity testing can be carried out through: content, criterion or construct validation[73]. The three ways of evaluating validity are described in brief below.

Content validation refers to the items composing the scale, their selection and expert opinions involved in constructing the scale. The higher the content validity of a measure the broader are the inferences that can be drawn about test participants[73].

Criterion validation is defined as the correlation of a scale with a 'gold standard' measurement of the trait. Two types of criterion validation exist: concurrent validation (the gold standard and trait measure are applied at the same time) or predictive validation (the criterion is not available until some time later)[73].

Construct validation is represented by the process of learning more about the construct measured by a scale. It involves making and testing new predictions. This type of validation facilitates testing the theory and the measure simultaneously.
According to Chronbach and Meehl (1955) construct validation involves three mandatory steps: 1. explicitly spelling out a set of theoretical concepts and how they are related to each other; 2. developing scales to measure these hypothetical constructs and 3. testing the relationships among the constructs and their observable manifestations. Later in 1995, Clark and Watson recommend that the initial stages of scale development could include writing out a brief description of the construct, how it manifest objectively and how it is related to other constructs and behaviours[73].

For this project **content validation** of the Domain Scales and the Well-Being Index was not necessary. The design and instrumentation of the GUI study involved several groups of experts who participated in constructing the questionnaires, evaluating results from the pilot studies and suggesting necessary changes. For each domain, the indicators of development used were derived from GUI questionnaire items and standardized instruments designed to measure domain-specific outcomes. Given that this project used pre-collected data, **criterion validation** was not possible.

The **construct validation** of the Domain Scales and Well-being Index was carried out through examining associations between these and developmental determinants known to have influence on infancy and early childhood outcomes. The *construct validity* was verified by employing unadjusted linear regression models to test associations between each Domain Scale and Well-Being Index with the selected pre-established developmental determinants from the following five groups: 1. Individual characteristics, 2. Child's interactions, 3. PCG and family factors, 4. Socio-demographic and economic factors and 5. Pre-natal factors. In line with the "whole child" conceptualization of the project these accounted for: the role of the child as

agent in his/her own life, child's life context (child's interactions, proximal and distal factors) and pre-natal life aspects.

4.5 Applications of the Domain Scales and the Well-Being Index

The final stage of this project consists of illustrating the utility of the interval and ordinal forms of the Domain Scales and the Well-Being Indices constructed.

Applications of the interval form are presented first. These vary from simple descriptive and analytical purpose investigating differences between various sub-groups of children within and across samples (e.g. region, sex and others) to complex fully adjusted linear regression analysis to establish what are the complete sets of significant developmental determinants for each Domain and the Well-Being Index. Importantly, including baseline Domain and Well-being scores as explanatory variables in the fully adjusted regression analysis for follow-up enables us to verify if outcomes from a previous point in time are predictive of future development above and beyond all other aspects from a child's life considered.

The ordinal version is useful in investigating longitudinal sample trends of Domain development and Well-Being from baseline to follow-up. Additionally, more insight into the background of the groups of children with negative (bottom 15%: 1. Very poor and 2. Poor development) and positive development (top 15%: 3. Very good development) can be gained through investigating socio-demographic characteristics of the three groups. Finally, at each time-point the distribution (numbers and proportions) of the children across the number of domains with negative (bottom 15%), good (between the 15 and 85%) and positive (top 15%) outcomes is presented.

The methods and statistical analysis employed to show relevant applications of the Domain Scales and the Well-Being Index are presented in detail in Chapter 10. Whenever possible results from analysis carried out in this project are reported and discussed in relation to findings from similar national and international research.

4.6 Item Response Theory for Health Sub-Domain Scale development

All Health sub-domain indicators available were ordinal or count variables. When examining indicators in initial form (i.e. Nights in hospital, Contacts GP, Episodes of wheezing, Number of infections etc.) it was observed that the count indicators had a positively skewed distribution with most children clustered around lower values. Given that higher values on the indicators above meant poorer outcomes and for consistency with the intended direction for the scale (higher scores for better outcomes) had to be reversed, it was anticipated that the resulting Sub-Domain Scale would show a skew towards the unfavourable end with most children's Health scores clustered at the top end of the scale. This could produce a *ceiling effe*ct, making it difficult to distinguish between the various grades of excellent health. Moreover, given the type of health indicators, the Health Scales would not have true interval properties expected when continuous indicators are used. In an attempt to construct Health Sub-Domain Scales with improved interval properties allowing for a better distribution of the participants, Item Response Theory (IRT) methods were also applied.

The IRT, also known as latent trait models (LTM), are probabilistic models of how/why individuals respond as they do to any given item[78]. The IRT specifies a nonlinear relationship between the data (health indicators) and the latent trait (health) and models accommodating for binary, ordinal or categorical data exist[85]. In IRT the latent trait estimates (or health estimates in our case) are dependent on both the persons' responses and the properties (discrimination and difficulty) of the items or health indicators in this case[73, 85].

IRT is based on the following hard assumptions:

1. The scale is unidimensional, therefore the test measures only one construct and the items relate only to one trait or ability
2. Local independence (item responses are independent given a subject's latent trait): the probability to answer any item in a positive direction (proving more of the trait) is unrelated with the probability of answering any other item in a positive direction by people with the same amount of the trait

Therefore, after controlling for the latent trait score (health score) the item responses are uncorrelated[73].

What follows from the two assumptions presented above is:

1. The performance of subjects on the test can be predicted by a set of factors which are called abilities or latent traits
2. The relationship between a person's performance on any item and the latent trait can be described by an item characteristic curve or item response function[73].

One of the main purposes of the IRT is to create a scale allowing to measure subject's "ability" or "trait level" and that can then be interpreted with reference to the characteristics (difficulty and discrimination) of items in the test[85, 86]. In IRT latent trait estimates (person's scores) depend on both persons' responses and the properties of the items. In CTT the latent trait estimate is the total score across all items. Scores on scales developed using CTT methods have meaning relative to the persons in the sample and sample norms are needed to interpret a given person's score. In IRT, properties of the items (outcomes) and persons are placed along the same underlying continuous latent metric ("conjoint scaling")[73, 86]. In CTT, the ability of each person is relative to the abilities of the rest of the test sample. IRT allows for person's scores to be interpreted relative to items and not group norms. In IRT each test item is assigned a weight that is a function of its difficulty level[73].

In this project, the IRT method was employed with the sole purpose of obtaining a Health Sub-Domain Scale that would allow a better distribution of the children across this latent trait. Although IRT methods are mostly used with data purposely collected for scale development with the aim of improving measurement instruments through close analysis of the component items, this was beyond the purpose of this project due to the fact that pre-collected data was used and retests were not possible.

4.7 Summary

This chapter offered an account of the methodological considerations and methods used for the development of the Domain Scales and the Well-Being Index. The role of indicators, their grouping in Sub-Domains and issues regarding reliability of the Sub-Domain Scales were addressed. The methods used to verify the structure and validity of the Domain Scales and the Well-Being Index were presented. The two forms (interval and ordinal) that the Domain Scales and Well-Being Indices were provided in were discussed and a brief account of their possible applications was presented.

Chapter 5 The Health and Physical Development Domain Scales

5.1 Background

This chapter presents the development and results from the Health and Physical Development Domain Scales for baseline (9 month-olds) and follow-up (3 year-olds). These were constructed on two sub-domains (Figure 5.1): 1. Health and 2. Physical Development. The Health Sub-Domain indicators at baseline were: general health, diagnosed chronic conditions, contact with GP due to illness, contacts with Paediatrician, contacts with A&E department and nights spent in hospital. The follow-up Health Sub-Domain included the six corresponding indicators and antibiotic prescriptions and episodes of wheezing were also added. The indicator *number of diagnosed chronic conditions* for each child, initially considered as indicator of Health at follow-up, was discarded before Sub-Domain score generation (reasons explained in detail in the results section of this chapter). Baseline Physical Development Sub-Domain was accounted for by the weight-to-length indicator, while the corresponding follow-up Sub-Domain was represented by the weight-to-height indicator.

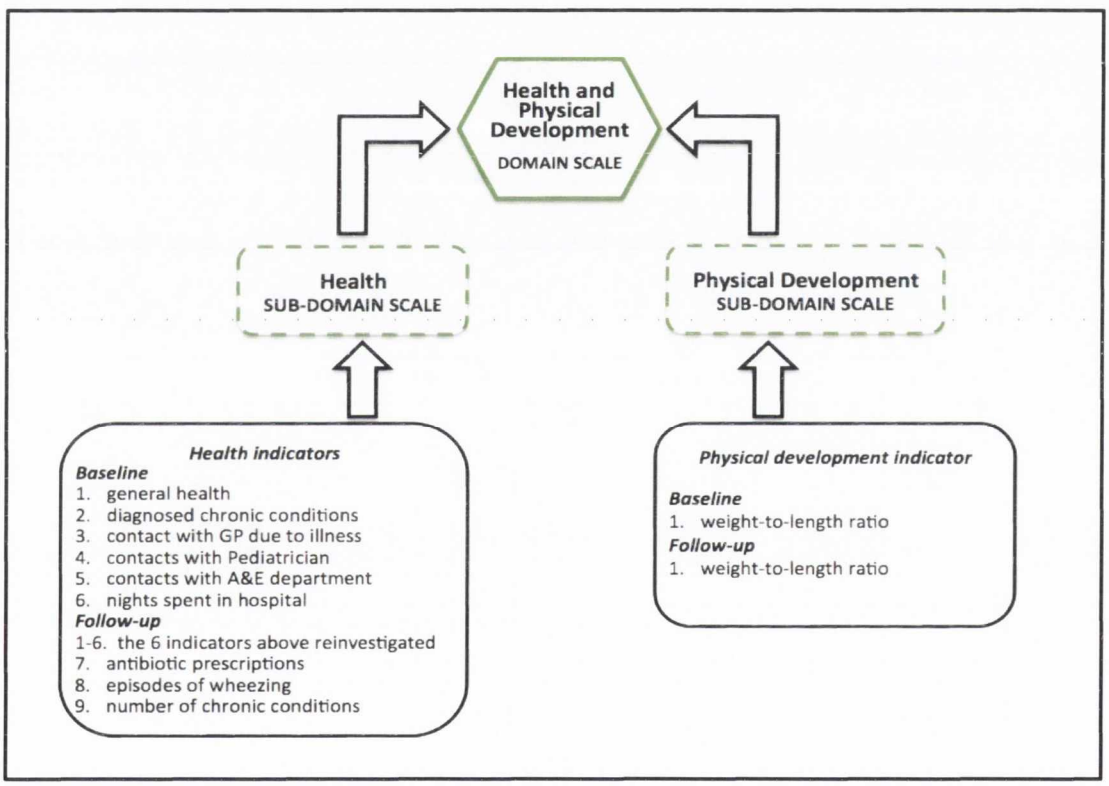

Figure 5.1 Health and Physical Development: from indicators to Sub-Domains and Domain Scales (baseline and follow-up)

5.2 Methods

5.2.1 Participants and exclusions

The Health and Physical development scale was developed for 10,879 participants at baseline (9 months) and 9,429 participants at follow-up (3 years). Table 5.1 presents the total number of participants with missing data on each of the Health and Physical development indicators selected for baseline and follow-up.

Table 5:1 Missing Health and Physical Development indicators

Health and Physical Development indicators	Participants at baseline (9 months) N= 11,134 (100%)	Participants at follow-up (3 years) N= 9,793 (100%)
Health		
1.General health	42(0.4%)	6(0.06%)
2.Diagnosed chronic conditions	27(0.24%)	13(0.14%)
3.Contacts with GP due to ness	27(0.24%)	25(0.24%)
4.Contacts with Paediatrician	27(0.24%)	22(0.23%)
5.Contacts with A&E department	29(0.3%)	18(0.19%)
6.Nights spent in hospital	8(0.07%)	15(0.16%)
7. Antibiotic prescriptions		260(2.75%)
8. Episodes of wheezing		16(0.17%)
9. Number of chronic conditions		13(0.14%)
Physical development		
Weight-to-length (height) ratio	167(1.53%)	47(0.49%)

5.2.2 Procedure

First, the **reliability** of each Health Sub-Domain Scale (for baseline and follow-up) was verified by examining *inter-indicators correlations*, in conjunction with the *total and partial Cronbach's alphas*. Inter-indicator correlations with a Pearson correlation coefficient of 0.20-0.40 were desired[f]. The Physical Development Sub-Domain comprised of a single indicator and estimating internal consistency was not required.

Next **Step 1** (transforming indicators to z-scores), **Step 2** (calculation Sub-Domain scores as mean of indicators' z-scores) **and Step 3** (Domain scores calculation as mean of Sub-Domains' z-scores) described in the previous chapter were employed to generate the baseline and follow-up Health and Physical Development Domain Scales.

As previously noted (Chapter 4) the Health Sub-Domain indicators available were either ordinal or count variables. To explore on ways to develop for Health Sub-Domain Scales with improved interval properties, two methods were employed in generating the Health Sub-Domain scores. First, using Classical Test Theory methods (CTT Health Sub-Domain Scale), all indicators were treated as continuous[47], and the Health Sub-Domain scores were generated as the mean of indicators' z-scores. Next, the Item Response Theory methods (IRT Health Sub-Domain Scale) were used. All indicators were re-coded as four-level ordinal variables and using latent trait models the Health Sub-Domain scores were derived as ability estimates on the health latent trait. One of the big advantages of the IRT approach is the ability to generate health scores on a scale with "closer" to interval properties, suggesting a better distribution of the children across the health latent trait[73].

Step 1- Transforming Sub-Domain indicators to corresponding z-scores

All Health indicators were conversed to z-scores. The following indicator z-scores were reversed so that higher scores indicate better outcomes: GP contacts, Paediatrician contacts, A&E contacts, nights in hospital, number of infections and number of episodes of wheezing. For the Physical Development Sub-Domain, both very high and very low weight-to-length or weight-to-height indicator values could be considered as poorer outcomes. This was accounted for by multiplying by -1 all indicator z-scores above the mean (0). The resulting

[f] When combining items in a multidimensional scale a moderate degree of inter-item correlation is desired. It is not indicated to combine items that are not correlated with one another; equally high correlations between items would imply that some items carry little additional information, resulting in increased redundancy.

indicator was further standardized to mean of 0 and standard deviation of 1. Therefore, the lower values of the final Physical Development indicator reflected concerns about both underweight and overweight children.

Step 2- Calculating (a.) Health Sub-Domain and (b.) Physical development Sub-Domain scores

2a. Developing Health Sub-Domain scores involved two separate approaches. Results from the two approaches were compared to decide on the Health Sub-Domain scores to be used for Domain Scale generation.

> 2a.1. Classical Test Theory Health Sub-Domain scores were generated as the mean of the corresponding indicators z-scores in the first instance.
>
> 2a. 2. Next, for the purpose of deriving Item Response Theory Health Sub-Domain scores Health Sub-Domain indicators were re-coded to ordinal variables with four response levels, a value of 1 representing a poor outcome and a value of 4 representing a very good outcome. Re-coding was not necessary for the *general health* and *chronic conditions* indicators (already available in the desired format). For all other Health indicators (count variables) data was categorized based on quartiles if appropriate. In some instances (i.e. Indicator of admissions to the AE department or Indicator of contacts with a Paediatrician) to obtain the four groups data was further divided by using 33rd and 66th percentiles. Consistent with the CTT method, to ensure that higher values on each indicator represent better outcomes, for all these indicators, children in the first quartile were assigned the highest score. As for the CTT method, the reliability was estimated by verifying *inter-indicators correlations*, in conjunction with *the total and partial Cronbach's alphas* for the resulting set of ordinal Health Sub-Domain indicators. Give the type of data, two *graded response models (GRM) for ordinal* data were fitted: a constrained GRM model (assuming equal discrimination parameters across all indicators) and an unconstrained GRM model. The overall goodness-of-fit for both models was verified. The Health Sub-Domain scores were represented by ability estimates (or the amount of latent trait) and computed as summary measures of the posterior distribution[g] P(*latent trait*|*manifest variables*), or in our case: P(*Health*|*Health indicators*)[87].

Both CTT and IRT Health Sub-Domain scores were transformed to z-scores resulting in a CTT Health Sub-Domain Scale and an IRT Health Sub-Domain Scale. The distributions of two scales were compared to establish the scale with improved discrimination ability along the health spectrum. Similarly, the Cronbach's alpha coefficients for the two scales were examined. Better discrimination and a higher Cronbach's alpha coefficient observed for the IRT Health Sub-Domain Scale indicated the Health scores to be used in Step 3.

2b. The Physical Sub-Domain comprised of a single continuous indicator (baseline: weight-to-length ratio; follow-up: weight-to-height ratio) and corresponding indicator z-scores represented the Sub-Domain scores.

[g] In Bayesian statistics, the posterior predictive distribution is the distribution of unobserved data (prediction) conditional on the observed data. This is described as the distribution that a new independent and identically distributed data point would have, given a set of N existing independent and identically distributed observations.

Step 3- Calculating Health and Physical development Domain scores

Finally, the Health and Physical Development Domain Scale was generated as the average of the standardized (Mean=0 and SD=1) IRT Health and Physical Development Sub-Domain Scales. The Domain Scale was then standardized to mean 100 and standard deviation 10.

5.2.3 Statistical analysis

The function `table.cor()` in R was used to generate the inter-indicator correlation matrix for the Health Sub-Domain Scale (both initial and ordinal versions), while Cronbach's alphas were obtained using the function `alpha()` from the package `pshych` in R. This returned the alpha coefficient for the complete sub-domain with all indicators included also showing results after eliminating one indicator at the time. The function `scale()` was employed to generate indicators z-score.

Generating the CTT Health Sub-Domain scores involved the use of simple mathematical functions to calculate the mean of indicators' z-scores.

The function `grm()` from the `package ltm for R` was used for the IRT method [87] and the goodness-of -fit for the two models was evaluated through a likelihood ratio test using `ANOVA()`. The health scores were then generated with the function `factor.scores()` from the same R package. The `factor.scores()` function argument `resp.patterns` was used to specify that the scores of the latent trait were to be calculated based on the response patterns available from the ordinal Health Sub-Domain indicator set.

5.3 Results

5.3.1 Descriptive statistics

The descriptive statistics of all indicators considered for the Health and Physical Development Domain at baseline and follow-up are shown in Table 5.2.

During initial descriptive statistical analysis stages, substantial overlap was observed between responses for *diagnosed chronic conditions* and *number of chronic conditions* indicators. Before proceeding with reliability estimates for the baseline and follow-up Health Sub-Domain Scales, the correlation coefficient between these two indicators was calculated, and a value of Pearson's r= 0.84 indicating very strong relationship between the two was observed. Therefore, it was decided to discard the *number of chronic conditions* from the follow-up Health indicators set. This decision was based on the fact that the indicator *diagnosed chronic conditions,* which also accounted for the impact of the condition on child's day to day activities was considered a better expression of the child's functioning on the Health and Physical Development Domain.

Table 5:2 Descriptive statistics for the Health and Physical Development Domain indicators (baseline and follow-up)

Health and Physical development indicators	Baseline N=10,879 (100%)	Follow-up N=9,429 (100%)
Health sub-domain indicators		
1.General health		
Very health, no problems	9033(83%)	7091(75%)
Healthy, few minor problems	1728(16%)	2151(23%)
Sometimes quite	102(0.9%)	163(1.7%)
Almost always unwell	16(0.1%)	24(0.3%)
2.Diagnosed chronic conditions		
No chronic condition	8254(76%)	8041(85%)
Minor condition	1949(18%)	1062(11%)
Moderate condition	504(4%)	285(3%)
Severe condition	172(2%)	41(0.5%)
3.Contact with GP due to ness		
One or less	4638(43%)	4254(45%)
Two	2045(19%)	1841(20%)
Three or four	2356(22%)	1200(13%)
More than four	1840(17%)	2134(22%)
4.Contacts with Paediatrician		
None	7638(70%)	6829(72%)
One contact	2016(19%)	1601(17%)
Two contacts	615(6%)	539(6%)
3 or more contacts	610(6%)	460(5%)
5.Contacts with A&E department		
None	8943(82%)	7813(83%)
One contact with A&E department	1545(14%)	1316(14%)
Two contacts	246(3%)	213(2%)
More than two contacts	145(1%)	87(1%)
6.Nights spent in hospital due to illness		
None	9489(87%)	7860(83%)
One night	440(4%)	545(8%)
Two to five	538(5%)	307(3%)
5 or more nights	412(4%)	717(8%)
8. Number of antibiotic prescriptions		
No prescriptions		3333(35%)
1 prescription		2799(30%)
2 prescriptions		1565(17%)
3 or more prescriptions		1732(18%)
9. Number of episodes of wheezing		
No episodes		6695(71%)
1-3 episodes		395(4%)
4 episodes		786(8%)
More than 4 episodes		1553(16%)
10. Number of chronic conditions		
No chronic conditions		8296(98%)
One chronic condition		1089(12%)
Two chronic conditions		277(3%)
Three chronic conditions		124(1%)
Physical development	**Mean (SD)**	**Mean (SD)**
Weight-to length (height) ratio	0.13(0.1)	0,16(0.02)
Weight	9.66(1.19)	15.62(2.02)
Length/Height	72.86(3.54)	96.21(3.95)

Next, Figures 5.2 and 5.3 were used to illustrate some of the Health Sub-Domain indicators available. These are presented in their original format and the positively skewed distribution of these count variables can be observed.

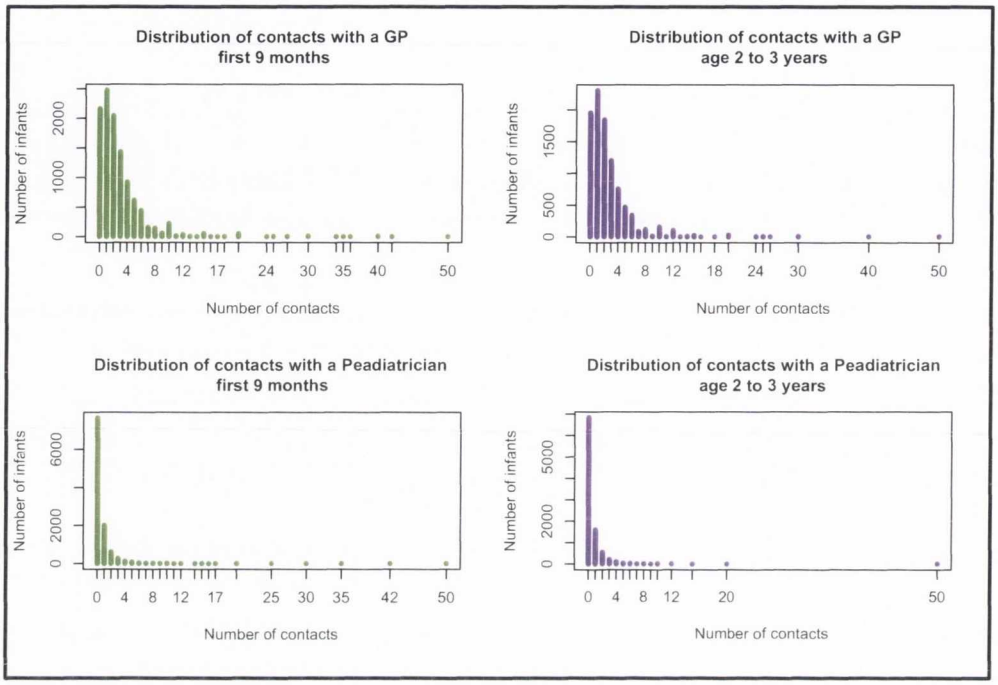

Figure 5.2 Distribution of Health Sub-Domain indicators (count or ordinal variables) at baseline and follow-up: 1. Contacts with GP and 2. Contacts with Paediatrician

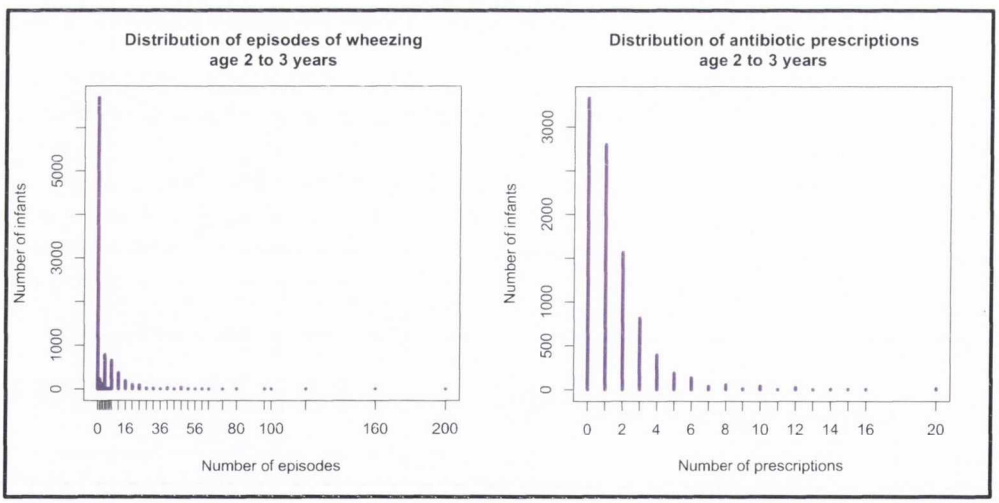

Figure 5.3 Distribution of additional follow-up Health Sub-Domain indicators (count variables): 1. Episodes of wheezing and 2. Antibiotic prescriptions

5.3.2 Reliability estimates

The Health sub-domain **reliability estimates** for baseline and follow-up are presented below. First, inter-indicator correlations and total and partial Cronbach's alphas are shown for the CTT Health Sub-Domain score approach. Next, the three reliability estimates for the IRT Health Sub-Domain score approach are presented.

1. CTT Health Sub-Domain scores

The **inter-indicator correlations** are displayed in Table 5.3 (baseline) and Table 5.4 (follow-up) respectively. All indicators are considered in their initial form before z-score transformation and reversal. The absolute value for the correlation coefficient is presented.

Pearson's correlation coefficients outside the desired interval (r: 0.20-0.40) are shown in bold. At baseline, none of the inter-indicator correlation coefficients were above r=0.40, however some low correlations were observed (for *contacts with the A&E department* and *nights spent in hospital due to illness* indicators). At follow-up, the *antibiotic prescription* indicator showed a strong positive relationship (r=0.59) with *contact with GP due to illness indicator* and correlated lower than r=0.20 with *contacts with Paediatrician, contacts with the A&E department* and *nights spent in hospital due to illness* indicators. Given the high prevalence of antibiotic prescribing in Ireland[88] the strong correlation with *contact with GP due to illness indicator* was not surprising. The follow-up *general health* indicator correlated higher than the desired limit (but lower than r=0.50) with three other indicators.

Table 5:3 Inter-indicator correlations for baseline Health Sub-Domain (CTT approach)

Health and physical development indicators* at 9 months	1	2	3	4	5
1.General health	-				
2.Diagnosed chronic conditions	0.30	-			
3.Contact with GP due to illness	0.33^{n}	0.27^{n}	-		
4.Contacts with Paediatrician	0.21^{n}	0.26^{n}	0.26	-	
5.Contacts with A&E department	**0.19^{n}**	**0.16^{n}**	0.23	0.38	-
6.Nights spent in hospital due to illness	**0.17^{n}**	0.21^{n}	**0.18**	0.37	0.26

*- Indicators were considered in their initial form before z-score transformation or reversal

^{n} – A negative relationship was observed due to the fact that for one indicator higher values represented better outcomes while the reverse was true for the other.

Table 5:4 Inter-indicator correlations for follow-up Health Sub-Domain (CTT approach)

Health and physical development indicators* at 3 years	1	2	3	4	5	6	7
1.General health	-						
2.Diagnosed chronic conditions	**0.44**	-					
3.Contact with GP due to illness	**0.48^{n}**	0.31^{n}	-				
4.Contacts with Paediatrician	0.30^{n}	0.25^{n}	0.29	-			
5.Contacts with A&E department	0.22^{n}	**0.14^{n}**	0.26	0.28	-		
6.Nights spent in hospital due to illness	0.24^{n}	0.16^{n}	0.22	0.51	0.22	-	
7. Antibiotic prescriptions	0.38^{n}	0.33^{n}	**0.69**	**0.17**	**0.17**	**0.16**	-
8. Episodes of wheezing	**0.46^{n}**	0.26^{n}	**0.43**	0.29	0.21	0.23	0.43

*- Indicators were considered in their initial form before z-score transformation or reversal

^{n} – A negative relationship was observed due to the fact that for one indicator higher values represented better outcomes while the reverse was true for the other.

The **total Cronbach's alpha** for the Health Sub-Domain Scale was 0.47 (CI: 0.45-0.48) at baseline and 0.60 (CI: 0.59- 0.61) at follow-up. The **partial Cronbach's alphas** for the Health Sub-Domain Scales at both data collection points are presented in Table 5.5. All baseline partial Cronbach's alphas were lower than the total Cronbach's alpha suggesting that all

indicators should be retained. At follow-up, an increase in the scales Cronbach's alpha from 0.60 to 0.65 was observed when the indicator *episodes of wheezing* was removed.

Table 5:5 CTT Health Sub-Domain approach: baseline and follow-up total and partial Cronbach's alphas

CTT Health Sub-Domain approach	Baseline	Follow-up
Total Cronbach's alpha		
All indicators included	0.47	0.60
Partial Cronbach's alpha		
Excluding General health	0.46	0.58
Excluding GP contacts	0.39	0.48
Excluding Paediatrician contacts	0.34	0.55
Excluding AE contacts	0.42	0.59
Excluding Nights spent in hospital	0.47	0.56
Excluding Diagnosed chronic conditions	0.45	0.56
Excluding Antibiotic prescriptions		0.52
Excluding Episodes of wheezing		0.65

While observing inter-indicator correlations outside the desired interval (0.2-0.4) was not ideal, all Health Sub-Domain indicators were considered theoretically meaningful for child's health. For instance, the number of antibiotic prescriptions can be considered a proxy for the number of infections a child suffered from, with higher number of prescriptions indicating sub-optimal child functioning. Primary Caregiver's rating of a child's health was previously shown to be an accurate estimation of the true health status of the child[89]. Although removing the *episodes of wheezing* indicator from the follow-up Health Sub-Domain Scale would increase its internal consistency, given a relatively high prevalence of asthma in Irish children of 20%[90] it was believed that this indicator is particularly relevant for Irish children's health outcomes.

After analysing the three reliability estimates and taking in consideration the scientific relevance of each indicator showing sub-optimal correlations with others, it was decided that all Health indicators should be retained.

Therefore, the **final set of Health Sub-Domain indicators** used thereafter to calculate Sub-Domain scores comprised of all six initial indicators at baseline and eight of the nine indicators initially considered at follow-up (except, *number of chronic conditions* indicator which had been previously discarded during preliminary stages of descriptive analysis).

2. IRT Health Sub-Domain scores

The four-level ordinal versions of the six baseline and eight follow-up Health Sub-Domain indicators (from the CTT approach) were used to derive IRT Health Sub-Domain scores.

The **inter-indicator correlations** for the four-level ordered version of the Health indicators are displayed in Table 5.6 (baseline) and Table 5.7 (follow-up) respectively. Pearson's correlation coefficients outside the desired interval (0.20-0.40) are presented in bold. Similar to the CTT Health Sub-Domain score approach, none of the baseline inter-indicator correlation coefficients were above r=0.40, however some low correlations were observed (mostly for *contacts with the A&E department* and *nights spent in hospital due to illness* indicators). Consistency with the CTT approach was also observed at follow-up with two exceptions: 1. the *general health* indicator showed a single correlation higher than the desired limit (r=0.45 with the *diagnosed chronic condition* indicator) and 2. the episodes of wheezing indicator was poorly correlated (r<0.15) with contacts with Paediatrician, contacts with A&E department and nights spent in hospital indicators.

Table 5:6 Inter-indicator correlations for baseline Health Sub-Domain (IRT approach)

Health and physical development indicators at 9 months	1	2	3	4	5
1.General health	-				
2.Diagnosed chronic conditions	0.26	-			
3.Contact with GP due to illness	0.25	0.20	-		
4.Contacts with Paediatrician	**0.19**	0.21	0.21	-	
5.Contacts with A&E department	**0.17**	**0.14**	0.21	0.25	-
6.Nights spent in hospital due to illness	**0.19**	**0.18**	**0.17**	0.30	0.39

*- Indicators were considered in their ordinal form, higher values are indicative of better outcomes

Table 5:7 Inter-indicator correlations for follow-up Health Sub-Domain (IRT approach)

Health and physical development indicators at 3 years	1	2	3	4	5	6	7
1.General health	-						
2.Diagnosed chronic conditions	**0.45**	-					
3.Contact with GP due to illness	0.37	0.24	-				
4.Contacts with Paediatrician	0.32	0.33	0.28	-			
5.Contacts with A&E department	**0.15**	**0.13**	**0.18**	0.33	-		
6.Nights spent in hospital due to illness	0.21	0.23	**0.17**	0.29	0.22	-	
7. Antibiotic prescriptions	0.33	0.20	**0.59**	0.23	**0.15**	**0.17**	-
8. Episodes of wheezing	0.31	0.26	0.30	**0.14**	**0.11**	**0.14**	0.34

*- Indicators were considered in their ordinal form, higher values are indicative of better outcomes

The baseline **total Cronbach's alpha** for the IRT Health Sub-Domain score approach (indicators in ordinal form) was 0.64 (CI: 0.62-0.65) while the corresponding follow-up total Cronbach's alpha was of 0.75 (CI: 0.73- 0.76). The **partial Cronbach's alphas** for IRT Health Sub-Domain Scales at both data collection points are presented in Table 5.8. All baseline and follow-up partial Cronbach's alphas were lower than the total Cronbach's alpha confirming that all indicators should be retained.

Table 5:8 IRT Health Sub-Domain approach: baseline and follow-up total and partial Cronbach's alphas

IRT Health Sub-Domain approach	Baseline	Follow-up
Total Cronbach's alpha		
All indicators included	0.64	0.75
Partial Cronbach's alpha		
Excluding General health	0.60	0.72
Excluding GP contacts	0.64	0.69
Excluding Paediatrician contacts	0.57	0.72
Excluding AE contacts	0.59	0.74
Excluding Nights spent in hospital	0.58	0.74
Excluding Diagnosed chronic conditions	0.60	0.73
Excluding Antibiotic prescriptions		0.69
Excluding Episodes of wheezing		0.73

5.3.3 Sub-Domain Scales

The totality of baseline and follow-up Health Sub-Domain scores calculated formed corresponding Health Sub-Domain Scales. Health Sub-Domain scores were derived using two approaches, consequently for each time-point two scales were formed: a CTT Health Sub-Domain Scale and an IRT Health Sub-Domain Scale. The distribution of children's scores across the CTT and IRT Health Sub-Domain Scales for baseline and follow-up are presented in Figures 5.4-5.7.The baseline and follow-up Physical Development Sub-Domains were composed of one corresponding indicator: weight-to-length ratio for baseline and weigh-to-height ratio for follow-up. For each sample (baseline and follow-up) Physical Development Sub-Domain indicators after z-score transformation and reversal formed Physical Development Sub-Domain Scales. Figure 5.8 and Figure 5.9 show the baseline and follow-up Sub-Domain scales.

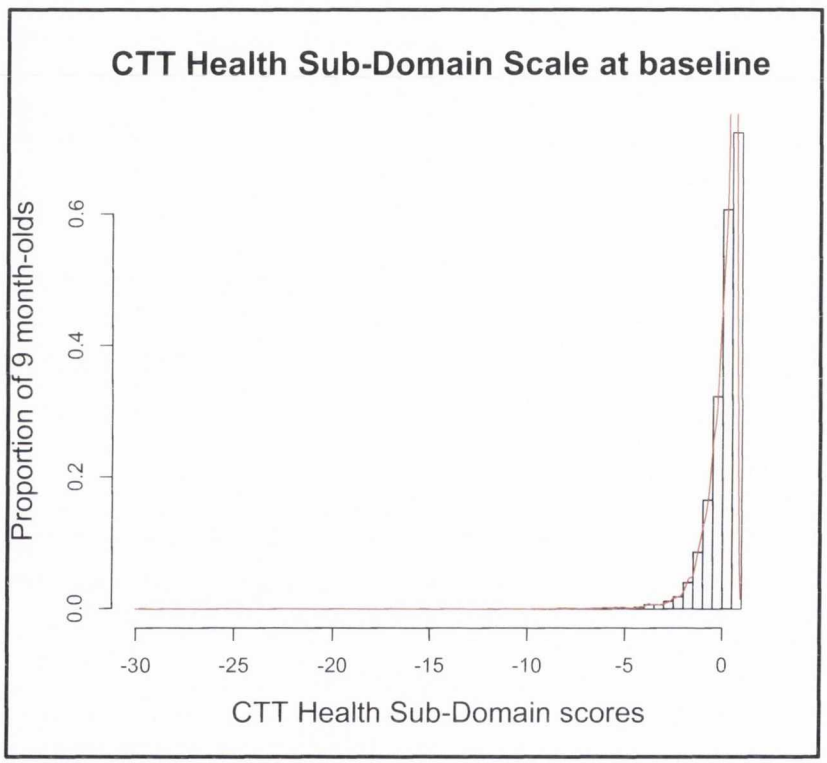

Figure 5.4 Baseline CTT Health Sub-Domain Scale

(negative skew and poorer discrimination between children at the positive end of the spectrum can be observed)

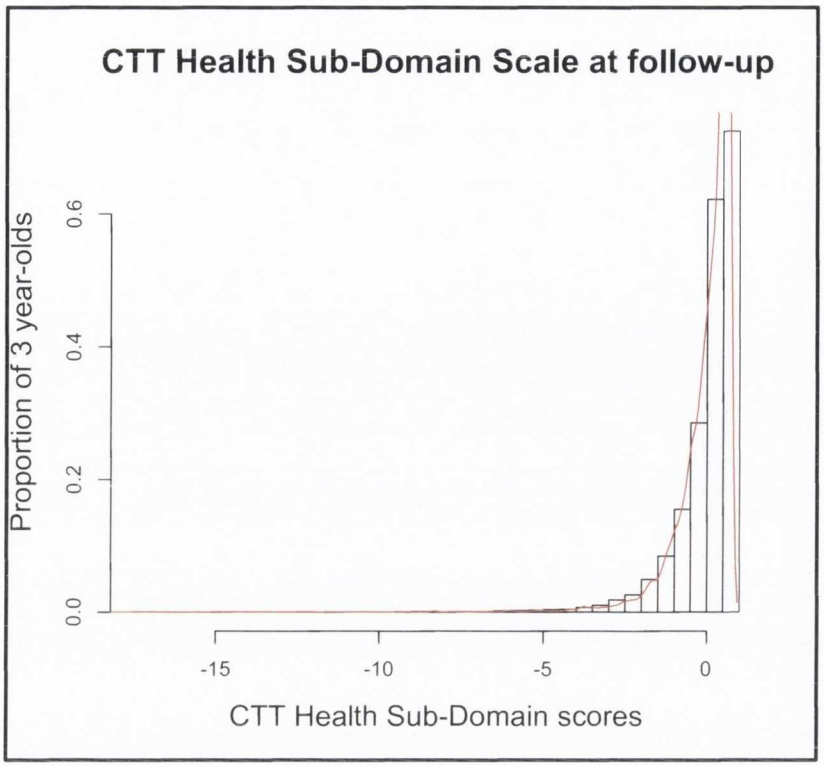

Figure 5.5 Follow-up CTT Health Sub-Domain Scale

(negative skew and poorer discrimination between children at the positive end of the spectrum can be observed)

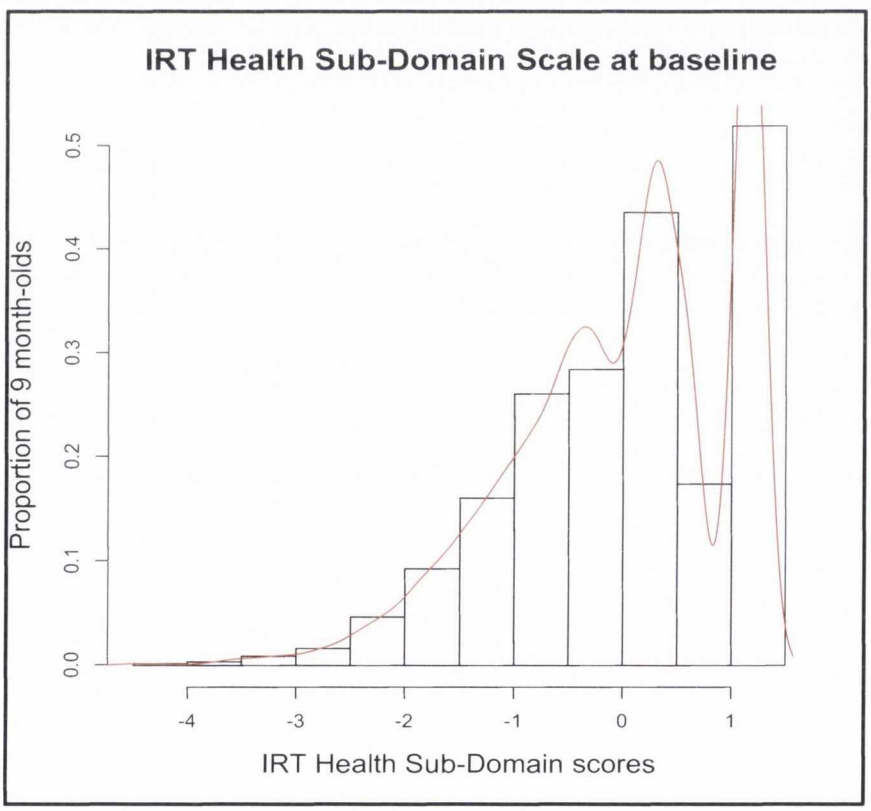

Figure 5.6 Baseline IRT Health Sub-Domain Scale

(better discrimination between children at the positive end of the spectrum can be observed)

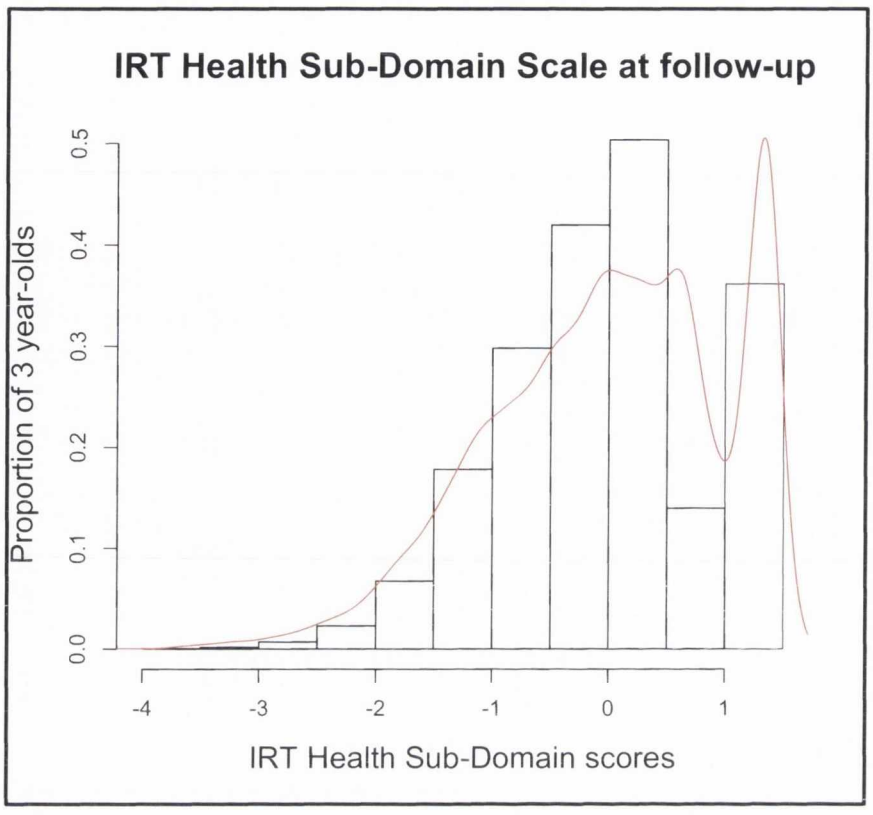

Figure 5.7 Follow-up IRT Health Sub-Domain Scale

(better discrimination between children at the positive end of the spectrum can be observed)

At both data collection points, the **IRT Health Sub-Domain Scales** showed higher total Cronbach's alpha coefficients than the CTT Health Sub-Domain Scales (baseline: 0.64 and follow-up: 0.75; respectively baseline: 0.47 and follow-up: 0.57). Similarly, the distribution of IRT Health scores was closer to the normal curve and less skewed than that of CTT Health scores. Additionally, at both time-points, a strong relationship was observed between the health scores resulted with CTT and with IRT approach. This confirmed that the scales measure the same concept. Pearson's correlation coefficients between the two were: 1. r=0.77 at baseline and 2. r=0.80 at follow-up. Therefore, the IRT Health scores were further considered for the development of the Health and Physical Development Domain Scales.

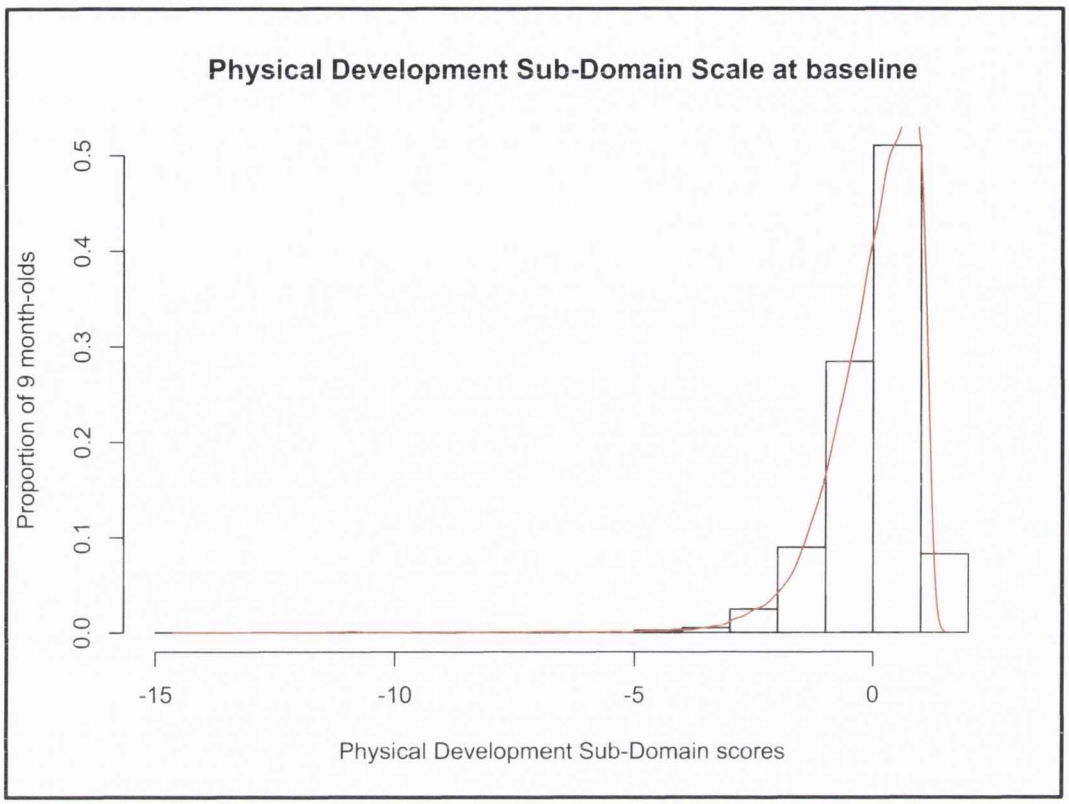

Figure 5.8 Baseline Physical Development Sub-Domain Scale

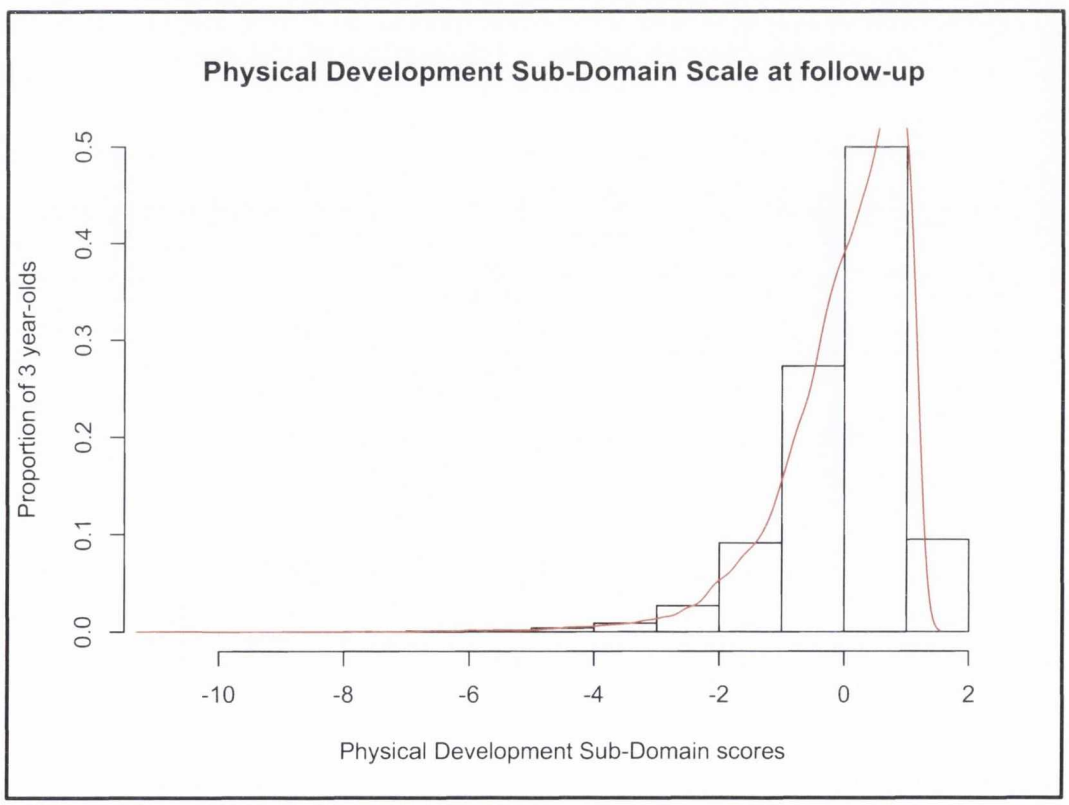

Figure 5.9 Follow-up Physical Development Sub-Domain Scale

5.3.4 Domain Scales

The distribution of the children's scores across the interval version of the baseline and follow-up Health and Physical Development Domain Scales, after standardization (Mean=100 and SD=10) are presented in Figures 5.10 for baseline and 5.11 for follow-up. Finally, distributions of the children's class across the ordinal version of the baseline and follow-up Health and Physical Development Domain Scales are shown in Fugure 5.12 for baseline and Figure 5.13 for follow-up.

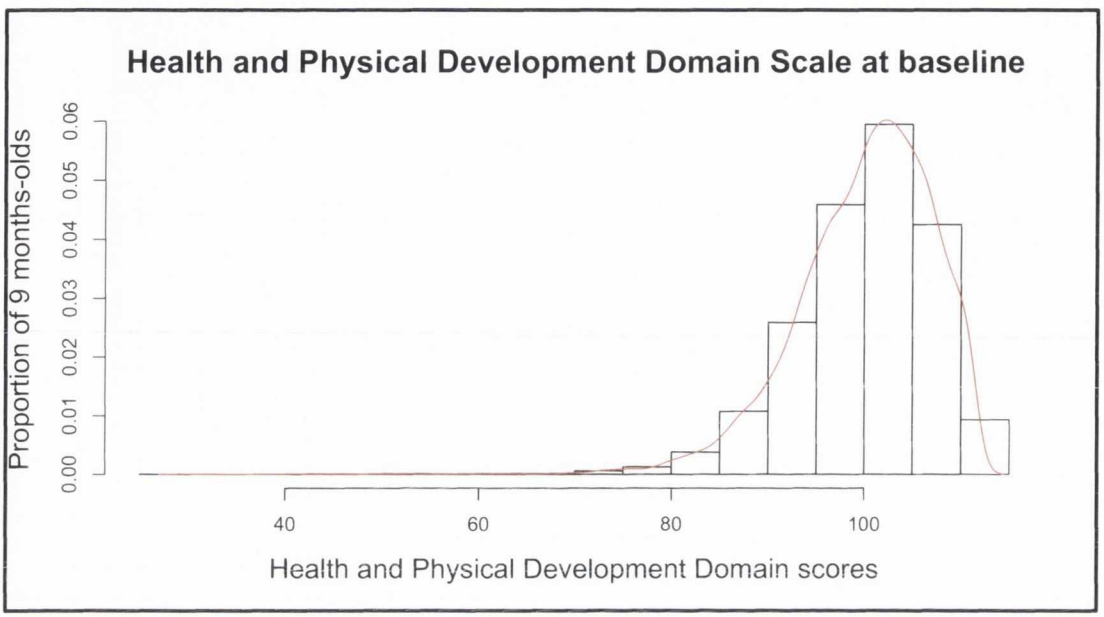

Figure 5.10 Baseline Health and Physical Development Domain Scale interval version

(scores were standardized to Mean=100, SD=10)

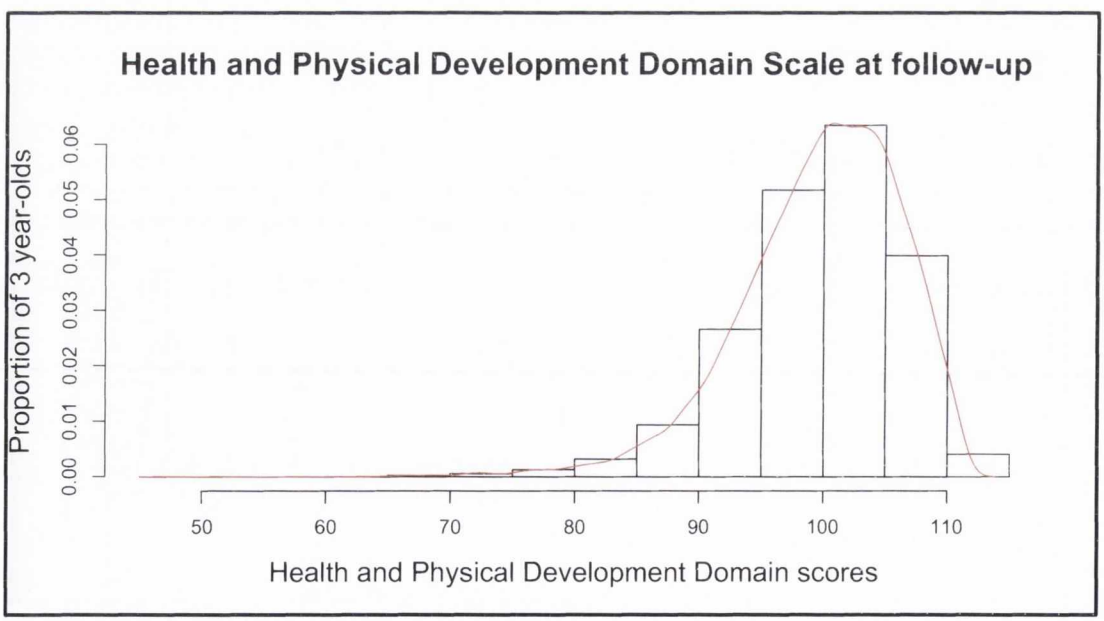

Figure 5.11 Follow-up Health and Physical Development Domain Scale interval version

(scores were standardized to Mean=100, SD=10)

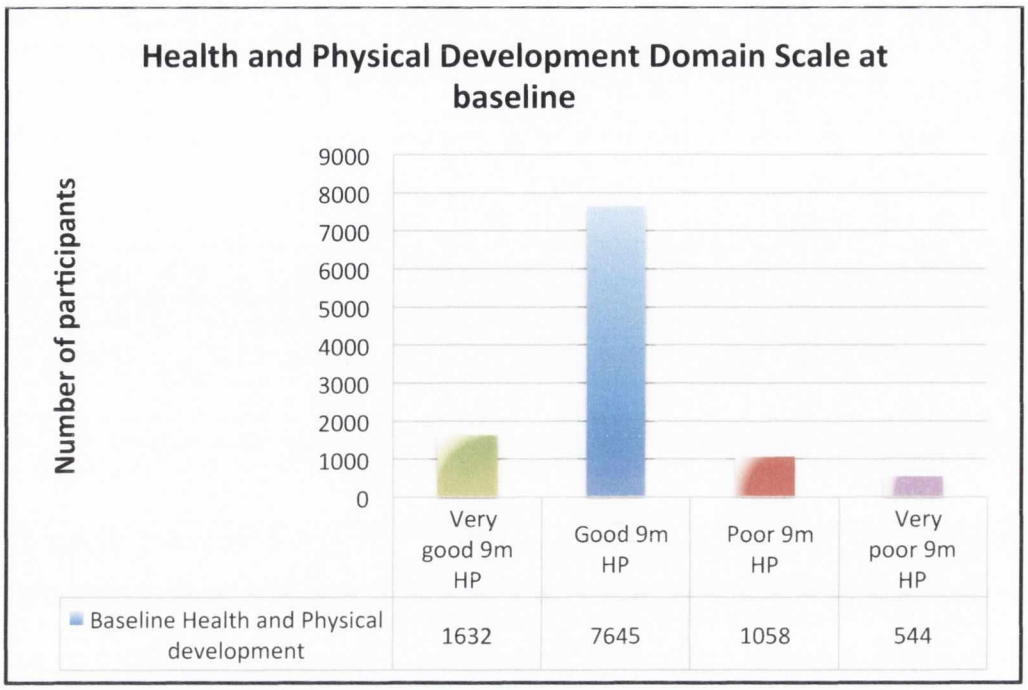

Figure 5.12 Baseline Health and Physical Development Domain Scale ordinal version

(Very good- equal or above the 85th percentile, Good- between 15th and 85th percentile, Poor- above 5th and lower or equal to 15th percentile, Very poor- lower or equal to the 5th percentile)

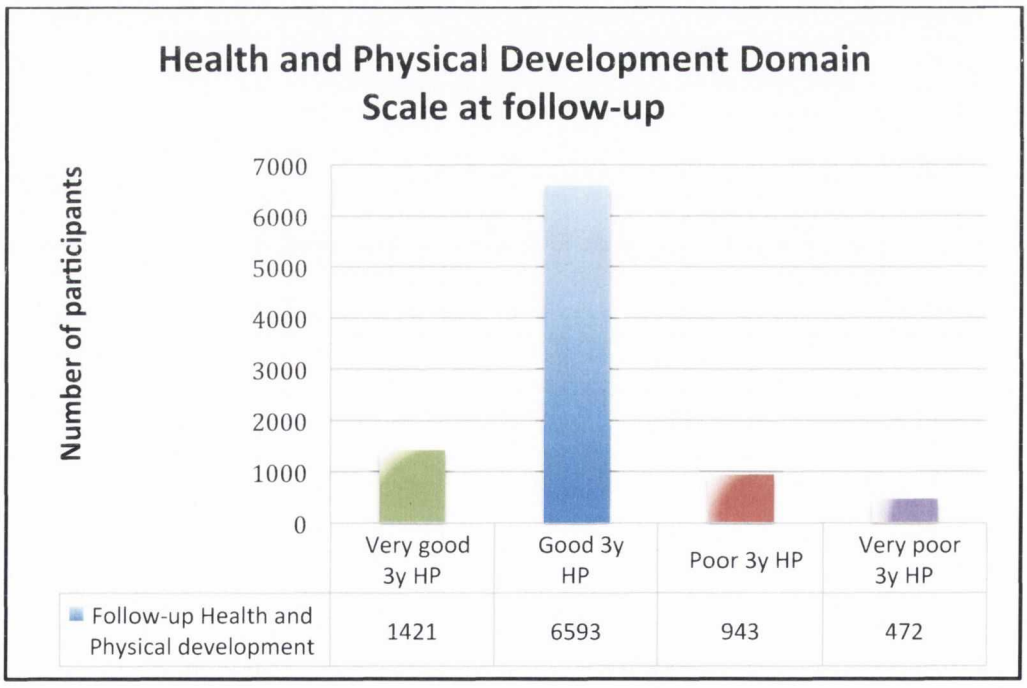

Figure 5.13 Follow-up Health and Physical Development Domain Scale ordinal version

(Very good- equal or above the 85th percentile, Good- between 15th and 85th percentile, Poor- above 5th and lower or equal to 15th percentile, Very poor- lower or equal to the 5th percentile)

5.4.5 Additional results from the IRT Health Sub-Domain Scale approach

For both time points the unconstrained (does not assume equal discrimination for all items) GRM model was a better fit for the data and results from the Likelihood Ratio Tests are presented in Table 5.9 (baseline) and 5.10 (follow-up).

Table 5:9 Goodness-of-fit (Likelihood Ratio Table) for constrained and unconstrained GRM models: IRT Health Sub-Domain at baseline

Baseline IRT Health Sub-Domain	AIC	BIC	log.Lik	LRT	df	p.value
Constrained GRM model	92845.42	92984.02	-46403.71			
Unconstrained GRM model	92656.01	92831.08	-46304.00	199.42	5	<0.001

Table 5:10 Goodness of fit (Likelihood Ratio Table) for constrained and unconstrained GRM models: IRT Health Sub-Domain at follow-up

Baseline IRT Health Sub-Domain	AIC	BIC	log.Lik	LRT	df	P.value
Constrained GRM model	114175.5	114354.3	-57062.74			
Unconstrained GRM model	113069.0	113297.9	-56502.52	1120.45	7	<0.001

Results from the fitted unconstrained GRM model used to generate IRT Health Sub-Domain scores at baseline are presented in Figures 5.14 and 5.15.

1. According to the Test Information Curve (Figure 5.14. 2) we observed that the Health indicators used provided more information about respondents with low ability on the latent trait (or lower Health scores). This was further confirmed by observing that the amount (percentage) of the test information accounted for at ability levels (Health scores) in the interval (-9: 0) was almost 90%, compared to 10% for Health scores between 0 and 9.
2. This is also confirmed by the Item Information Curves (Figure 5.14.1) as the curves corresponding to most indicators (except GP visits) are centred below 0 (considered the average ability or Health score)
3. The Item Response Category Characteristic Curves (Figure 5.14.2) show the relationship between level of ability (Health score) and the probability of endorsing the respective category for each item. We observed that for most indicators the categories 1 and 4 (each category represents an indicator value showing child scores for that outcome, category 4 signifies best outcomes) function well at discriminating children with extreme ability or Health scores. The two exceptions observed were the indicator of general health and chronic conditions which show poor discrimination at the lower end of Health spectrum. Therefore, for most indicators a lower Health score corresponds with category 1, while for all indicators higher ability (Health scores) is accounted for by category 4. Categories 2 and 3 on most indicators (except GP visits) are mostly endorsed by children with low Health scores. This suggests that for most indicators values of 2 or 3 are better discriminators between children with poorer Health. This is further noted when analysisng Item Response Category Characteristic Curves on an indicator to indicator basis (Figure 5.15). Of all indicators, the indicator *GP visits* appears to be best at discriminating between children, with categories between 1 and 4 reflecting a gradual increase in children's ability (Health scores).

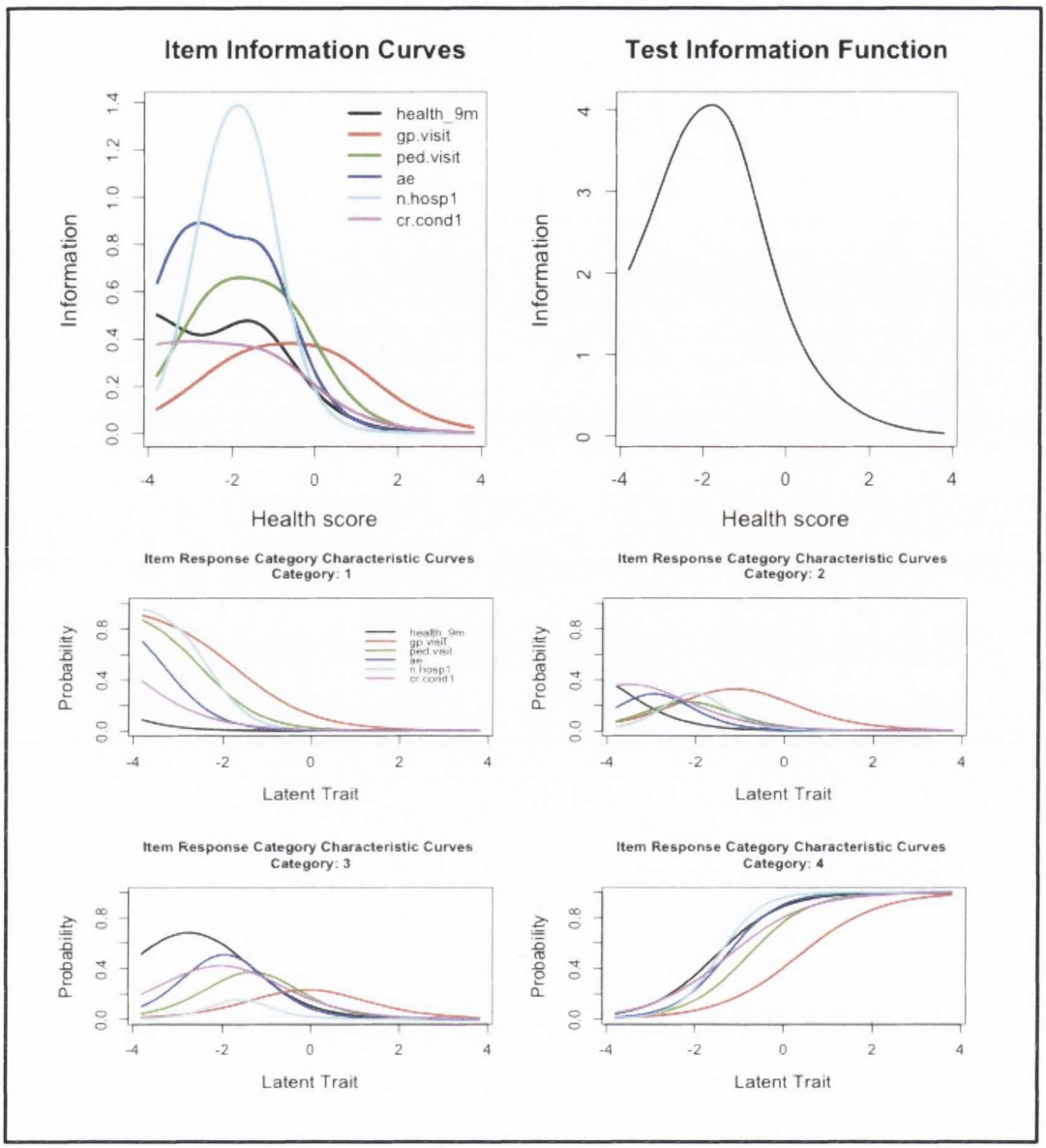

Figure 5.14 Results from the GRM unconstrained model for baseline data: 1. Item (indicator) Information Curves; 2. Test Information Function and 3. Item Response Category Characteristic Curves

Legend for Figures 5.14 and 5.15:

- health_9m: indicator of general health
- gp.visit: indicator of contacts with GP
- ped.visit: indicator of contacts with Paediatric specialist
- ae: indicator of contacts with the A&E Department
- n.hosp: indicator of nights in hospital
- cr.cond: indicator of diagnosed chronic conditions

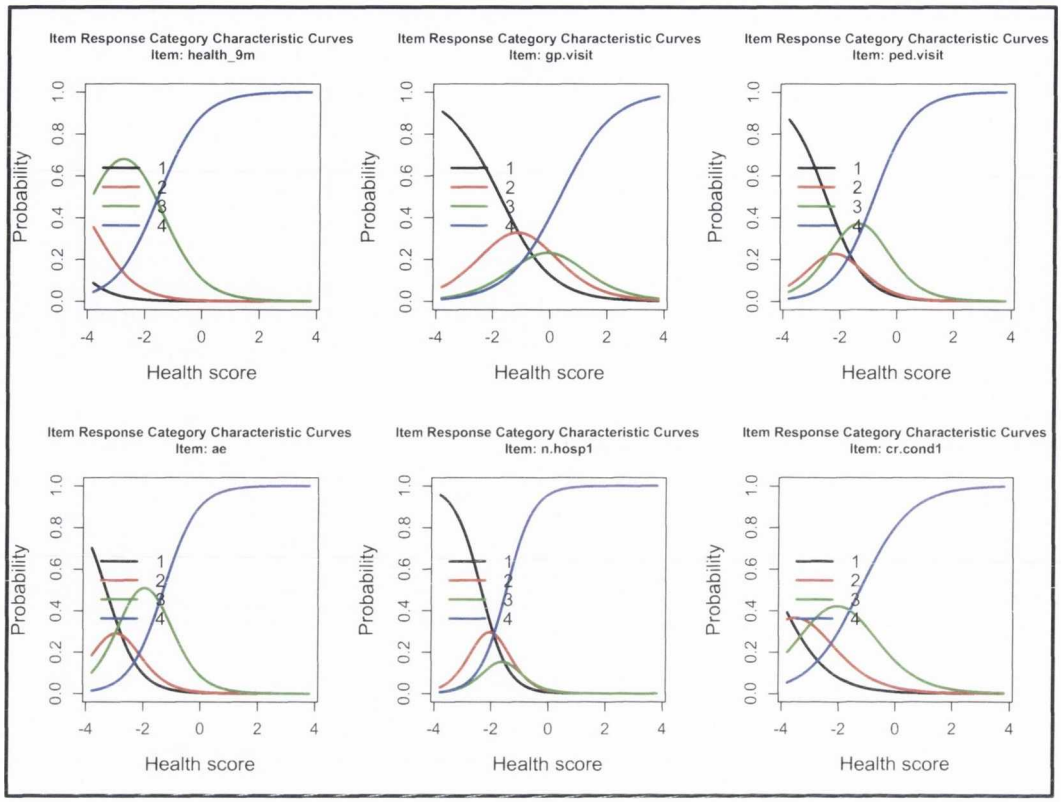

Figure 5.15 Item Response Category Characteristic Curves for each Health indicator at baseline

Results from the fitted unconstrained GRM model used to generate IRT Health Sub-Domain scores at follow-up are presented in Figures 5.16 and 5.17. Similar observations to baseline can be made:

1. According to the Test Information Function (Figure 5.16.2) more information is provided for children with low Health scores and the test information accounted for at ability levels in the interval (-6:0) was almost 78%, compared to 20% for Health scores between 0 and 6.
2. In addition to the indicator of GP visits, the indicator of antibiotic prescription also functions well at discriminating between the various levels of ability (Health scores). However, the Item Information Curves for the 4 categories of the two indicators are very similar and if findings from this analysis were used to improve on the test measuring Health ability, one might decide to discard one of the two. Similar to baseline the indicators of general health and chronic conditions are poor discriminators at the lower end of the Health spectrum. Similar observations can be made about contacts with AE follow-up indicator. When analysing Item Information Curves it can be observed that contacts with AE and nights in hospital follow-up indicators bring little information to the test. Thus, they could probably be excluded if improvements of the test were desired.

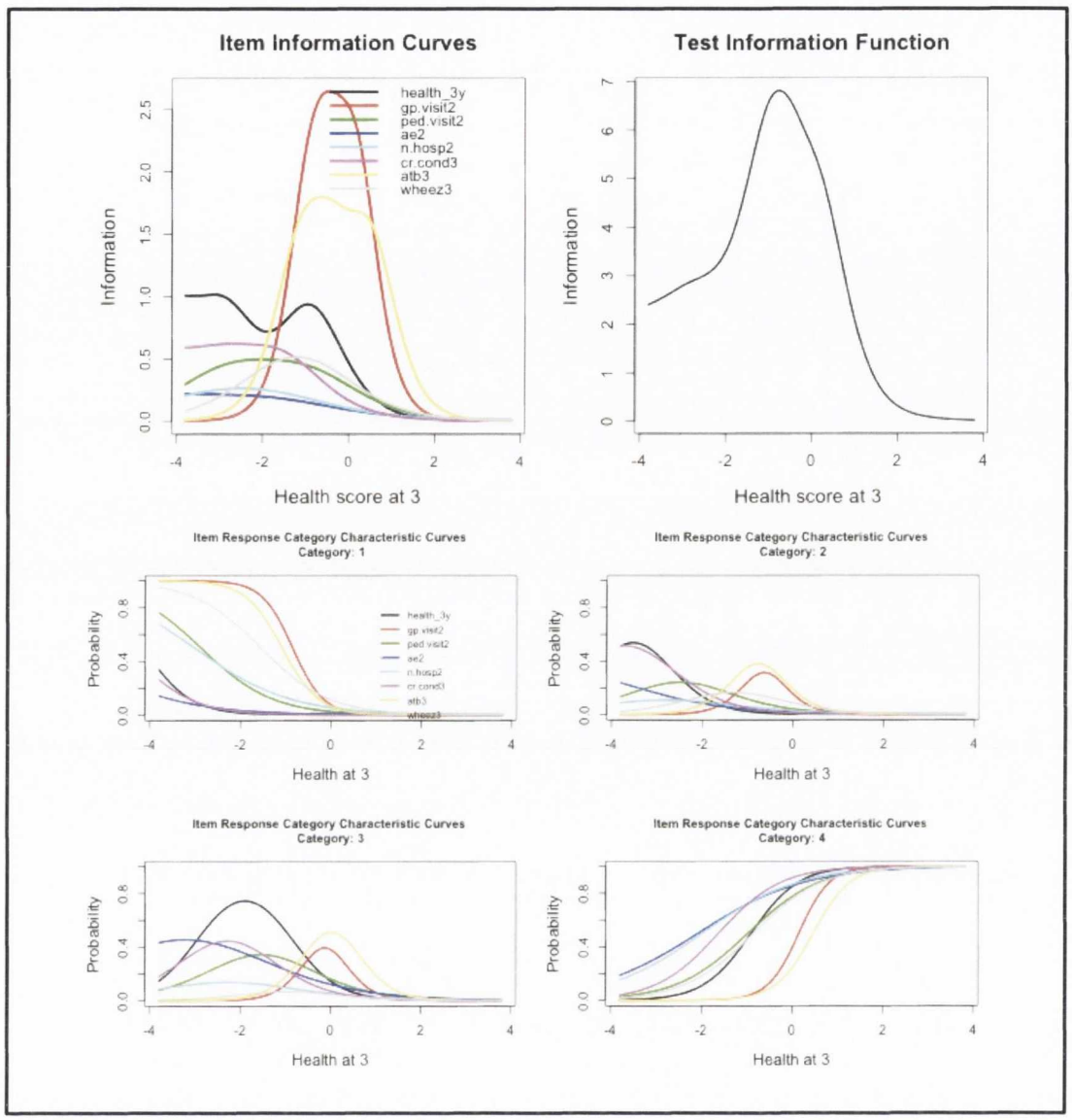

Figure 5.16 Results from the GRM unconstrained model for follow-up data: 1. Item (indicator) Information Curves; 2. Test Information Function and 3. Item Response Category Characteristic Curves

Legend for Figures 5.16 and 5.17:

- health_3y: indicator of general health
- gp.visit2: indicator of contacts with GP
- ped.visit2: indicator of contacts with Paediatric specialist
- ae2: indicator of contacts with the A&E Department
- n.hosp2: indicator of nights in hospital
- cr.cond3: indicator of diagnosed chronic conditions
- atb3: indicator of antibiotic prescriptions
- wheez3: indicator of episodes of wheezing

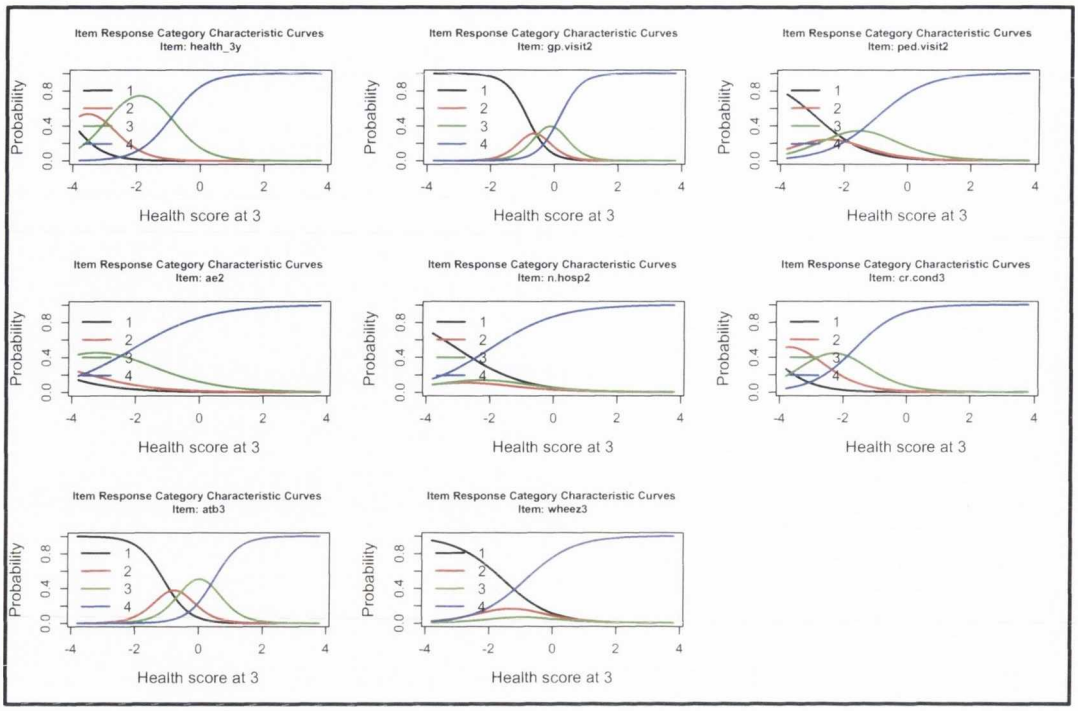

Figure 5.17 Item Response Category Characteristic Curves for each Health indicator at follow-up

The information presented above can be used to improve on the tests assessing child Health at baseline and follow-up. Indicators investigating positive aspects of health would be useful in improving the capacity of the two tests to discriminate better between children with good and very good Health. However, this was beyond the scope of this PhD thesis and was not persuaded any further.

5.4 Summary

The development of the Health and Physical Development Domain Scale is presented schematically in Figure 15.18.

Developing the Health and Physical Development Domain Scale proved challenging mostly due to the fact that child's health (Health Sub-Domain Scale) was not investigated through any standardized instruments and the original indicators available (before standard score transformation or reversal) were ordinal or positively skewed count variables. On the other hand, the Physical Sub-Domains (at baseline and follow-up) were represented by single indicators (ratio variables) and the corresponding Sub-Domain Scales were easily constructed as the totality of indicator's z-scores (Figure 15.18- **Step 2b**).

Two methods (Figure 15.18-**Step 2**) were employed in developing the Health sub-domain scores. First, as for all other sub-domains, a Classical Test Theory approach was taken (Figure 15.18-**Step 2a.1**). The resulting baseline and follow-up Health Sub-Domain Scales had a skewed distribution with most children situated at the positive end of the health spectrum.

Next, Item Response Theory methods (Figure 15.18-**Step 2a.2**) were used with the aim of generating Health Sub-Domain scores that would allow better discrimination between children resulting in a Sub-Domain Scale (and implicitly Domain Scale) with a less skewed distribution and improved interval properties. The Health Sub-Domain indicators from the final sets (after discarding *number of chronic conditions* at follow-up) were re-coded as four-level ordinal

variables. Similarly to CTT method, although some inter-indicator Pearson's correlation coefficients were not included in the desired interval it had been decided, based on their theoretical meaning, that all indicators should be retained. The IRT Health Sub-Domain scores generated formed Sub-Domain Scales with improved internal consistency, interval properties and better discrimination ability between children situated at the positive end of the health spectrum. Therefore, these were used further to develop the Health and Physical Development Domain Scales as the mean of 1.Health and 2.Physical Development Sub-Domain z-scores (Figure 15.18- **Step 3**).

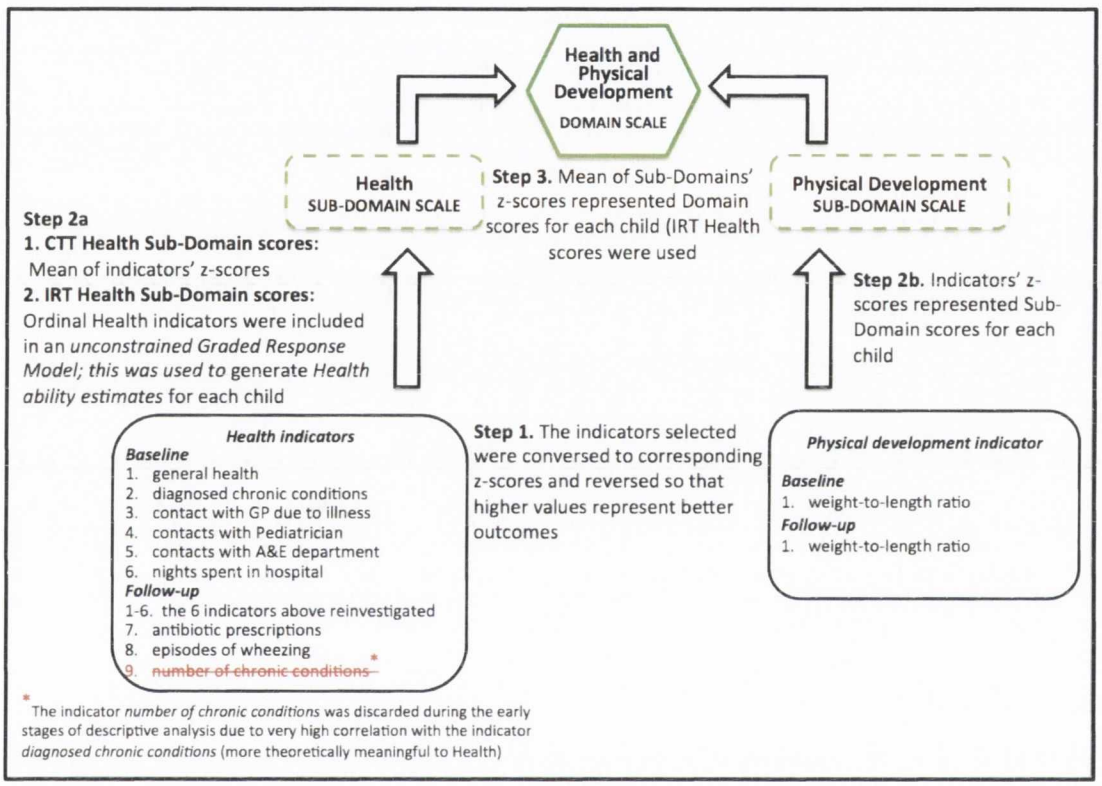

Figure 5.18 Health and Physical Development Domain

(schematic representation of the scale development process including particular steps and sub-steps used to generate Sub-Domain scores)

The Health and Physical Development Scale was presented in an *interval* (standardized to Mean=100 and SD=10) and an *ordinal version* which was used to categorize children as: Very good (equal or above the 85th percentile), Good (between 15th and 85th percentile), Poor (above 5th and lower or equal to 5th percentile) and Very poor (lower or equal to the 5th percentile) Health and Physical Development.

Chapter 6 The Socio-emotional Domain Scales

6.1 Background

This chapter presents the development process and results for the Socio-Emotional Domain Scales for 9 month-old children (baseline) and follow-up at 3 years. These were constructed on two sub-domains (Figure 6.1): 1. Social and 2. Emotional. The two Social indicators at baseline were: Communication and Personal/social ability scores. The Social Sub-Domain at follow-up comprised of one indicator: Pro-social ability score. The Emotional Sub-Domain was represented by three indicators: Fussiness, Unadaptability and Unpredictability scores at baseline and by a single indicator, Psychological difficulties score at follow-up.

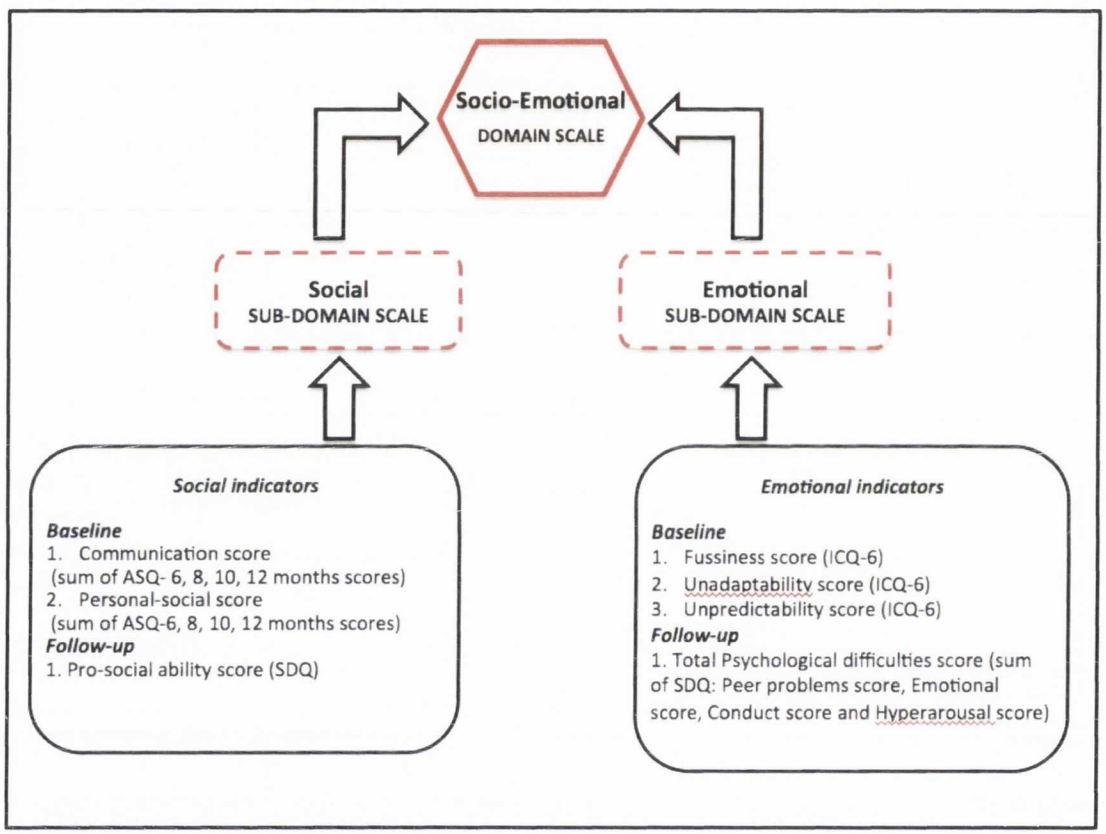

Figure 6.1 Socio-Emotional Domain: from indicators to Sub-Domains and Domain Scales (baseline and follow-up)

The development process of the Socio-emotional Domain Scale was straightforward. All indicators were continuous variables representing individual scores and Classical Test Theory methods were used. All Emotional indicators represented negative traits of the child and these were reversed before constructing the corresponding Sub-Domain Scales. The methods used are presented below.

6.2 Methods

6.2.1 Participants and exclusions

The Social-emotional scale was constructed for a total of N=10,751 participants at baseline and N=9,785 participants at follow-up. Table 6.1 presents the total number of participants with missing data for each one of the Social and Emotional indicators selected for baseline and follow-up.

Table 6:1 Missing Socio-Emotional indicators

Socio-Emotional domain indicators	Participants at baseline (9 months) N= 11,134 (100%)	Participants at follow-up (3 years) N= 9,793 (100%)
Social		
1. Communication ability	121(1%)	
2. Personal/social ability	227(2%)	
3. Pro-social behaviour score		8(0.1%)
Emotional		
1. Fussy/difficult	32(0.3%)	
2. Unadaptable	31(0.3%)	
3. Unpredictable	10(0.1%)	
4. Total psychological difficulties		8(0.1%)

6.2.2 Procedure and Statistical analysis

First, the **reliability** of Social and Emotional Sub-Domains for baseline was verified by examining *inter-indicators correlations*, in conjunction with the total and *partial Cronbach's alphas* for each Sub-Domain Scale. Inter-indicator correlations with a Pearson correlation coefficient of 0.20-0.40 were desired. The follow-up Social and Emotional Sub-Domains comprised of single indicators and estimating internal consistency was not necessary.

Next **Step 1, Step 2 and Step 3** described in detail in Chapter 3 were employed to generate the baseline and follow-up Socio-Emotional Domain Scales.

Step 1- Standardizing Social and Emotional Sub-Domains indicators

All Social and Emotional indicators were transformed to corresponding z-scores. Baseline and follow-up Emotional indicators z-scores were reversed (by multiplying them by -1) so that higher values represent better outcomes.

Step 2- Calculating Social and Emotional Sub-Domain scores

At baseline, Social and Emotional Sub-Domain scores were generated as the average of corresponding indicator z-scores. Given that at follow-up both the Social and Emotional Sub-Domain were represented by single indicators, no calculations were necessary. The sub-domain scores were represented by z-scores of the corresponding indicators.

Step 3- Calculating Socio-Emotional Domain scores

The Socio-Emotional Domain Scale was generated as the average of the Social Sub-Domain z-scores and Emotional Sub-Domain z-scores. The Socio-Emotional Domain Scale was then standardized to mean 100 and standard deviation 10.

The statistical analysis to estimate reliability and develop the Sub-Domains and Domains Scales was carried out in R and similar functions as those employed for Health and Physical Development Domain (CTT Health Sub-Domain approach) were used.

6.3 Results

6.3.1 Descriptive statistics

Table 6.2 displays the descriptive statistics for all Socio-Emotional Domain indicators. As the Emotional Sub-Domain indicator at follow-up (Total Psychological Difficulties score) was derived by the GUI team from four SDQ dimensions scores, descriptive statistics for these are also included in the table for completeness.

Table 6:2 Descriptive statistics for the Socio-Emotional Domain indicators (baseline and follow-up)

Socio-Emotional indicators at baseline (N=10,751)	**Mean (SD)/ Median (IQR)**
Social sub-domain	
Communication ability	185.32(31.44)
Personal/social ability	187.74(32.52)
Emotional sub-domain	
Fussy/difficult	14(11-18)
Unadaptable	8(6-11)
Unpredictable	6(4-8)
Socio-emotional indicators at follow-up (N=9,785)	**Median (IQR)**
Social sub-domain	
Pro-social behaviours	8 (7-9)
Emotional sub-domain	
Psychological difficulties	7(4-10)
1. Peer-problem score	1(0-2)
2. Emotional score	1(0-2)
3. Conduct score	2(1-3)
4. Hyperactivity score	3(1-4)

Next, baseline Social and Emotional indicators are displayed (Figure 6.2 and 6.3) in their initial form (before z-score transformation). At follow-up, each Sub-Domain was represented by a single indicator and indicators' z-scores were taken as Sub-Domain scores. The follow-up indicators' distribution is consistent with that of the Sub-Domain Scales and this will be presented in the next section.

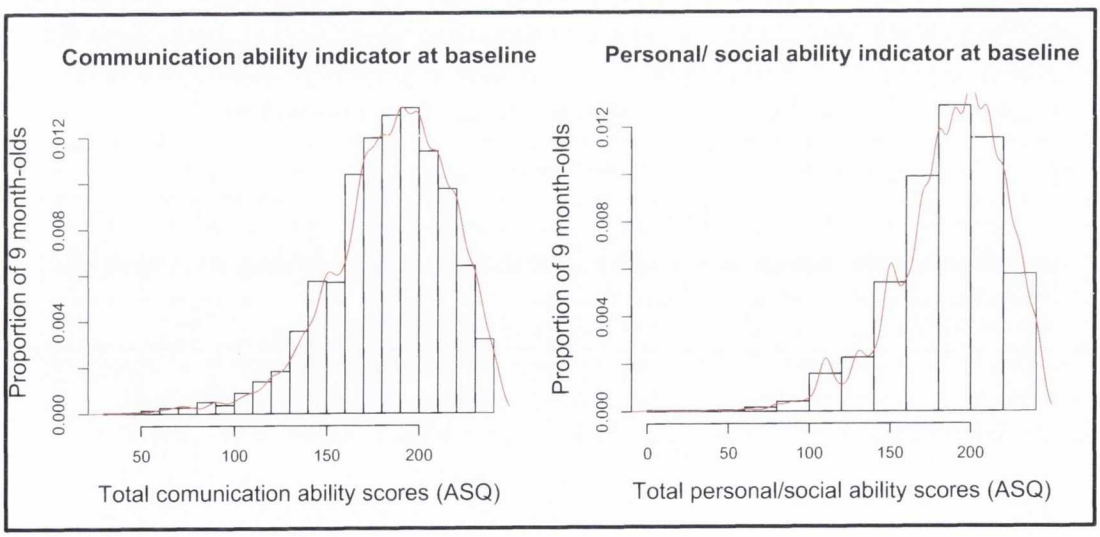

Figure 6.2 Distribution of Social Sub-Domain indicators at baseline

(for each indicator child scores were derived by adding results from 4 age-tailored version (6, 8, 10, 12 months) of the corresponding ASQ sub-scale. Indicator generation process was described in detail in Chapter 3. For each one of the two indicators derived higher scores represented better outcomes)

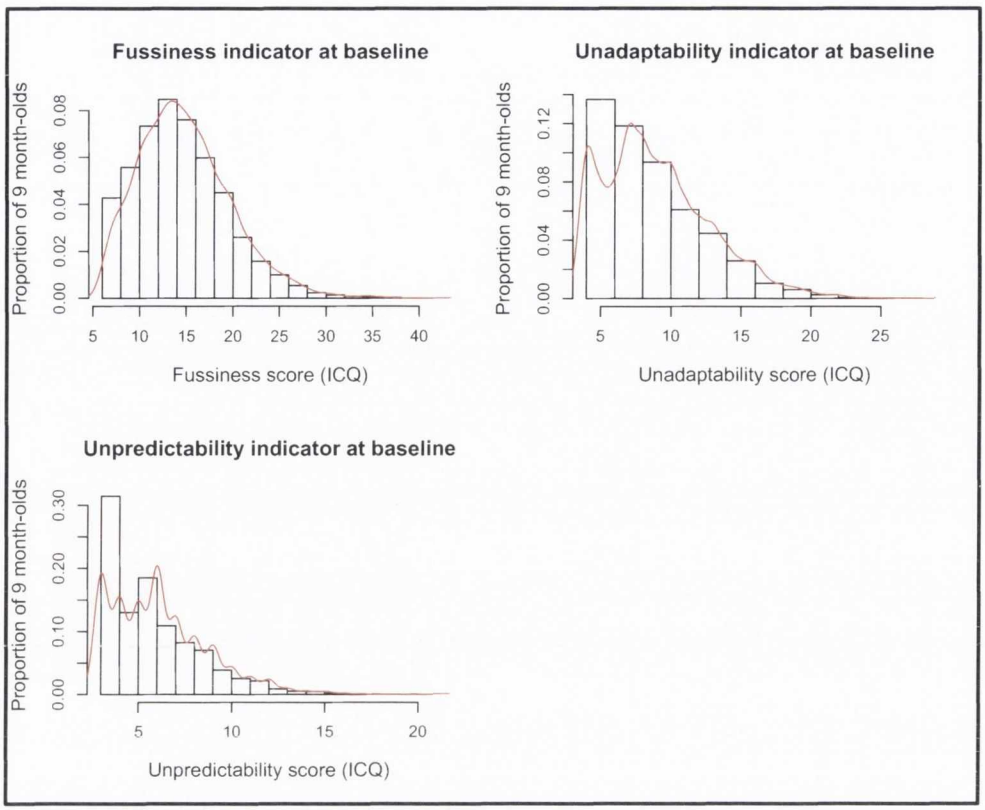

Figure 6.3 Distribution of Emotional Sub-Domain indicators at baseline

(for each one of the three indicators, child scores mirrored results from the corresponding ICQ-6 sub-scales. These were described in detail in Chapter 3. For each one of the three indicators higher scores represented worse outcomes- more difficult temperament).

6.3.2 Reliability estimates

The **inter-indicator correlations** for the Social and Emotional Sub-Domain at baseline are displayed in Table 6.3. The Pearson's correlation coefficient between the two indicators forming the Social Sub-Domain was slightly higher than desired (r=0.44). A similar result (r=0.42) was observed for two of the indicators (1. Fussy and 2. Unadaptable scores) representing the Emotional Sub-Domain. The **total Cronbach's alpha** was 0.61 (CI: 0.58-0.64) for the Social Sub-Domain Scale and 0.58 (CI: 0.56-0.6) for the Emotional Sub-Domain Scale. The relatively low total Cronbach's alpha observed for both Sub-Domains could be explained by the fact that they are constructed on a reduced number of items or indicators (2 for Social respectively 3 for the Emotional Sub-Domain)[h]. The **partial Cronbach's alphas** for the Social and Emotional Sub-Domain Scales at baseline are presented in Table 6.4.

[h] A Scale Cronbach's alpha is dependent on the number of scale items and magnitude of inter-item correlations[51].

Table 6:3 Inter-indicator correlations for the Social and Emotional Sub-Domains at baseline

	Baseline Social indicators	S1	S2	
Social Sub-Domain	S1.Communication ability score	-		
	S2.Personal/social ability score	**0.44**	-	
	Baseline Emotional indicators	E1	E2	E3
Emotional Sub-Domain	E1. Fussy/difficult score	-		
	E2. Unadaptable score	**0.42**	-	
	E3. Unpredictable score	0.37	0.2	-

Table 6:4 Total and partial Cronbach's alphas for the Social and Emotional Sub-Domains at baseline

Social Sub-Domain	**Baseline Social indicators**
All indicators included	0.61
Partial Cronbach's alpha	
Excluding Communication ability score	0.44
Excluding Personal/social ability score	0.44
Emotional Sub-Domain	**Baseline Emotional indicators**
All indicators included	0.58
Partial Cronbach's alpha	
Excluding Fussy/ difficult score	0.32
Excluding Unadaptable score	0.52
Excluding Unpredictable score	0.53

Observing some inter-indicator correlations outside the desired interval and relatively low total Cronbach's alphas (a value of 0.70 was desired, 0.55 was considered acceptable) for each sub-domain is not ideal. However, the two standardized instruments used (ASQ and ICQ) were the most theoretically meaningful measures of child's social and emotional capacities available with the GUI baseline data. Therefore, all baseline indicators were retained and included in the Sub-Domain score calculation process.

Reliability estimates for the Social and Emotional Sub-Domains at follow-up were not calculated, as each Sub-Domain comprised of a single indicator. For completeness, given that the Emotional indicator at follow-up was derived from four separate dimensions of the SDQ, Pearson's correlation coefficients between these were examined and are shown in Table 6.5. Observing correlations within the desired interval (Pearson's correlation coefficient: 0.20-0.40) between the four dimensions forming the follow-up Emotional Sub-Domain indicator/score confirmed that these dimensions measured different aspects of the same trait with no redundancies.

Table 6:5 Correlations between scores from the four SDQ dimensions used by the GUI team to calculate Total psychological difficulties score (follow-up Emotional Sub-Domain indicators)

Emotional Sub-Domain at follow-up	Total psychological difficulties score	1	2	3
Individual component scores of the Total psychological difficulties score	1. Peer problems score	-		
	2. Emotional score	0.26	-	
	3. Conduct score	0.22	0.25	-
	4. Hyperarousal score	0.23	0.19	0.42

6.3.3 Sub-Domain Scales

Baseline and follow-up children's Social and Emotional Sub-Domain scores formed corresponding scales. The four Sub-Domain Scales (two for baseline and two for follow-up) after standardization (Mean=0 and SD=1) are shown in Figures 6.4-6.7

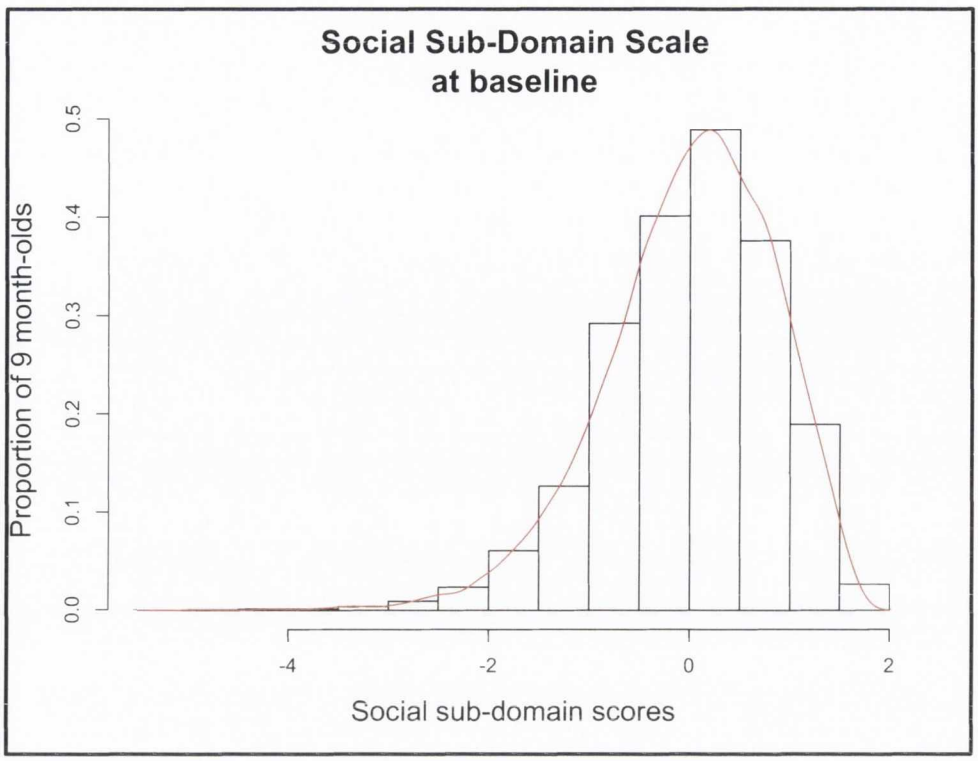

Figure 6.4 Baseline Social Sub-Domain Scale

(the bell-shaped density curve observed suggests that children scores across the scale are normally distributed)

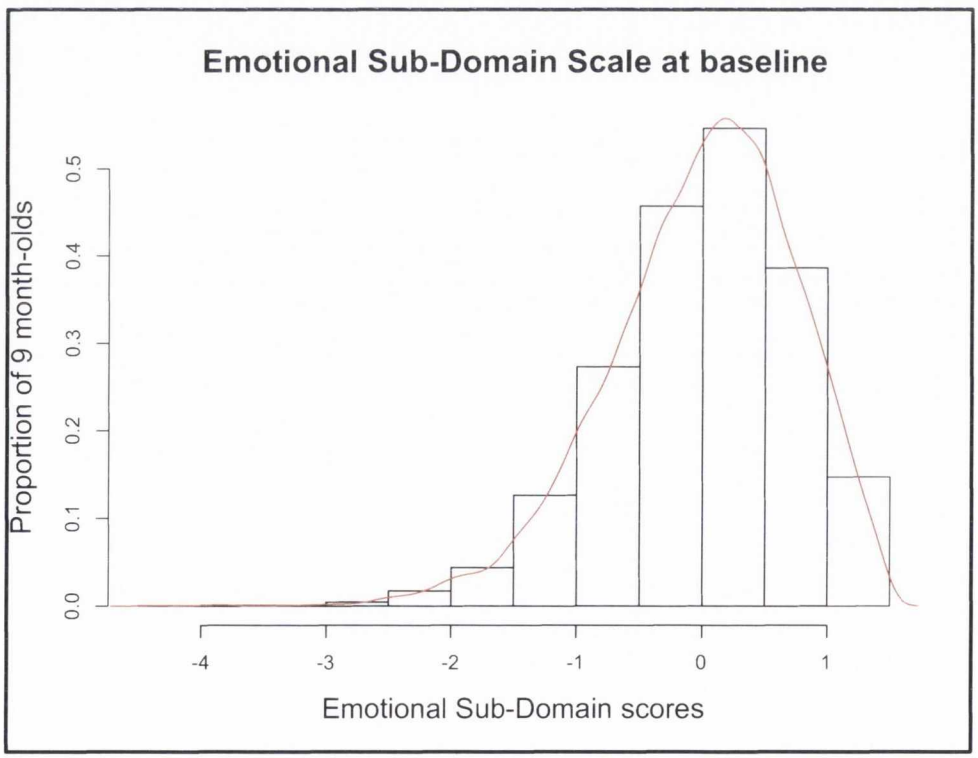

Figure 6.5 Baseline Emotional Sub-Domain Scale

(the bell-shaped density curve observed suggests that children scores across the scale are normally distributed)

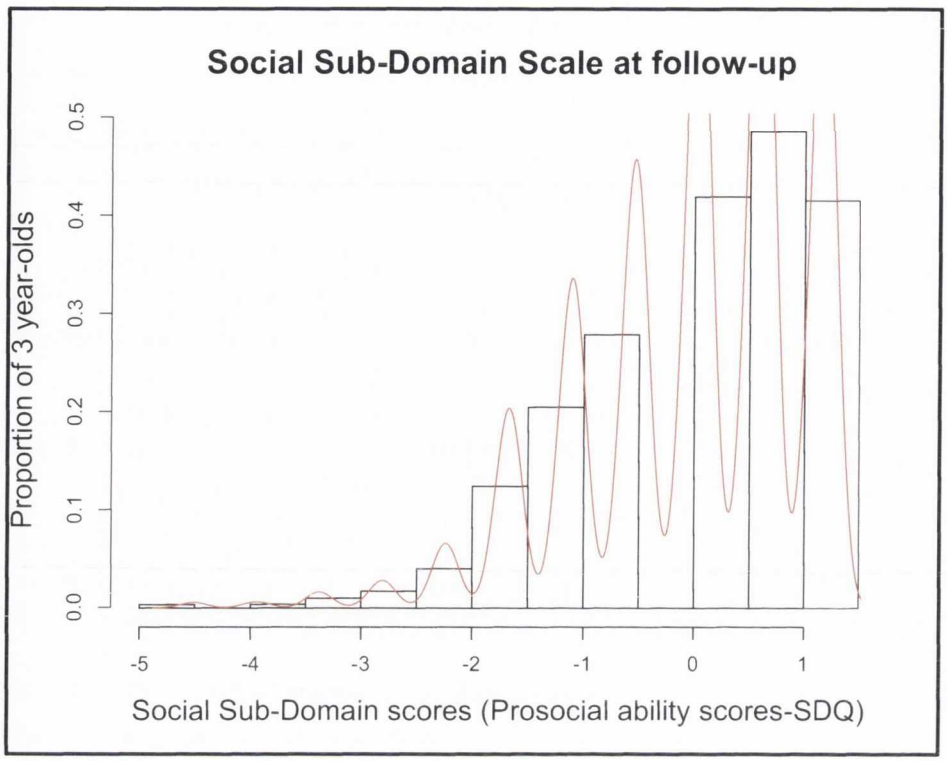

Figure 6.6 Follow-up Social Sub-Domain Scale

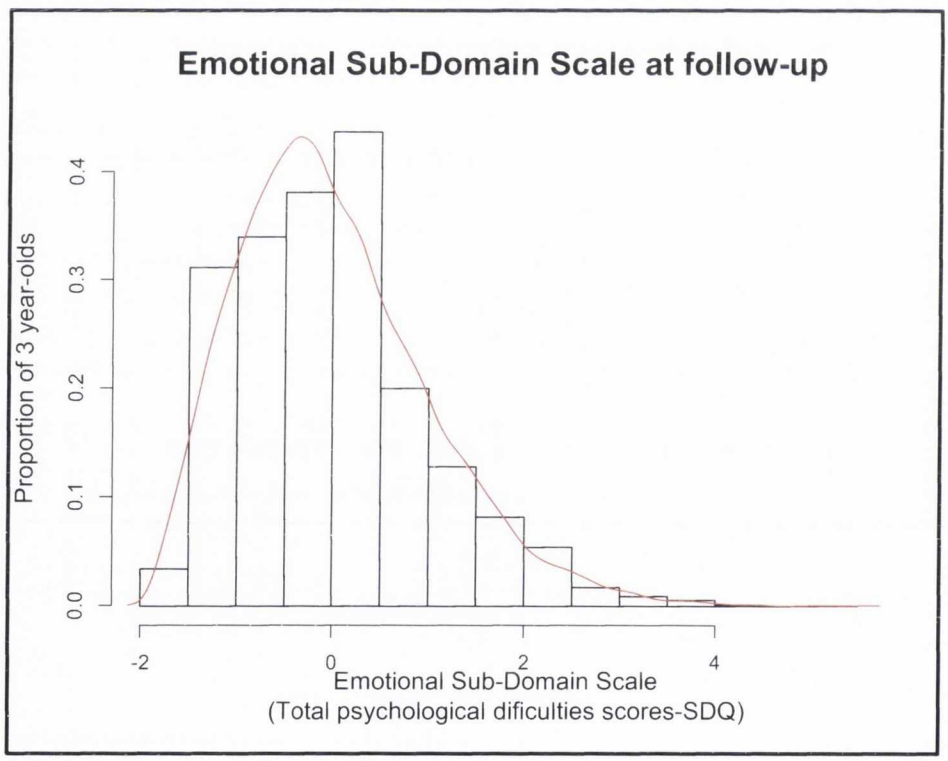

Figure 6.7 Follow-up Emotional Sub-Domain Scale

6.3.4 Domain Scales

The distribution of children scores on the baseline and follow-up Socio-Emotional Domain Scales (interval version) after standardization (Mean=100 and SD=10) is presented below (Figures 6.8 and 6.9).
Finally, distribution of children across the ordinal version of the baseline and follow-up Socio-Emotional Domain Scales are shown in Figures 6.10 and 6.11.

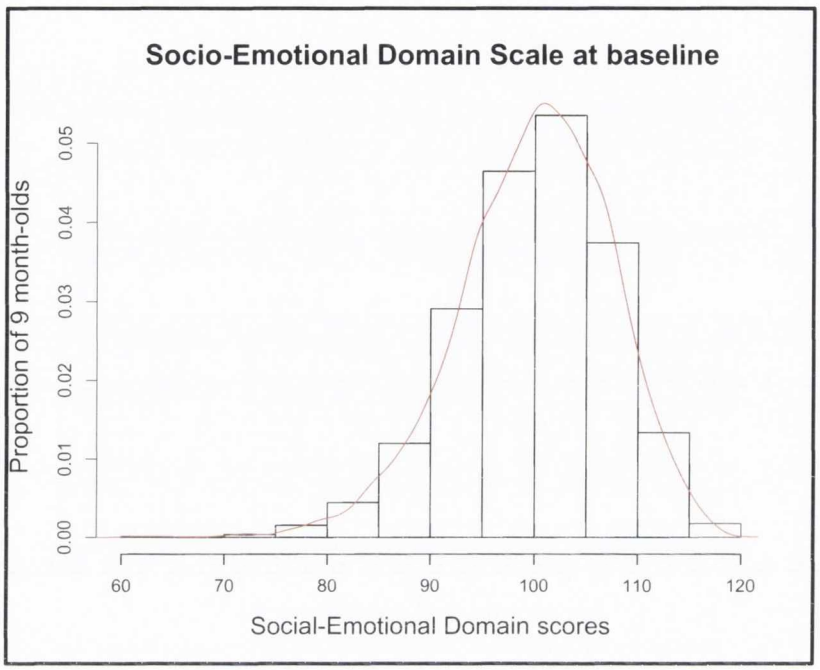

Figure 6.8 Baseline Socio-Emotional Domain Scale interval version

(scores were standardized to Mean=100, SD=10)

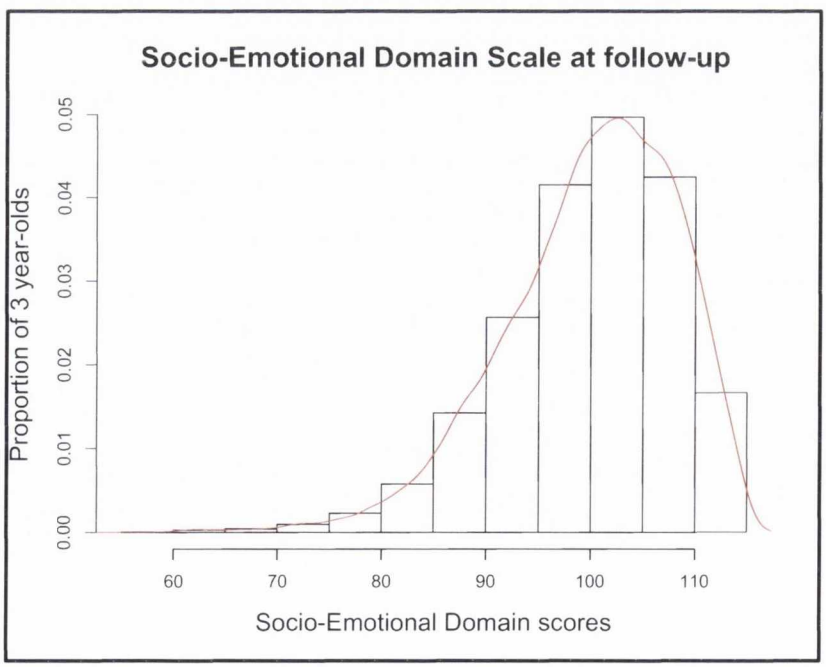

Figure 6.9 Follow-up Socio-Emotional Domain Scale interval version

(scores were standardized to Mean=100, SD=10)

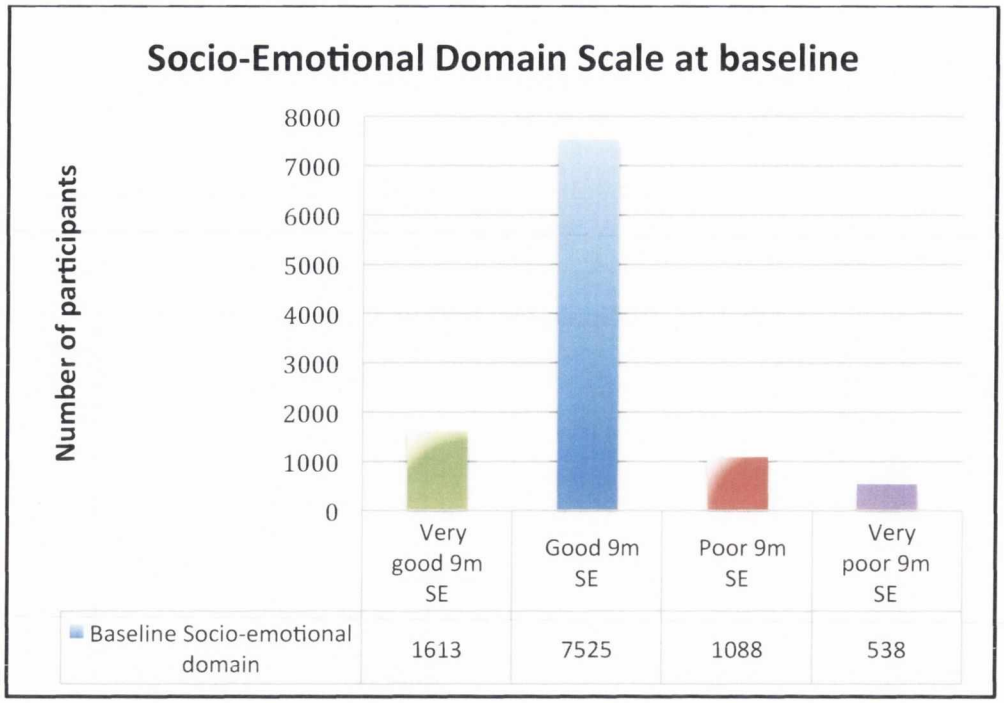

Figure 6.10 Baseline Socio-Emotional Domain Scale ordinal version

(Very good- equal or above the 85th percentile, Good- between 15th and 85th percentile, Poor- above 5th and lower or equal to 15th percentile, Very poor- lower or equal to the 5th percentile)

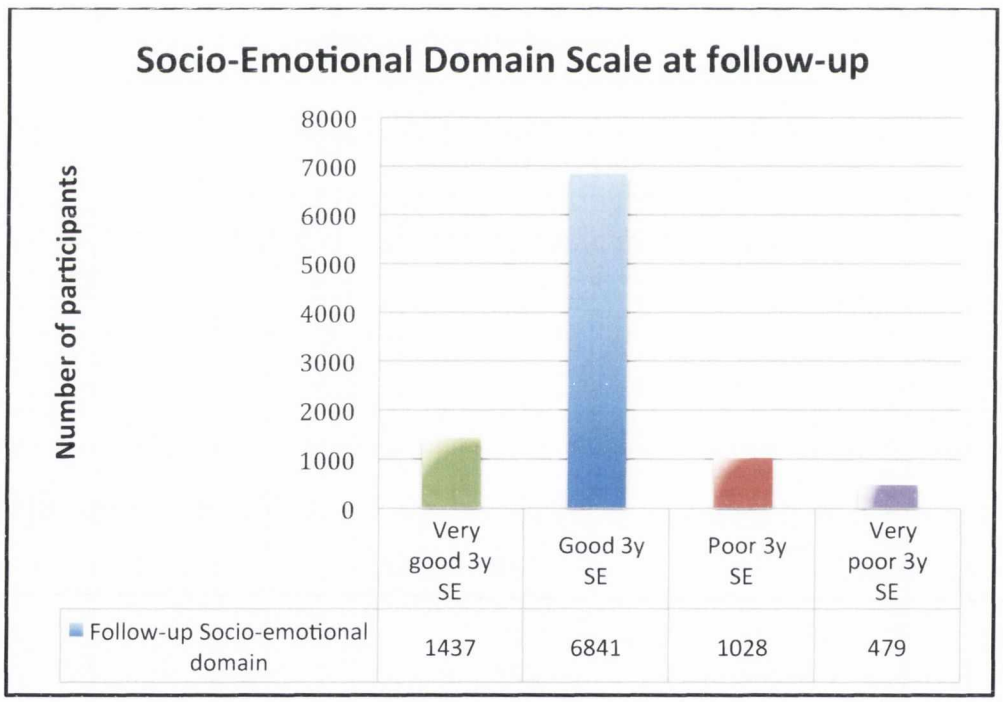

Figure 6.11 Follow-up Socio-Emotional Domain Scale ordinal version

(Very good- equal or above the 85th percentile, Good- between 15th and 85th percentile, Poor- above 5th and lower or equal to 15th percentile, Very poor- lower or equal to the 5th percentile)

6.4 Summary

Developing the baseline and follow-up Socio-Emotional Domain Scale was straightforward as indicators from each sub-domain were continuous in nature and were represented by child scores resulted from the application of standardized tests. The baseline Sub-Domain Scales were developed using Classical Test Theory methods and three steps employed were: Step 1. Indicator z-score transformation, Step 2. Sub-Domain scores generation (as mean of indicators z-scores) and Step 3. Domain scores calculation as mean of Sub-Domain z-scores. Both follow-up Sub-Domains were represented by single indicators and the Sub-Domain scores were equal to the indicator's z-scores. The development process for the Socio-Emotional Domain Scale is presented schematically in Figure 6.12.

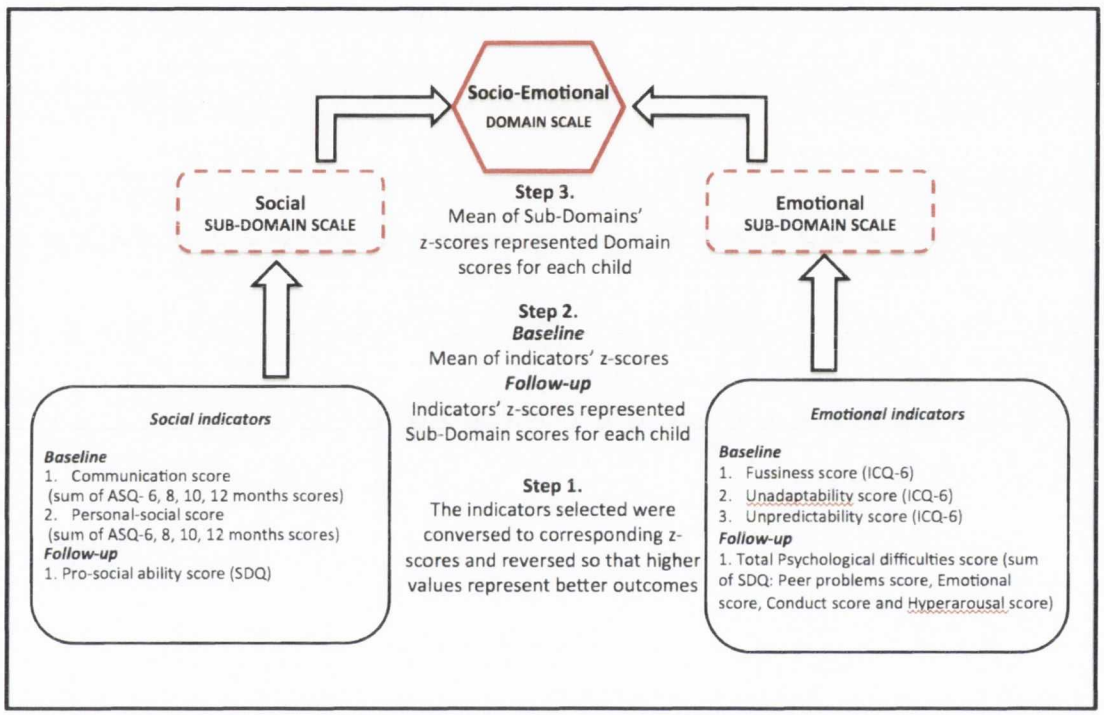

Figure 6.12 Socio-Emotional Domain

(schematic representation of the scale development process including particular steps and sub-steps used to generate Sub-Domain scores)

All Sub-Domain and Domain scales were originally of interval type, and most of them (except follow-up Social Sub-Domain Scale) had close to normal distributions. **The Socio-Emotional Domain Scale** was presented in an *interval* (standardized to Mean=100 and SD=10) an *ordinal version* which was used to categorize children as: Very good (equal or above the 85th percentile), Good (between 15th and 85th percentile), Poor (above 5th and lower or equal to 5th percentile) and Very poor (lower or equal to the 5th percentile) Socio-Emotional functional status.

Chapter 7 The Cognitive-motor Domain Scales

7.1 Background

This chapter presents the development and results for the Cognitive-Motor Domain Scales for 9 month-old children (baseline) and follow-up at 3 years. These were constructed on two sub-domains (Figure 7.1): 1. Cognitive and 2. Motor Sub-Domain. The single Cognitive indicator at baseline was Problem-solving ability (ASQ). Non-verbal and Verbal ability (BAS) were used as Cognitive indicators at follow-up. The Motor Sub-Domain was represented by the Fine and Gross motor ability indicators derived from the ASQ at baseline and interviewer task performance assessment at follow-up.

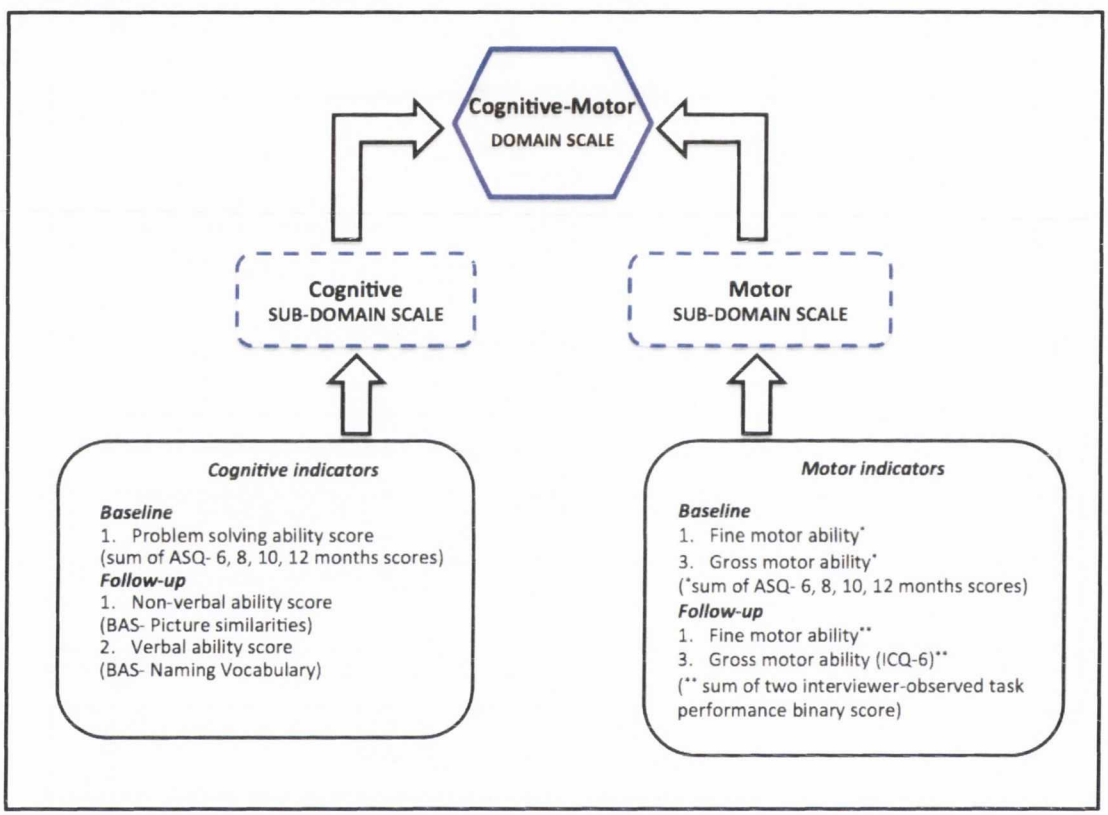

Figure 7.1 Cognitive-Motor Domain: from indicators to Sub-Domains and Domain Scales (baseline and follow-up)

The development process of the Cognitive-motor Domain Scale was straightforward. Most indicators (except those for the Motors Sub-Domain at follow-up) were continuous variables representing individual scores. The follow-up Motor indicators were ordinal variables. The methods used are presented below.

7.2 Methods

7.2.1 Participants and exclusions

The Cognitive-motor scale was developed for a total of N= 10,134 participants at baseline (9 months) and N=9,046 participants at follow-up (3 years). Table 7.1 presents the total number of participants with missing data on each of the Cognitive-motor indicators selected for baseline and follow-up.

Table 7:1 Missing Cognitive-Motor indicators

Cognitive-Motor Domain indicators	Participants at baseline (9 months) N= 11,134 (100%)	Participants at follow-up (3 years) N= 9,793 (100%)
Cognitive		
1. Problem solving ability	815(7%)	
2. Non-verbal ability		244(2%)
3. Verbal ability		614(6%)
Motor sub-domain		
1. Fine motor ability	71(0.64%)	63(0.64%)
2. Gross motor ability	449(4%)	113(1%)

7.2.2 Procedure and statistical analysis

First, the **internal consistency** of the baseline Motor and the follow-up Cognitive and Motor Sub-Domain Scales was verified by examining inter-indicators correlations, in conjunction with the total and partial Cronbach's alphas for the Sub-Domain Scales. As before, inter-indicator correlations with a Pearson correlation coefficient of 0.20-0.40 were desired. Similarly, for the total Cronbach's alpha a value of 0.70 was the desired standard (however, value of 0.55 or above was considered acceptable). The baseline Cognitive Sub-Domain Scale comprised of a single indicator and estimating internal consistency was not necessary.

Next **Step 1, Step 2 and Step 3** described in Chapter 3 were employed to generate the baseline and follow-up Cognitive-Motor Domain scores.

Step 1- Standardizing Cognitive and Motor Sub-Domains indicators

All Cognitive and Motor indicators were transformed to corresponding z-scores. Higher values on all indicators represented better outcomes. Therefore, no inversions (multiplications by -1) were needed.

Step 2- Calculating Cognitive and Motor Sub-Domain scores

At baseline, Motor Sub-Domain scores were generated as the average of corresponding indicators z-scores. Given that baseline Cognitive Sub-Domain was represented by a single indicator no calculations were necessary, and the Sub-Domain scores were represented by the corresponding indicator z-scores. At follow-up, The Cognitive and Motor Sub-Domain scores were generated in a similar way as the baseline Motor Sub-Domain scores (i.e. average of corresponding indicator z-scores).

Step 3- Calculating Cognitive-Motor Domain scores

The Cognitive-Motor Domain Scale was generated as the average of the Cognitive sub-domain z-scores and Motor sub-domain z-scores. The Cognitive-motor scale was then standardized to a mean 100 and standard deviation 10.

Similar to previous domains, the statistical analysis used to estimate reliability and develop the Sub-Domains and Domains Scales was carried out in R and similar functions as those employed for Health and Physical Development Domain (CTT Health Sub-Domain approach) were used.

7.3 Results

7.3.1 Descriptive statistics

Table 7.2 displays the descriptive statistics for all Cognitive-motor domain indicators.

Table 7:2 Descriptive statistics for the Cognitive-Motor Domain indicators (baseline and follow-up)

Cognitive-motor indicators at baseline (N=10,134)	**Mean (SD)**
Cognitive sub-domain	
Problem solving ability	189.98(34.36)
Motor sub-domain	
Fine motor	208.54(31.87)
Gross motor	151.92(49)
Cognitive-motor indicators at follow-up (N=9,046)	**Mean (SD)/ Median (IQR)**
Cognitive development sub-domain	
Non-verbal ability	60.96(14.23)
Verbal ability	74.87(19.83)
Motor sub-domain	
Fine motor indicator	2(1:2)
Gross motor indicator	2(2:2)

All Cognitive and Motor indicators (except *Problem solving ability*) are displayed below in their initial form, before z-score transformation (Figure 7.2- 7.4). The *Problem solving ability* was the only indicator for the baseline Cognitive Sub-Domain. Therefore, its distribution was identical with that of the Cognitive Sub-Domain Scale (Figure 7.5 shows Problem solving ability indicator z-scores taken as Sub-Domain scores).

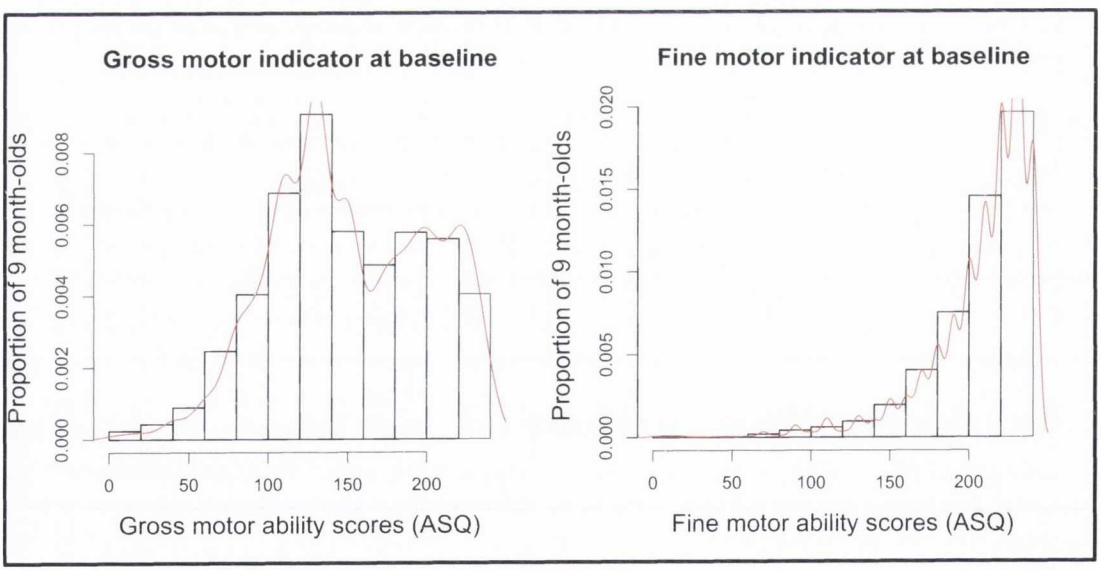

Figure 7.2 Baseline Gross and Fine motor indicators

(for each indicator child scores were derived by adding results from 4 age-tailored version (6, 8, 10, 12 months) of the corresponding ASQ sub-scale. Indicator generation process was described in detail in Chapter 3-higher scores represented better outcomes)

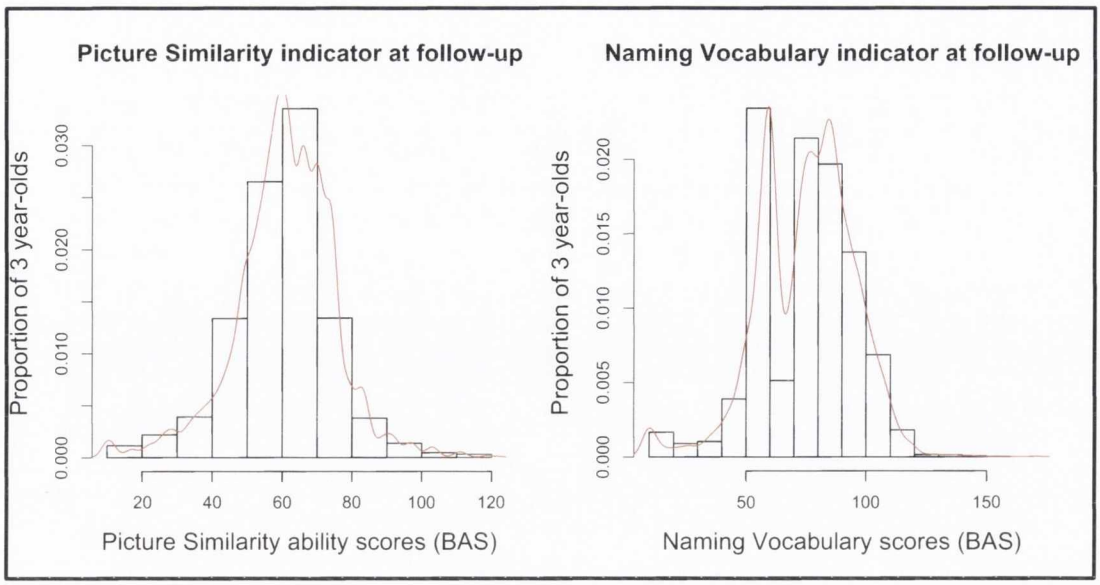

Figure 7.3 Follow-up Non-verbal and Verbal ability indicators

(child scores were derived by the GUI from the BAS standardized instrument)

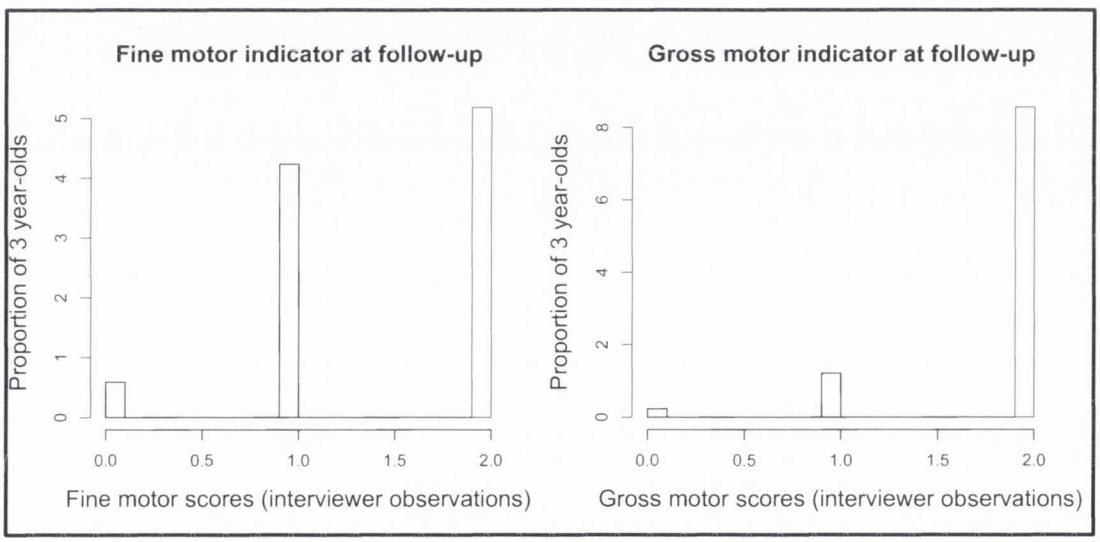

Figure 7.4 Follow-up Fine and Gross motor indicators

(child scores were calculated as sum of results from interviewer-observed task performance. A score of 2 on the fine motor indicator means that the child was able to copy a vertical line drawn by the mother and to hold a pencil in pincer grip; a score of 1 indicates that the child performed one of the two tasks successfully, while 0 indicates that the child was unable to perform any of the two tasks (less than 10% of the total number of children. Similarly, a score of 2 on the gross motor indicator means that the child was able to throw a ball over the head and stand in one leg; a score of 1 indicates successful performance of only one of the two tasks while a score of 0 indicates that none of the two tasks were performed as required)

7.3.2 Reliability estimates

Reliability estimates for the Cognitive sub-domain at baseline were not calculated, as this sub-domain comprised of a single indicator. The **inter-indicator correlation** between Fine and Gross motor baseline indicators was 0.27. This Pearson's correlation coefficient obtained was contained within the desired interval (0.20-0.40). The corresponding **total Cronbach's alpha**

for the baseline Motor sub-domain was 0.4 (CI: 0.37-0.43). The **partial Cronbach's alphas** dropped to 0.27 when either of the two indicators was removed.

The **inter-indicator correlation** between Non-verbal and Verbal ability indicators at follow-up was 0.39. This Pearson's correlation coefficient obtained was contained within the desired interval (0.20-0.40). The corresponding **total Cronbach's alpha** for the follow-up Cognitive sub-domain was 0.55 (CI: 0.52-0.58). The **partial Cronbach's alphas** dropped to 0.40 when either of the two indicators was removed. The **inter-indicator correlation** between Fine and Gross indicators at follow-up was 0.19. The **total Cronbach's alpha** for the follow-up Motor sub-domain was 0.29 (CI: 0.26 -0.33). The **partial Cronbach's alphas** were 0.18 when either of the two indicators was removed. Using the decision sequence regarding retaining or discarding indicators[i] described in detail in Chapter 4 (page 56) it was decided to keep all initial indicators for baseline and follow-up.

7.3.3 Sub-Domain Scales

The distribution of children's scores across the Cognitive and Motor Sub-Domain Scales for each sample (baseline and follow-up) is presented in Figures 7.5-7.8. Close to normal distributions were observed for the baseline Motor and follow-up Cognitive Sub-Domain Scales. The follow-up Motor Sub-Domain Scale was negatively skewed with most children situated at the positive end of the spectrum. This was not surprising given the type of indicators used to construct the scale (three-level ordinal indicators).

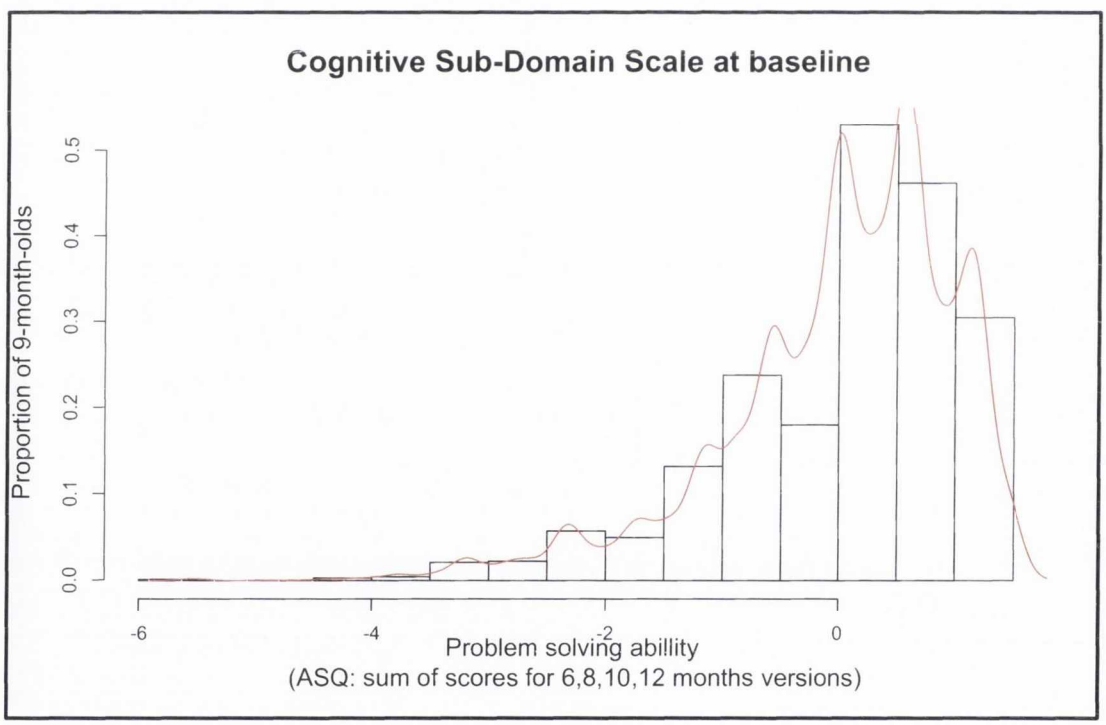

Figure 7.5 Cognitive Sub-Domain Scale at baseline

(child scores were derived by adding results from 4 age-tailored version (6, 8, 10, 12 months) of the "Problem solving ability" ASQ sub-scale- higher scores represented better outcomes)

[i] In brief if an indicator has a poor contribution to the scale (suggested by observing an increased Partial Chronbach's alpha when the respective indicator is removed) the theoretical importance of the indicator for the scale should be considered to help decide if the indicator should be discarded or retained.

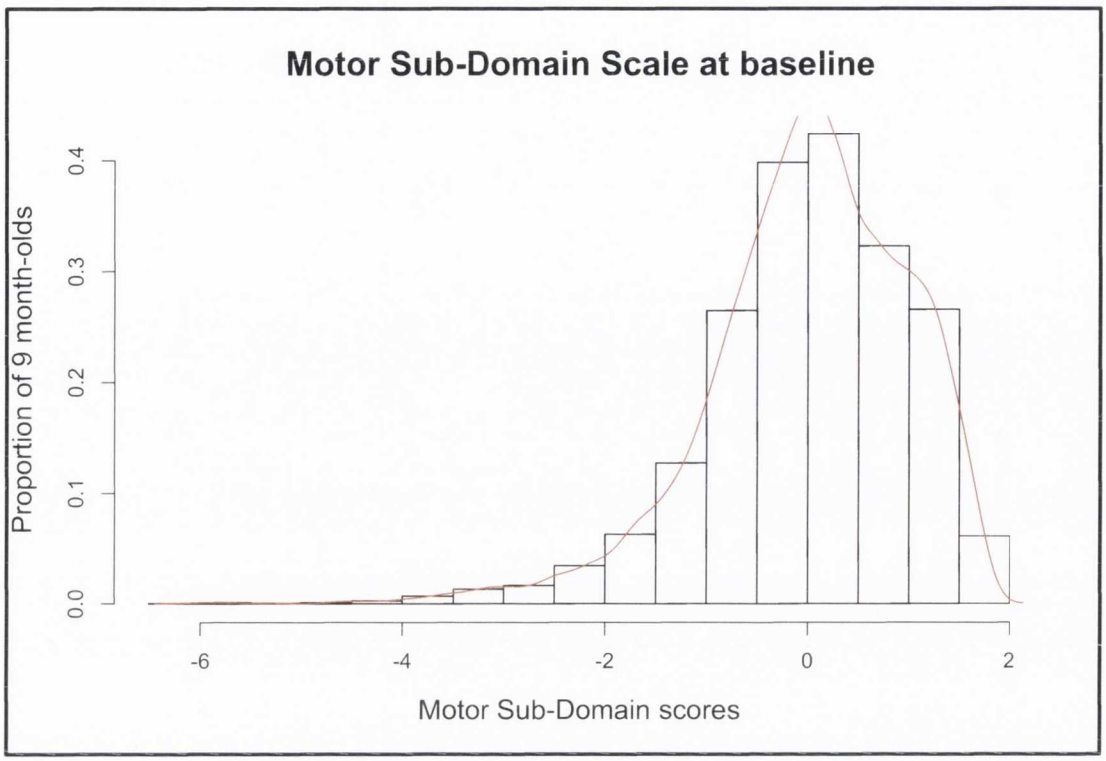

Figure 7.6 Motor Sub-Domain Scale at baseline

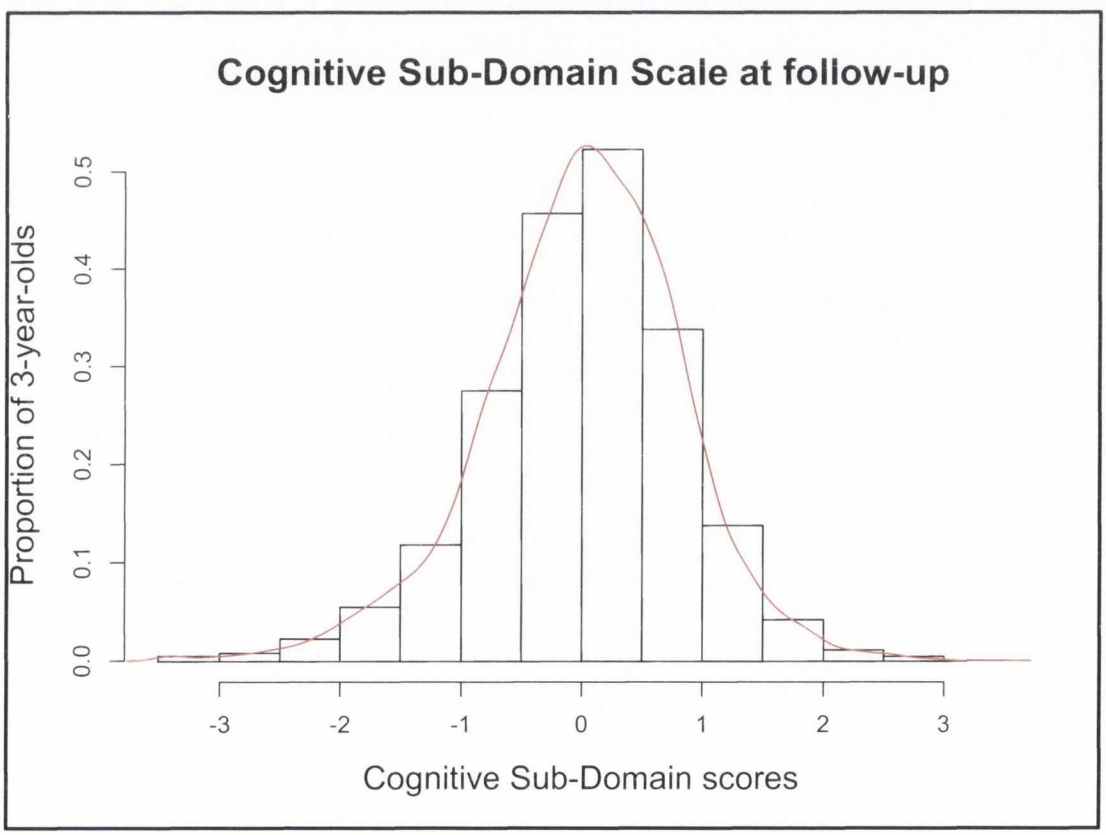

Figure 7.7 Cognitive Sub-Domain Scale at follow-up

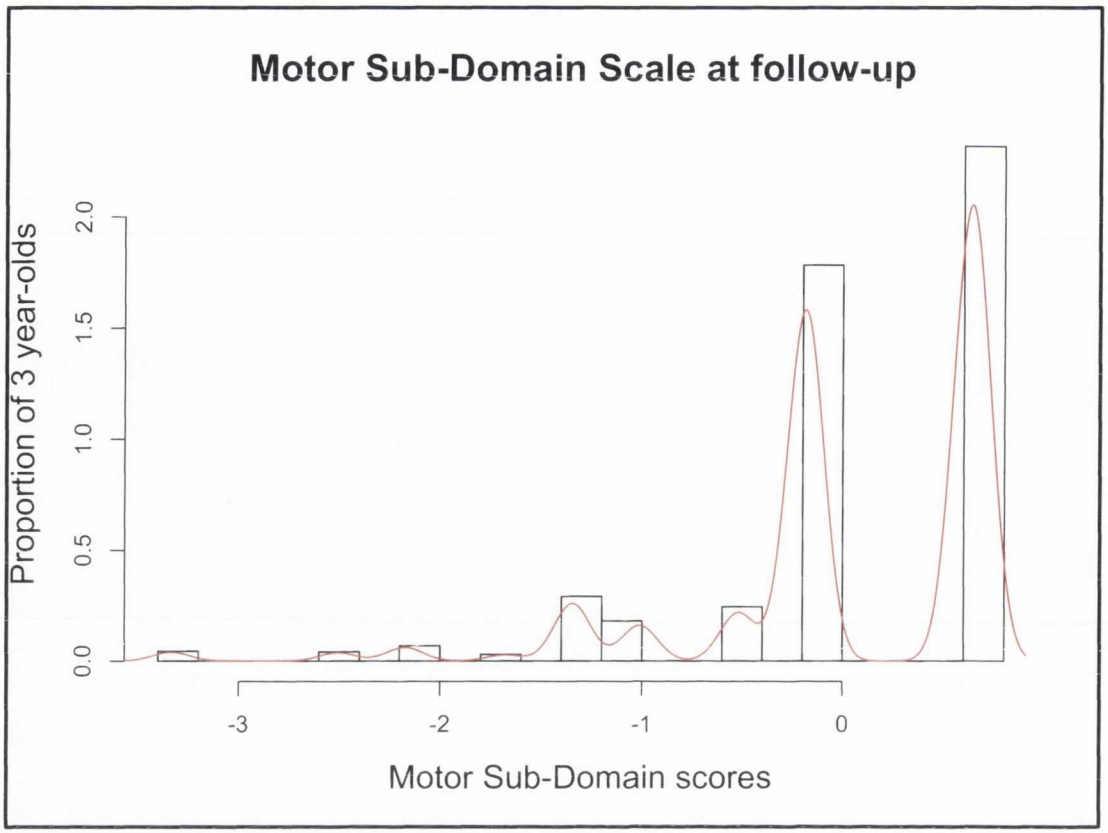

Figure 7.8 Motor Sub-Domain Scale at follow-up

7.3.4 Domain Scales

The distribution of children's scores across the interval version of the baseline and follow-up Cognitive-Motor Domain Scales after standardization (Mean=100 and SD=10) are presented in Figures 7.9 and 7.10. Finally, children's scores' distribution across the ordinal version of the Cognitive-Motor Domain Scale is illustrated in Figure 7.11 for baseline and Figure 7.12 for follow-up.

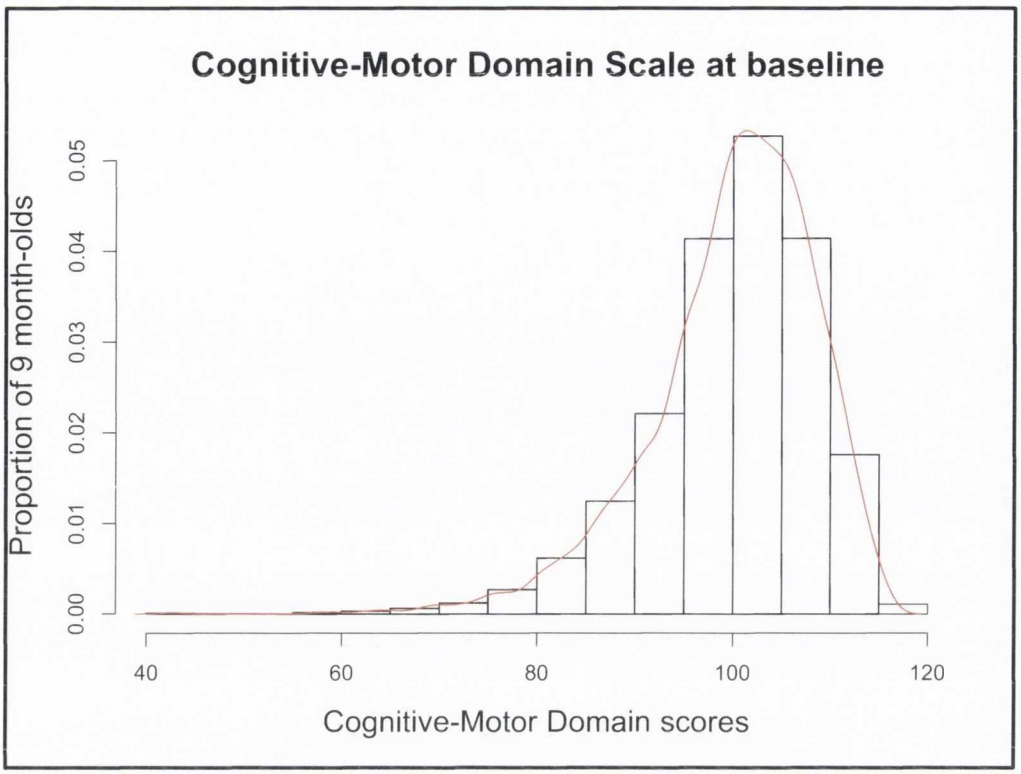

Figure 7.9 Baseline Cognitive-Motor Domain Scale interval version

(scores were standardized to Mean=100, SD=10)

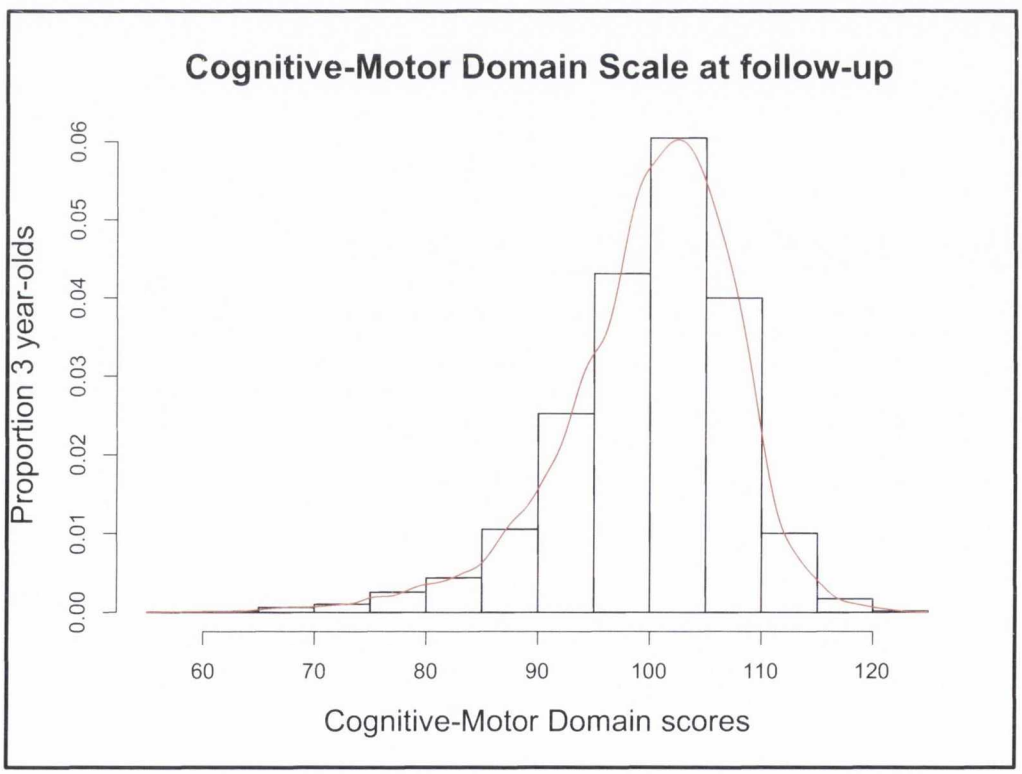

Figure 7.10 Follow-up Cognitive-Motor Domain Scale interval version

(scores were standardized to Mean=100, SD=10)

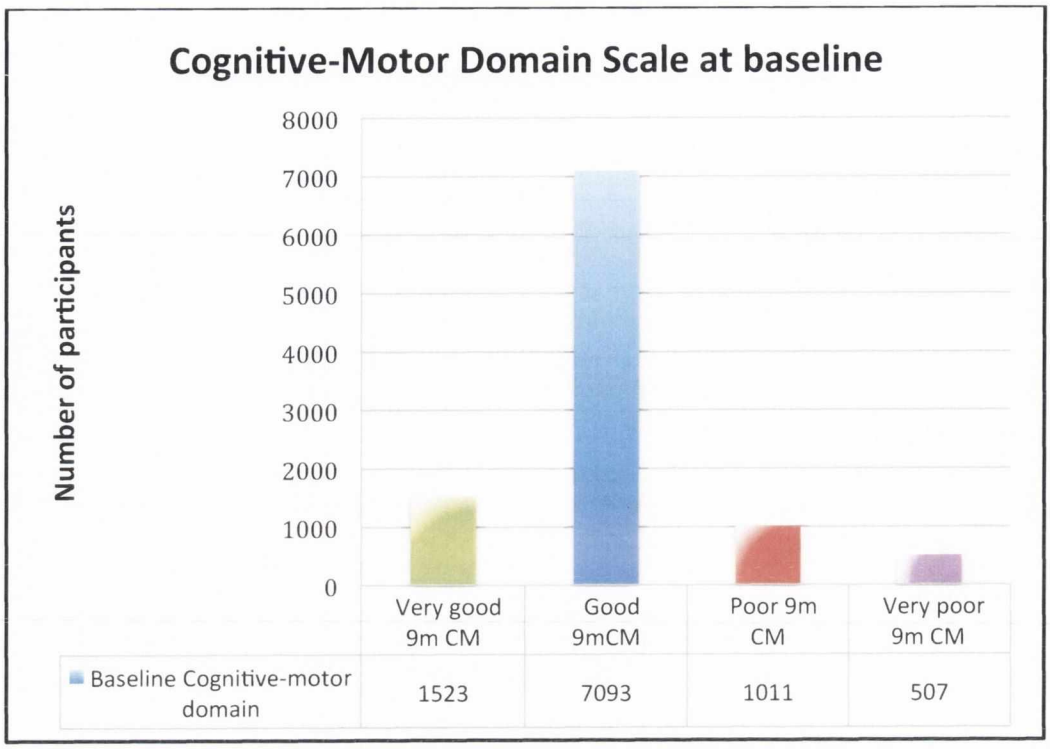

Figure 7.11 Baseline Cognitive-Motor Domain Scale ordinal version

(Very good- equal or above the 85th percentile, Good- between 15th and 85th percentile, Poor- above 5th and lower or equal to 15th percentile, Very poor- lower or equal to the 5th percentile)

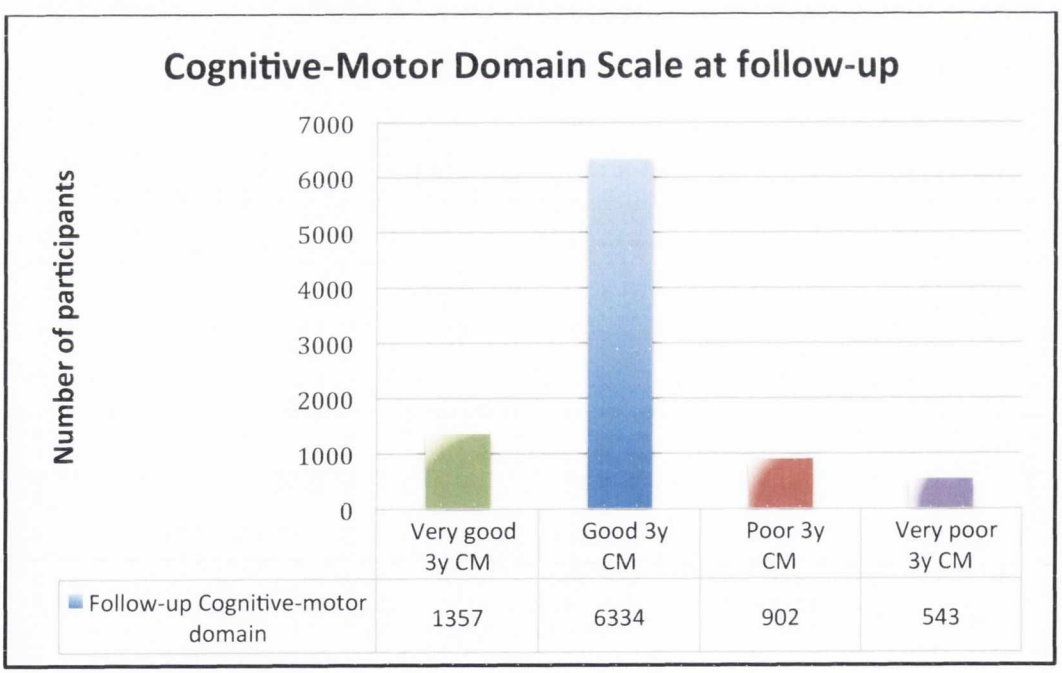

Figure 7.12 Follow-up Cognitive-Motor Domain Scale ordinal version

(Very good- equal or above the 85th percentile, Good- between 15th and 85th percentile, Poor- above 5th and lower or equal to 15th percentile, Very poor- lower or equal to the 5th percentile)

7.4 Summary

Developing the baseline and follow-up Cognitive-Motor Domain Scale was straightforward. Similar to the Socio-Emotional Domain, the indicators for the baseline Cognitive-Motor Domain and follow-up Cognitive Sub-Domain were continuous scores from standardized instruments resulting in interval-type scales. The follow-up Motor Sub-Domain Scale was constructed on three-level ordinal indicators resulting in an ordinal scale with a Poison-type distribution. The baseline Motor Sub-Domain and both follow-up Sub-Domain Scales were developed using Classical Test Theory methods. The three steps employed were: Step 1. Indicator z-score transformation, Step 2. Sub-Domain scores generation (as mean of indicators z-scores) and Step 3. Domain scores calculation as mean of Sub-Domain z-scores. The baseline Cognitive Sub-Domain was represented by a single indicator and the Sub-Domain scores were equal to the indicator's z-scores. The development process for the Cognitive-Motor Domain Scale is presented schematically in Figure 7.14.

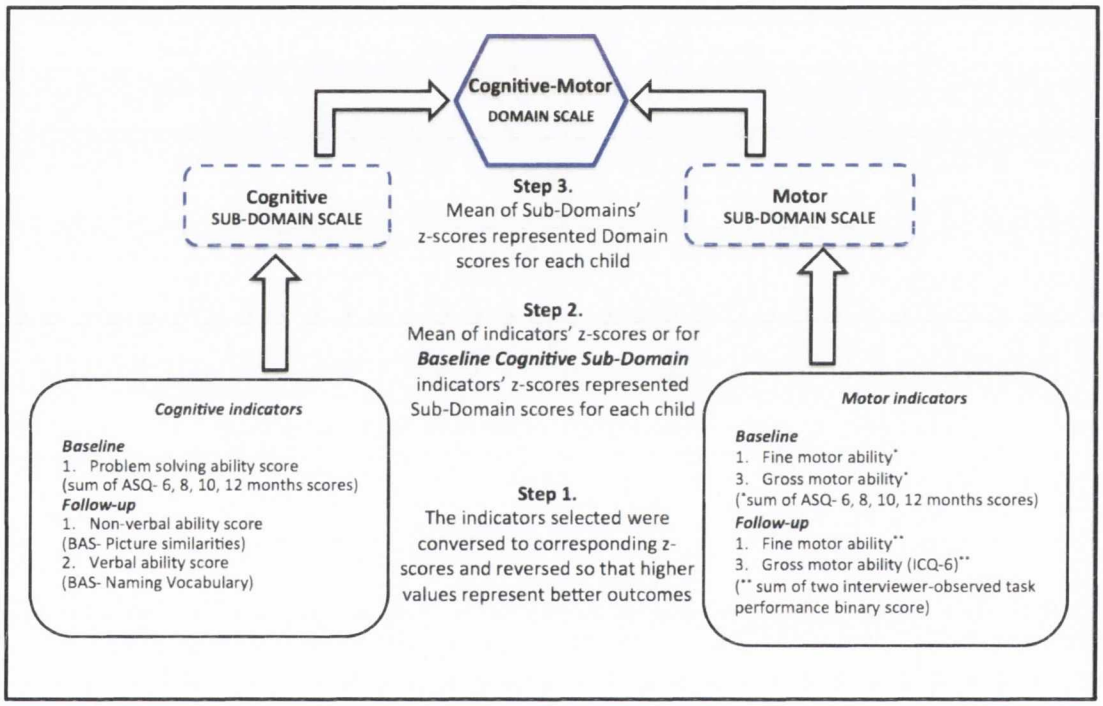

Figure 7.13 Cognitive-Motor Domain

(schematic representation of the scale development process including Sub-Domain particularities observed)

The Cognitive-Motor Domain Scale was presented in an *interval* (standardized to Mean=100 and SD=10) an *ordinal version* which was used to categorize children as: Very good (equal or above the 85th percentile), Good (between 15th and 85th percentile), Poor (above 5th and lower or equal to 5th percentile) and Very poor (lower or equal to the 5th percentile) Cognitive-Motor capacities.

Chapter 8 Developing the Well-being Index

8.1 Background

This chapter presents the development and results of the Well-being Index at baseline and follow-up. The Well-Being Index was constructed using the three Domain Scales: 1. Health and Physical Development, 2. Socio-Emotional and 3. Cognitive-Motor Domain Scale (Figure 8.1).

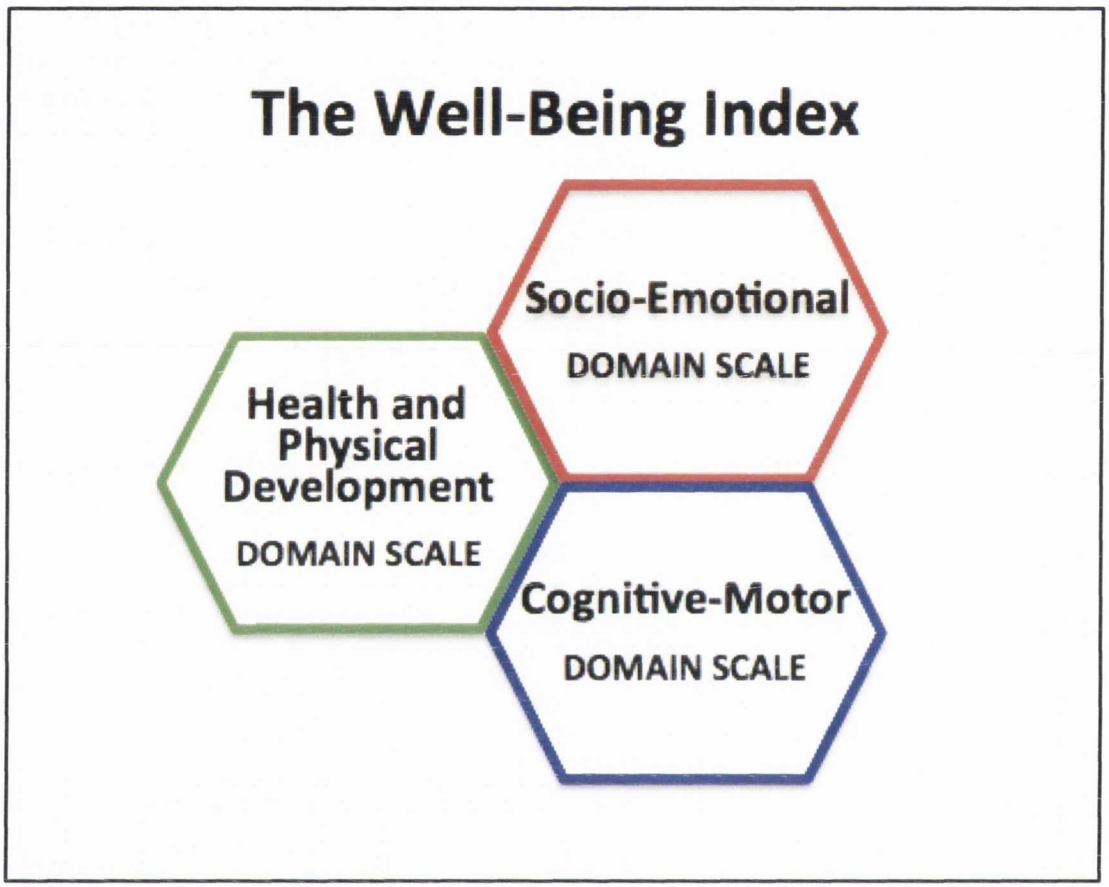

Figure 8.1 The Well-Being Index

(from Domain Scales to Well-Being Index baseline and follow-up)

The development process of the Well-being Index was straightforward. The methods employed are presented below.

8.2 Methods

8.2.1 Participants and exclusions

The Well-Being Index was generated for all children that obtained a score for all three composing Domains. Baseline Well-Being Index scores were calculated for N=9,812 children and the follow-up Well-Being Index was generated for N=8,843 children. Table 8.1 presents the total number of participants with missing data for each one of the composing domains for baseline and follow-up.

Table 8:1 Participants with missing Domain scores

Well-Being Index composing domains	Participants at baseline (9 months) N= 11,134 (100%)	Participants at follow-up (3 years) N= 9,793 (100%)
Health and Physical development	255(2.29%)	750(7.65%)
Socio-emotional	383(3.43%)	747(7.62%)
Cognitive-motor	1000(8.98%)	748(7.63%)

8.2.2 Procedure and statistical analysis

The Well-Being Index was constructed under Classical Test Theory considerations. The three domains were considered of equal importance to children's well-being and the Well-Being scores were generated as the average of the three Domain z-scores. This was in line with previous studies suggesting equal domain weighting as the desired approach in absence of an appropriate statistical and theoretical weighting mechanism[14, 38, 70]. Some researchers consider that well-being results could be improved by including weights derived from surveys that are purposely build to generate estimates of the importance given by individuals to particular functional aspects[27, 38]. Others feel that assigning equal domain weights ensures a holistic approach to child well-being avoiding instances where one aspect of child functioning (i.e. health) drives the overall well-being score[38].

As previously explained in Chapter 4, calculating Well-being scores represents **Step 4** of the index development process. The Well-Being Index for each sample (baseline and follow-up) was represented by the totality of children's Well-Being scores standardized to mean 100 and standard deviation 10.

Similar to the three domains, the statistical analysis used to calculate Well-Being scores and to standardize the Well-Being Index was carried out in R. The function `scale()` was used to obtain Domain z-scores. Generating the Well-Being scores involved the use of simple mathematical functions to calculate the mean of Domains' z-scores.

8.3 Results

The distribution of children's scores across the interval version of the baseline and follow-up Well-Being Index after standardization (Mean=100 and SD=10) are presented Figures 8.2 and 8.3. Finally, the distribution of children's scores across the ordinal version of the Well-Being Index is illustrated in Figure 8.4 for baseline and Figure 8.5 for follow-up.

8.4. Summary

At each time-point, Well-Being Index scores were limited to children that were assigned a Domain score for each one of the three composing Domain Scales: Health and Physical Development, Socio-Emotional and Cognitive-Motor Domain Scale. The Well-Being Index scores were calculated as the average of the three Domains' standard scores. The resulting Well-Being Index for each sample, was presented in an *interval* (standardized to Mean=100 and SD=10) an *ordinal version* which was used to categorize children as: Very good (equal or above the 85th percentile), Good (between 15th and 85th percentile), Poor (above 5th and lower or equal to 5th percentile) and Very poor (lower or equal to the 5th percentile) overall Well-Being.

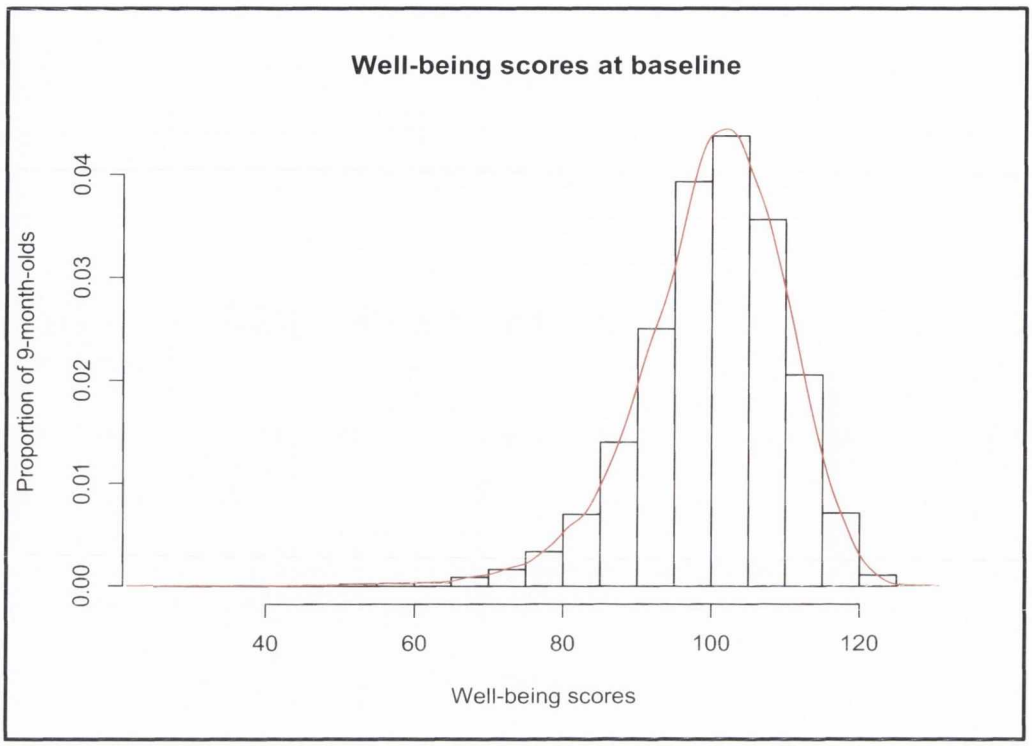

Figure 8.2 The baseline Well-Being Index interval version

(scores were standardized to Mean=100, SD=10)

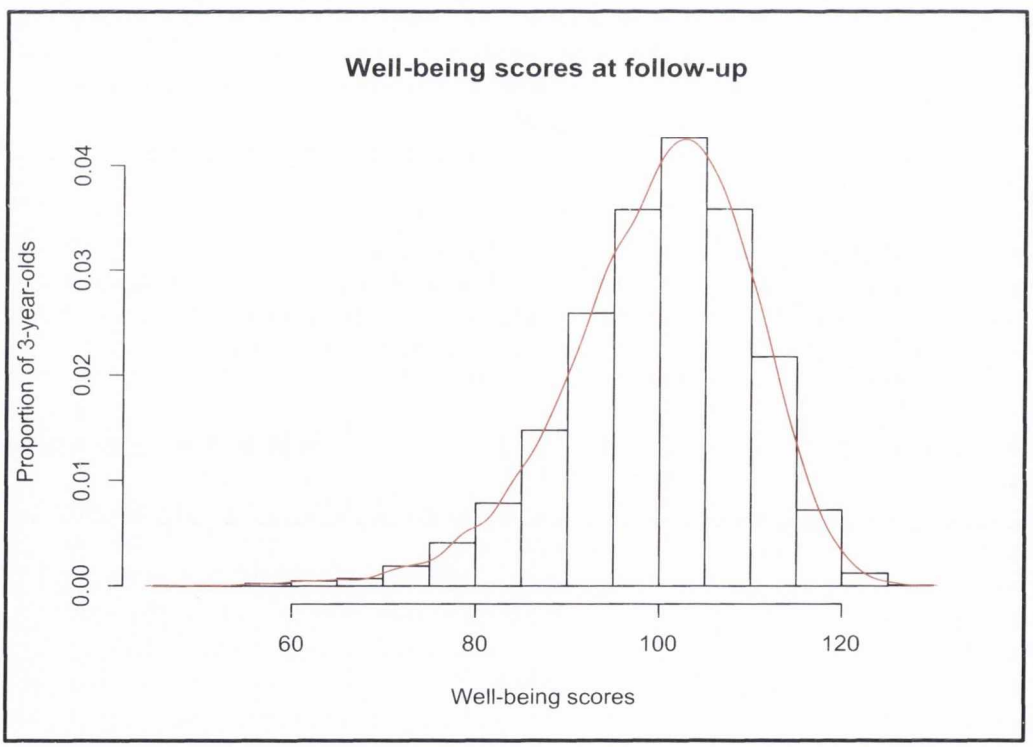

Figure 8.3 The follow-up Well-Being Index interval version

(scores were standardized to Mean=100, SD=10)

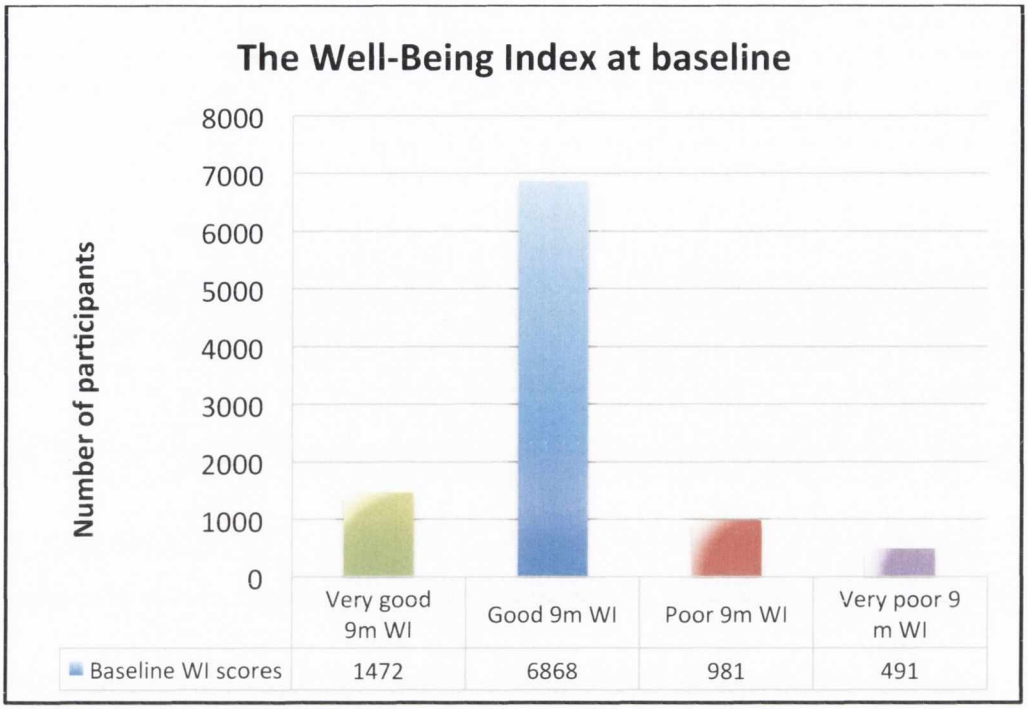

Figure 8.4 The baseline Well-Being Index ordinal version

(Very good- equal or above the 85th percentile, Good- above the 15th and below the 85th percentile, Poor- above the 5th and lower or equal to the 15th percentile, Very poor- lower or equal to the 5th percentile)

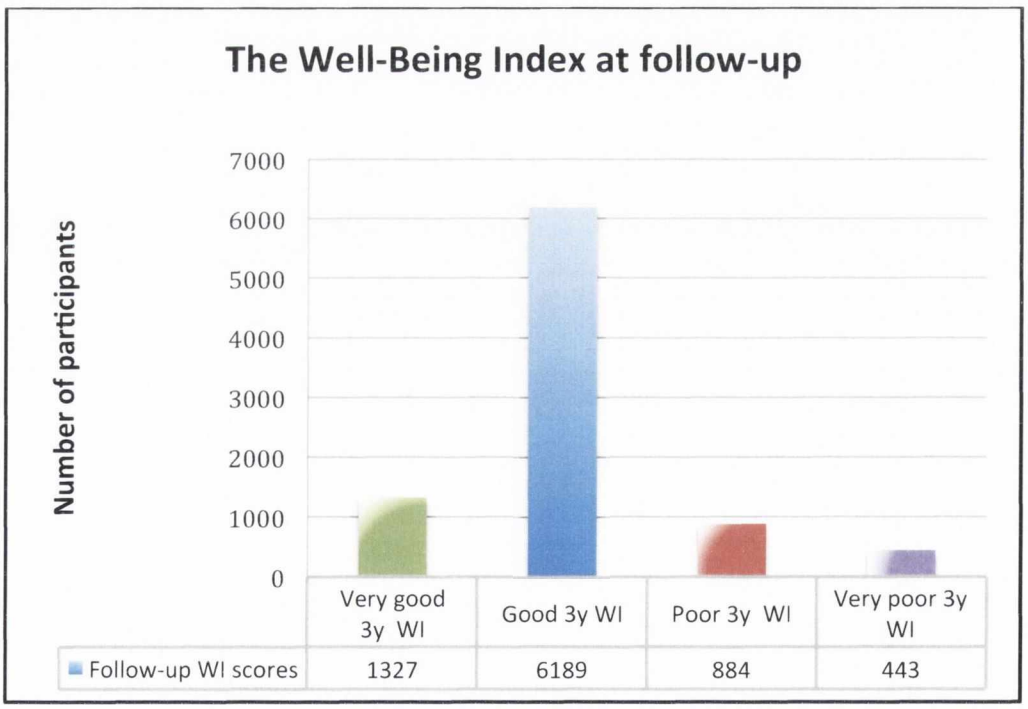

Figure 8.5 The follow-up Well-Being Index ordinal version

(Very good- equal or above the 85th percentile, Good- above the 15th and below the 85th percentile, Poor- above the 5th and lower or equal to the 15th percentile, Very poor- lower or equal to the 5th percentile)

Chapter 9 The structure and validity of the Domain Scales and the Well-Being Index

9.1 Background

The final stage of a scale or an index development process is concerned with ensuring its appropriate structure and validity. Adequate *structure* ensures that all index components are measuring what they are thought to be measuring and are relevant to the trait assessed by the index. The *validity* of a scale or an index helps determine if accurate conclusions regarding the presence and degree of the measured trait for an individual can be reached. Three ways of assessing validity exist: criterion, content and construct validation (described in detail in Chapter 4).

This chapter presents the steps employed to examine the structure and validity of the Domain Scales and Well-Being Index. Briefly, the Domain Scale and Well-being Index are measuring broad life concepts and *sound structure* was ensured by verifying that: 1. each indicator is included in the correct sub-domain; 2. each sub-domain is relevant for the corresponding domain and 3. each domain is correlated (at least moderately) with the Well-Being Index.

The *validity* of the Domain Scales and Well-Being Index was assessed through construct validation. This type of validation allows learning more about the construct measured by each Domain Scale and Well-Being Index. It involves making and testing new predictions and most importantly facilitates testing the measure and the theory simultaneously. Previous large volume of research suggests that a wide range of contextual aspects from children's lives can influence their development. The Domain Scales and Well-Being Index are summaries of developmental outcomes and evidence of relationship between these and various aspects from children's lives would provide necessary validity support. Moreover, observing significant relationships would allow us to highlight what are the contextual factors that can impact the development of Irish children. Therefore, validity was established by investigating unadjusted associations of each Domain Scale and the Well-Being Index with pre-established developmental determinants. These were selected in line with the bio-ecological model of human development and the Barker hypothesis. Five main groups were identified: individual characteristics, child's interactions, PCG and family factors, socio-demographic and economic factors and pre-natal factors. Additional theoretical support for individual developmental determinants from each group is presented in Tables 9.1-9.5.

9.2 Methods

9.2.1 Procedure

9.2.1.1 Structure of the Domain Scales and the Well-Being Index

The Domain Scales covered broad developmental-theory constructs. Similarly, while being slightly more restricted the Sub-Domain Scales were reflective of domain aspects with many possible manifestations or outcomes. A first step in ensuring good psychometric properties of each Sub-Domain Scale was taken by estimating their reliability (discussed in previous chapters). Next, to verify the structure of the final Sub-Domain and Domain Scales and the Well-Being Index the following steps were taken:

1. The correlations between each indicator in its final form (after z-score transformation and reversal if necessary) and each Sub-Domain Scale and the three Domain Scales

were verified. It was expected that indicators would show higher and significant correlations with the Sub-Domain and the Domain Scales they were included in

2. The correlation between each Sub-Domain Scale and all Domain Scales were investigated and it was expected that the Sub-Domain Scales would correlate significantly and higher with the corresponding Domain
3. The structure of the Well-being Index was investigated through Pearson's correlation coefficients between this and the three Domain Scales. We expected to observe at least moderate correlations (Pearson's r= 0.5-0.7) between the index and all three domains. Other studies used Confirmatory Factor Analysis (LSAC Outcome Index) or Forced one factor Principal Component Analysis (The Well-being Index for 9 year-old Irish children) to validate the structure of the index. Due to the fact that Confirmatory Factor Analysis is generally used to examine the structure of narrowly defined constructs, developed to measure a single trait, and that this project viewed well-being as a multidimensional construct, we opted against using this method for structure validation. The approach employed in this project was previously suggested as an alternative to Factor Analysis when multi-scale tests are involved[73].

9.2.1.2 Validity of the Domain Scales and Well-being Index

The validity of the construct covered by each Domain Scale and Well-Being Index was assessed through investigating individual relationships with each pre-established developmental determinant selected. Therefore, construct validity was verified for each Domain Scale and Well-being Index with the help of multiple univariate regression models. The outcome variable of each model was one of the Domain Scales or the Well-Being Index. The developmental determinants selected were considered individually, as possible explanatory variable in each model. It was expected that each Domain Scale and Well-Being Index is significantly associated with all or most of the developmental determinants selected.

9.2.2 Statistical analysis

The structure of the Domain Scales was verified by investigating Pearson's correlations coefficients and significance levels generated the function `rcorr()` from the package `Hemisc` in R. The function `lm()` from the package `ltm` in R was used to construct the unadjusted linear regression models employed for the construct validation of each Domain Scale and Well-Being Index.

Table 9:1 Theoretical support for developmental determinants representing Individual characteristics

Individual characteristics	Previous findings
1. Gender	Boys have a higher prevalence of developmental difficulties. They develop slower and are more affected by learning and behavioural disorders[91, 92]. These differences are thought to be mainly related to biological factors and are influenced by gender differences in parental expectations[93].
2. Low birth-weight (birth-weight equal or lower than 2,500 grams)	Low birth-weight children more likely to show sub-optimal health functioning and compromised growth with lower height and weight gain[94-96]. On a socio-emotional level, low birth-weight children are more likely to show internalizing and externalizing behavioural problems including sub-optimal social competence and behavioural adaptation[89, 97]. From a neuro-developmental point of view delayed speech and language, reduced motor skills and impaired auditory and visual functioning were reported[89, 98]
3. Prematurity (delivery before the 37th week of gestation)	Prematurity can have long-term effects and lead to delayed development[99]. Premature children are more in keeping with their gestational age than their age calculated from date of birth[89, 100, 101].
4. Mode of delivery	Medication administered at childbirth can have both short-term (less attentive, irritable, withdrawn) and long-term effects on the child's physical and mental development (e.g. learning disabilities)[89]. Instrument delivery (forceps, vacuum, clamps) can result in damaging the child's brain, head or eye and some long term effects (e.g. hearing problems, squint) were reported[89]. Caesarean delivery was previously associated with poor health outcomes[102-105]. This type of delivery implies additional after birth support and was significantly associated with breathing difficulties[89].
5. Nutrition	Child nutrition is critically important to maintain good physical development and health[89, 106]. Numerous studies report the short and long term positive effects of **breastfeeding** for child's physical development by reducing the risk of neo-natal infections and atopic manifestations and enhancing the development of the immune system ultimately protecting against chronic diseases[77, 107, 108]. Longer exposure to breast-milk was associated with higher cognitive achievements and motor skills development[77, 89]. The physical closeness between mother and child was recognised to improve mother-child bond and reduce distress and discomfort[89]. During **early childhood, dietary habits** and preferences can be modified through increased diet diversification, exposure to various foods and parental modelling and reinforcement[109-111]. This could have a long-term effect in shaping preferences and consumption patterns with previous studies showing a significant association between availability of fruit and vegetables in the home and child's consumption of these foods. Diet-quality at age three years was associated with later academic achievements[75, 112].
6. Day and night sleep at 9 months	Can influence growth and children's functioning. By the age of 9 months, children should have developed an adult-like sleep pattern with an average of 11 hours of sleep at night and 3 hours during the day[74, 113]. However 9 months was also identified as the peak age for night waking, a sleeping disorder strongly associated with poor parental health and increased psychological distress[74].

Table 9:2 Theoretical support for developmental determinants representing Primary Caregiver and family factors

Primary Caregiver (PCG) and family factors	Previous findings
1. PCG's age	Previous research suggests that older mothers provide more warmth, emotional connection and structure to five-month old infants and richer cognitive experiences for one year olds, than younger mothers, even after controlling for socio-economic factors[114]. Possible improved parenting practices in older mother families have been attributed to the so-called maternal maturity hypothesis including richer life experience and improved financial and social resources[114].
2. PCG's health	Parental chronic illness might influence child development through direct pathway, by reduced capacity to support and care for the child or through an indirect pathway by causing emotional distress and depression[115].
3. **PCG's education**	Education plays an important role in child development starting from as early as the intrauterine period[89]. PCG's education was associated with child physical development[116] and educational achievements[117].
4. PCG's parental stress	Stress might impact parenting and further influence early childhood cognitive and socio-emotional development (e.g. child's capacity to regulate emotions) [89].
5. PCG's depression	Depressed PCGs can exhibit lower levels of responsiveness and less positive interactions influencing child's health and socio-emotional development[89].
6. PCG's BMI	Children who live in an environment where their peers and parents are overweight are more likely to misperceive their own weight status[74, 118].
7. SCG living in the house	The involvement of the Secondary Caregiver in a child's live has been linked with improved child development, a better family structure (married mothers reporting increased emotional support), reduced levels of Primary Caregiver stress and grater engagement in activities with the child, leading to more securely attached children[89]. Previous research shows that involvement of the Secondary Caregiver in childcare activities is linked with grater parental satisfaction and a better opinion of their partners[89]. Increased commitment and grater communication skills were observed between married caregivers[89].
8. Dyadic adjustment scores	Marital or partnership satisfaction pays an important role in ensuring optimal family functioning influencing adult well-being and interacting with child outcomes[16]. The quality of parenting can be influenced by the relationship between the parents and a conflicted relationship may inhibit the availability of the parents as source of support[89]. Previous research showed that understanding and responding appropriately to child's emotional "cues" from as early as peri-natal times promotes good cognitive and socio-emotional development[119] and it is suggested that child's subtle signals can be missed by parents preoccupied with a conflicted relationship[89].
9. Overall support (family, friends)	Dunst and Trivette (1998) highlight the importance of an integrated social system framework involving informal support networks like parents, relatives and friends for promoting positive functioning and alleviating negative reactions[120]. Previous research suggests that social support might influence the relationship between mother and child. Some reported more positive mother-child interactions for mothers with increased social support[121], while others found that parents from a low income background showed reduced tendency to punitive behaviour if they reported increased level of social support[122].

Table 9:3 Theoretical support for developmental determinants representing Child's interactions

Child's interactions	
1. Other children in the home	The existence of other children in the home can contribute to the quality of children's lives[89].
2. Relationship with PCG	The parent child relationship proved to be an important mediator of developmental outcomes on all levels of a child's life[74, 75]. Mothers report feelings of affection for their children from as early as intrauterine periods and positive mother-child bonding was previously associated with increased exclusive breastfeeding duration, and later in life with positive socio-emotional behaviours and better educational outcomes[74, 75].
3. Contact with grandparents	The involvement and support offered by parents to their adult children can play an important role throughout an individual life-course and could provide a wide range of support (i.e. emotional, financial, childcare etc.) at times of need. Research shows improved child health outcomes and improved well-being when extended family networks are in place[123].
4. Home learning-environment	Research shows that early home learning experience has a significant contribution to future learning competence[41]. Parents can play a key role in a child's cognitive development from very early stages by encouraging an active engagement with the material and social world ensuring language development. Research shows that children whom are **talked to** in a varied and engaged manner are more advanced in developing their vocabulary[74, 89]. **Frequent reading** and access to books was linked with increased child learning competence, increased pre-school literacy and school reading achievement remaining relatively stable across early school years[41]. This association was also demonstrated in children from disadvantaged background[41].
6. Childcare interactions	Differences in developmental outcomes for all three domains have been previously linked with the type of childcare that the child received. Previous research showed that children cared for in centre-based facilities face a higher risk of infections (ear, respiratory, etc.), stomach illness, other infectious diseases (such as salmonella, shigella, giardia and hepatitis etc.) and in general, they require more healthcare visits and antibiotic prescriptions than children cared for at home or on small-group care[89, 124-126]. On the other hand it has been suggested that children cared for at home show a higher incidence of small injuries than those cared for in centre-based facilities[89, 126]. An indirect effect of the type of care on later development has also been reported and increased number of antibiotic prescriptions was linked to poorer health outcomes (increased risk of asthma and allergies)[127] while repeated chronic infections in infancy have been associated with poorer attention in book-reading sessions[128]. Lamb and Ahnert (2006) suggest that the differential rates of illness for children who have experienced childcare might explain some of the inconsistencies in findings examining the effect of early childcare on linguistic and cognitive competence[89, 129]. Other studies, suggest that early exposure to infections through contact with a larger group of children which characterizes centre-based childcare facilities can promote immune system development and that by the age of three years the health differences between children in childcare and those cared for at home are no longer significant[125]. Furthermore, children exposed to large group-care were less likely to develop stomach illness or respiratory infections during the early school years and early exposure to common infection was shown to have a protective effect for the development of Type 1 diabetes or lymphoblastic leukaemia in childhood[89, 130]. The reported effects of childcare arrangements on cognitive and socio-emotional outcomes are mixed. Some studies have indicated that, while centre-based care has generally positive outcomes on cognitive development, the socio-behavioural outcomes are often negative, however it is generally agreed that aspects like the quality of the care, the

Child's interactions	
	child's relationship with parents and care-providers, and the child's own temperament play a determinant role for developmental outcomes[89, 129]. A recent American study, the Early Childhood Longitudinal Study (ECLS), indicated that the negative effect on socio-behavioural development of centre-based care was increased by the number of hours a week spent in the facility (more than 30 hours) and by the age (younger age) when the child entered centre-based care. The same study also highlighted that the interrelationship between socio-behavioural outcomes and type of childcare is modulated by family background like: family income (no effect on children from low-income background whereas the behaviour of children of higher-income families got worse the longer they spent in centre-based care each week) or ethnicity (no negative effects were observed in African-American or Hispanic children)[89, 131]. When using the ECLS data Bacharach and Baumeister (2003) found no significant differences were found between parental, non-relative and centre-based care in the relative risk of developing severe behaviour problems[89, 132]. Some studies expressed concerns in relation to early childcare and mother-child attachment, however, others concluded that in most instances secure attachment is established even when the mother returns to full-time work in the first six months[89, 133]. As with health and social-emotional development, positive cognitive development is the outcome of many interacting factors and the effects of out-of-home care on cognitive development have been debated for decades. In general, the research suggests that centre-based care leads to better cognitive and language outcomes than home-based care (Lamb & Ahnert, 2006) with some suggesting that these gains were affected by intensity of care (hours per week- more hours being associated with increased cognitive growth), age at which centre-care started (2– 3 years of age was the optimal age for cognitive and language development) and family/ethnic background. On the other hand a meta-analysis of 59 studies by Erel, Oberman and Yirmiya (2000) failed to find a reliable difference between the cognitive abilities based on the type of care they received[89, 134]. The quality of the care provided was identified to play an important role on developmental outcomes and it is suggested that centre-based care provision is better when staff-child ratios are lower and when staff are better trained and that more highly educated home-based carers provide richer learning environments and better care[89, 135].

Table 9:4 Theoretical support for developmental determinants representing Socio-demographic and economic factors

Socio-demographic and economic factors	
1. Equivalised family income	Previous research shows a negative association between poor family income and early childhood development and two main pathways were identified as possible explanations for this[136]. First, it is suggested that sub-optimal development is a direct result of deprivation from material resources[41]. Second, poor economic background can increase parental stress altering psychological responses leading to an indirect negative influence on early child development[41].
2. Social class	Family social class is linked to financial security and psychological capital enabling a range of social connections to the growing child[41]. It has an influence on the family learning environment and higher social class is associated with better development[41].
3. Ethnicity	The ethnic belonging of the Primary Caregiver can impact on child development in many ways. A non-English-speaking background can imply possible differing patterns of child rearing and can influence development of age appropriate vocabulary[41].
4. Neighbourhood safe for play	Good social organization is important for the developmental well-being of children and young children. Poor, socially unstable neighbourhoods can affect children's emotional and behavioural development either directly or indirectly. The direct impact is often seen at later stages of development when the behaviours of others in the neighbourhood can influence children at an individual level[137]. On the other hand, factors like availability of supporting community, social resources and access to services can affect the developing child indirectly through their impact on family functioning[41, 137].
5. Household member on SW benefits	Households with members in receipt of Social Welfare benefit might be in financial difficulty and this could influence child development[74, 75].

Table 9:5 Theoretical support for developmental determinants representing Pre-natal factors

Pre-natal factors	
1. Intake of folic acid and iron	Primary Caregiver's diet and vitamin intake can influence foetal growth and development and an increased intake of vitamins and minerals is recommended during pregnancy[89]. During pregnancy iron and folate deficiencies can increase risk of delivery complications, low birth-weight and have been shown to be associated with perinatal mortality. Given the well established effectiveness of folate intake prior to conception and until the 12th gestational week in preventing neural tube defects, from the year of 1993, the Irish Department of Health and Children is advising future mothers to take folic-acid supplementation[89]. Research shows that Primary Caregiver's quantity and quality of nutrition during pregnancy and folic acid supplementation are influenced both nationally and internationally by socio-economic disparities and that mothers from low-income background are less likely to have heard of the benefits of folate supplementation. Fowles et. al (2002) showed that the Primary Caregiver's education can also influence during-pregnancy nutrition and that although most mothers were aware of the importance of a healthy diet during pregnancy, those from a poorer background were less likely to be aware of the during-pregnancy nutritional requirements[138].
2. PCG smoking and alcohol consumption	Children born to mothers who smoke or consume alcohol during pregnancy were shown to have an increased risk for poor physical, neurological and behavioural functioning[139]. The detrimental effects of smoking during pregnancy are varied and dose-related. The most common negative effects observed during pregnancy or at birth are increased risk of perinatal mortality and pre-term birth, congenital malformations, restricted intrauterine growth and low birth-weight. Children born to mothers who smoke during pregnancy are five times more likely to die of Sudden Child Death Syndrome when compared to non-smoking mothers. Research shows that during pregnancy smoking is associated with long term negative health effects like impaired lung function and increased respiratory symptoms in children. Reduced cognitive functioning (language deficit at 8 months, one, two and three years and reduced cognitive scores) and altered behaviour were also reported[89]. Although it is widely recognized that heavy drinking could have severe negative consequences for intrauterine development including the development of Foetal Alcohol Syndrome (low birth-weight, delayed growth, deformities and reduced intellect) there is an on-going debate into the extent of dose-dependency for the associated risks[89]. Some studies indicate that moderate alcohol consumption in early or late stages of the pregnancy had no independent effect on weight or head circumference at birth or later at 5 years and others concluded that no longitudinal developmental effects could be observed. However, others reported that even moderate alcohol consumption can be associated with lower mental test scores at age 4 and a half and poor motor development at age 4[89].
3. PCG stress	Research shows that stress hormones can cross the placenta causing long-term damage to the baby[140]. Prenatal anxiety was shown to be associated with withdrawal, anxiety and depression in children[141, 142] and anxiety experienced during week 12-22 of pregnancy was significantly associated with increased attention deficit in a group of 18-32 months old children[141].

9.3 Results

9.2.3.1 Structure of the Domain Scales and Well-Being Index

Table 9.6 and 9.7 illustrate Pearson correlation coefficients (*r.*) between indicators and sub-domain or domain scores for baseline and follow-up.

At both time-points correlations were stronger between indicators within Sub-Domains rather than across Sub-Domains supporting the grouping of the indicators. The indicator-domain score correlations observed at baseline and follow-up were:

1. relatively low (r=0.3-0.5) for the Health and Physical Development Domain (except the correlation between the weight-to-length indicator and the domain scores which were high (r>0.7) at both time points.
2. moderate (r=0.5-0.7) for the baseline Socio-Emotional Domain and the follow-up Cognitive-Motor Domain
3. and high (r=0.7-0.9) for the baseline Cognitive-Motor Domain and the follow-up Socio-Emotional Domain .

All indicators showed higher, significant (p-value<0.001) correlations with the Domain scores they were included in, confirming good structure of the Domain Scales.

Correlations between Sub-domains, Domains and the Well-being Index are presented in Table 9.8 for baseline and 9.9 for follow-up. All Sub-Domains correlated higher with the corresponding Domains (r>0.65). At both time-points, we observed low (r<0.15) but statistically significant inter-domain correlations between the Health and Physical Development and each of the other two domains. This was consistent with previous findings[14, 41].

When examining correlations between each Domain Scale and the Well-Being Index it was observed that:

1. Baseline Socio-Emotional scores were highly (r=0.73) and significantly (p<0.001) correlated with the Well-Being Index scores
2. Similar results were observed for baseline Cognitive-Motor scores and Well-Being Index scores (r=0.78, p<0.001)
3. Baseline Health and Physical Development scores were moderately correlated with the Well-being Index scores (r=0.55, p<0.001)
4. Follow-up correlations between each Domain Scale and the Well-Being Index were significant (p<0.001) but slightly inferior to those observed at baseline (with Health and Physical Development Domain Scale: r=0.53, with Socio-Emotional Domain Scale r=0.70 and with Cognitive-Motor Domain Scale r=0.66)

The results presented above satisfied that all indicators were representative of the traits covered by the corresponding Sub-Domain and Domain Scales and these in turn were representative of the trait covered by the Well-Being Index. Observing low to moderate inter-domain and moderate to high domain-index correlations reinforced the multidimensional nature of well-being suggesting that development might not occur uniformly across all dimensions[41, 61]. Therefore, it is pertinent to conclude that presenting and analysing the Domain Scales together with the Well-Being Index would provide a more complete image of child well-being. This is the preferred approach of many well-being indices developers as it accounts for the fact that different developmental dimensions might follow different trends and it helps understanding what domains might be driving the overall well-being[14, 40, 47, 51, 61, 67,

[68]. The Domain Scales could be used separately when the focus is on a particular aspect of child well-being[14] or when a more detailed analysis of development is considered[41].

9.2.3.2 Validation of the Domain Scales and Well-being Index

Tables 9.10 to 9.14 show results from univariate analysis of associations employed for Domain Scale and Well-being Index validation. As expected most pre-established developmental determinants selected showed significant unadjusted associations with all Domain Scales and Well-Being Indices. Findings in relation to each group of variables representing developmental determinants are presented in brief below. These findings are discussed in more detail in Chapter 10.

Individual characteristics

All variables (except *Breastfeeding duration*, *Number of hours of day sleep* and *Number of hours of night sleep*) were significantly associated with all baseline and follow-up Domain Scales and Well-Being Indices. *Breastfeeding duration* was not associated with the child's baseline or follow-up Socio-Emotional Domain score. Similar results were found for *Number of hours of day sleep* (only considered in relation to baseline scales and Well-being Index) and the baseline Socio-Emotional Domain Scale. Additionally, day or night sleep were not associated with the baseline Cognitive-Motor Domain scores. Consistently, girls obtained higher scores across all Domains and Well-Being Indices. Reported to boys' outcomes, girls' well-being scores were 1.3 points higher at baseline and 3.7 points higher at follow-up. Being born through Caesarean section (planned or emergency) was significantly associated with lower scores across all Domains and Well-Being Indices when compared to normal birth.

Child's interactions

All child's interactions variables selected were significantly associated with the Domain Scales and the Well-Being Index. A more positive *child-PCG relationship* (accounted for by higher scores from the Quality of attachment scale for baseline and Pianta positive scale for follow-up) was significantly associated with higher Domain and Well-Being scores. Being in parental or a small group setting care increased baseline and follow-up Health and Physical Development scores when compared to centre-care facilities. A similar effect was observed in relation to the baseline Well-Being Index. At follow-up, *reading to the child* was significantly associated with increased Socio-Emotional, Cognitive-Motor and Well-Being scores. At both time-points having no contacts with the grandparents was associated with significantly lower Socio-Emotional, Cognitive-Motor and Well-Being Index scores.

Primary caregiver and family factors

All PCG and family variables selected with the exception of *PCG's health*, *PCG's BMI*, *SCG in the household* and *Dyadic adjustment* were significantly associated with all Domain Scales and Well-Being Indices. *PCG's health* was not associated with the child's Cognitive-Motor scores. Baseline *PCG's BMI* was not associated with child's well-being and follow-up *PCG's BMI* was not associated with child's socio-emotional development. Better PCG-SCG relationship (*Dyadic adjustment score*) was associated with higher Socio-Emotional, Cognitive-Motor and Well-Being Index scores. The association between Dyadic adjustment score and Health and Physical Development Scale was not significant. The presence of a *SCG in the household* was not significantly associated with baseline socio-emotional or cognitive-motor development, but significantly associated with follow-up improved development on the two domains. Higher levels of *PCG's stress and depression* were consistently associated with worse child outcomes across all Domains and Well-Being Index.

Socio-demographic and economic factors

At follow-up higher *income quintile* was significantly associated with higher Domain and Well-Being Index scores. At both time points children from households with no members on social welfare benefits obtained higher scores on all Domain Scales and Well-Being Indices. A consistent significant decrease in Domain and Well-Being Index scores was observed for children who lived in neighbourhoods considered less safe for outside play by the PCG. The effects of *PCG's ethnicity* were mixed. At baseline, children with mothers of ethnicity other than Irish had significantly higher well-being, health and physical development and cognitive-motor development while their Socio-Emotional scores were decreased. At follow-up, children from Irish mothers had better cognitive-motor and socio-emotional outcomes and had higher Well-Being Index scores. There was no significant association between *PCG's ethnicity* and follow-up health and physical development.

Pre-natal factors

Lower levels of during *pregnancy stress* were significantly associated with higher scores on all but the baseline Cognitive-Motor Domain. No intake of *Folic acid* during pregnancy was significantly associated with lower follow-up Domain and Well-Being Scores. Children born to mothers that did not take folic acid supplementations had 1.7 points lower follow-up Well-Being scores. Children of mothers who did not smoke during pregnancy had higher baseline Health and Physical Development and Well-Being scores. At follow-up, no smoking during pregnancy was strongly associated with better development on all Domains and Well-Being Index.

In general, the pre-established developmental determinants from all five selected groups showed significant associations with all Domain Scales and the Well-being Index. Some differences in the relationship between determinants and certain domains were observed and these add further validity support by confirming theoretical expectations. Four variables were selected to exemplify this. These are presented below:

1. **Reading to the child** was not associated with Health and Physical Development scores and strongly associated with all other Domains and the Well-Being Index. It was expected that this variable should mostly impact on cognitive-motor development (strongest effect observed beta coefficient of 0.63). Observing a slightly reduced effect (beta coefficient 0.6) on the Socio-Emotional scores could be an expression of the influence that any type of child-carer interaction could have on the child's socio-emotional development.

2. **PCG-SCG relationship** (*Dyadic adjustment score*) is not associated with Health and Physical Development scores and significantly associated Socio-Emotional, Cognitive-Motor and Well-Being Index scores. As expected the associations with Socio-Emotional scores were stronger (baseline: beta coefficient of 0.23; follow-up beta coefficient of 0.35) than those with the Cognitive-Motor scores (baseline: beta coefficient of 0.17; follow-up beta coefficient of 0.13).

3. **Baseline SCG presence in the household** was not associated with socio-emotional and cognitive-motor development. At follow-up this variable became significantly associated with the respective domain scores. This finding might suggest that during infancy child's PCG is the main contributor to child development on these two domains with the SCG's influence being observed more as the child grows.

4. **Smoking during pregnancy** was not associated with baseline Socio-Emotional and Cognitive-Motor scores. This variable became significantly associated with the respective follow-up scores. As expected, the positive effects of no smoking during pregnancy on child's health and physical development become apparent from infancy remaining consistent during early

childhood while intrauterine influences on socio-emotional and cognitive-motor development might manifest over time.

The associations between developmental determinants observed here are in line with previous child development studies (presented in Tables 9.1-9.5) and micro-level well-being research. The use of univariate analysis for validation purposes is in line with previous research[66]. The Domain Scales and Well-being Index are summaries of child development. Each one of the developmental determinants selected for this study have been previously associated with at least one of the dimensions included in the Well-being Index. Showing individual associations between each Domain Scale and Well-being Index and each or most of these developmental determinants brings appropriate evidence that the developmental constructs covered by the three domains and the index are valid[66]. Therefore, the significant unadjusted associations observed confirm the construct validity of the Domain Scales and Well-Being Indices. The differential effect of some development determinants for certain domains further strengthens the validity support, as development does not occur uniformly across all domains[66]. Additionally, according to our results Irish children's development is in line with developmental theories and the bio-ecological model of child development and can be influenced by individual characteristics, interactions, PCG, family, socio-demographic and economic factors. Moreover, observing significant associations between pre-natal factors and the Domain and Well-Being Index scores confirms the application of the Barker hypothesis. The stronger effects of some pre-natal factors (e.g. smoking during pregnancy, intake of folic acid) on follow-up scores could suggest that intrauterine influences manifest slowly and can be observed over time. In general the observed associations were stronger at follow-up. This could be explained by the fact that the impact of most of the determinants on child development is cumulative over time.

9.4 Summary and conclusions

The Domain Scales and the Well-Being Indices developed in this study demonstrated satisfactory structural and construct validity.

Given the multidimensional nature of well-being and the broadness of the development concepts covered by each one of the three domains, the structural validity was assessed through observing relationships and their significance between: indicators with Sub-Domain Scales, indicators with Domain Scales, Sub-Domain with Domain Scales, Sub-Domains with the Well-Being Index and Domain Scales with the Well-Being Index. Additionally, inter-domain correlations were also examined. The significant correlations observed satisfied that all indicators used are theoretically meaningful, measure what they were expected to be measuring and were included in the appropriate Sub-Domain and Domain. At each time-point, the relationships between the three Domains were of moderate strength suggesting that development is not a uniform process (i.e. a child can function poorly on one domain but compensate on other two domains and have a good well-being score) and differential domain development should be highlighted. A pertinent recommendation following from this is that the Domain Scales should be used in conjunction with the Well-Being Index in further analysis and presentation of results.

Using construct validation as validity support for the Domain Scales and the Well-Being Index had a dual role. First, it allowed to test the measures developed (Domain Scales and Well-Being Indices) against previously demonstrated, widely recognized theories of child development. Second, it highlighted significant associations between pre-established determinants of early life development from previous national and international research and the domain development and overall well-being of Irish children aged 9 months and later at 3

years. Findings resulting from construct validation analyses are informative for researchers, policymaker and current and future parents.

Table 9:6 Pearson's correlation coefficients between baseline indicators of development and Domain scores

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Health sub-domain																	
1.General health	-																
2.Chronic conditions	0.30***	-															
3.GP contacts	0.33***	0.27***	-														
4.Paediatrician contacts	0.21***	0.26***	0.26***	-													
5. A&E contacts	0.19***	0.16***	0.23***	0.38***	-												
6.Nights in hospital	0.17***	0.21***	0.18***	0.37***	0.26***	-											
Physical development sub-domain																	
7.Weight-to-length	0.02*	0.04***	0.03***	0.03***	0.04***	0.06***	-										
8. Health and Physical development domain	**0.38*** **	**0.39*** **	**0.41*** **	**0.35*** **	**0.33*** **	**0.26*** **	**0.72*** **	-									
Cognitive sub-domain																	
9.Problem solving ability	0.08***	0.08***	0.03**	0.07***	0.05***	0.10***	0.04***	0.07***	-								
Motor sub-domain																	
10.Gross motor ability	0.07***	0.11***	0.04***	0.06***	0.04***	0.08***	0.05***	0.10***	0.29***	-							
11.Fine motor ability	0.09***	0.10***	0.06***	0.07***	0.04***	0.10***	0.02.	0.08***	0.48***	0.27***	-						
12. Cognitive-motor domain	0.10***	0.12***	0.05***	0.09***	0.06***	0.12***	0.04***	0.11***	**0.86*** **	**0.63*** **	**0.75*** **	-					
Emotional sub-domain																	
13.Fussiness	0.12***	0.08***	0.12***	0.05***	0.04***	0.03	0.01	0.09***	0.06***	0.04***	0.06***	0.04***	-				
14. Unadaptability	0.05***	0.04***	0.03***	0.02	0.01	0.01	0.00	0.02*	0.07***	0.02**	0.07***	0.07***	0.37***	-			
15. Unpredictability	0.10***	0.05***	0.08***	0.03**	0.03**	0.02*	0.02*	0.04***	0.08***	0.02**	0.08***	0.07***	0.42***	0.20***	-		
Social sub-domain																	
16.Communication ability	0.08***	0.08***	0.02*	0.07***	0.04***	0.09	0.01	0.06***	0.38***	0.31***	0.32***	0.45***	0.07***	0.03***	0.10***	-	
17.Personal/social ability	0.09***	0.08***	0.04***	0.05***	0.03***	0.09***	0.03***	0.08***	0.43***	0.31***	0.36***	0.49***	0.06***	0.05***	0.06***	0.44***	-
18. Socio-emotional domain	0.15***	0.12***	0.09***	0.08***	0.05***	0.09	0.01	0.10***	0.38***	0.23***	0.33***	0.43***	**0.59*** **	**0.51*** **	**0.55*** **	**0.63*** **	**0.62*** **

Table 9:7 Pearson's correlation coefficients between follow-up indicators and Domain scores

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Health sub-domain																	
1.General health	1.00																
2.GP contacts	0.48***	1.00															
3.Paediatrician contacts	0.30***	0.29***	1.00														
4. A&E contacts	0.22***	0.26***	0.33***	1.00													
5.Nights in hospital	0.24***	0.22***	0.52***	0.24***	1.00												
6.Chronic conditions	0.46***	0.33***	0.26***	0.13***	0.18***	1.00											
7.Episodes of wheezing	0.38***	0.42***	0.14***	0.15***	0.15***	0.35***	1.00										
8.Antibiotic prescriptions	0.46***	0.69***	0.32***	0.24***	0.25***	0.26***	0.41***	1.00									
Physical development sub-domain																	
9.Weight-to-length	0.03**	0.02**	0.02**	0.01	0.01	0.02.	0.02*	0.02*	1.00								
10.Health and Physical development domain	**0.42*** **	**0.48*** **	**0.25*** **	**0.22*** **	**0.17*** **	**0.31*** **	**0.32*** **	**0.49*** **	**0.78*** **	1.00							
Cognitive sub-domain																	
11.Picture similarity ability	0.02*	0.02.	0.04***	0.04***	0.03**	0.02*	0.02*	0.03**	0.04	0.04***	1.00						
12.Nominal/verbal ability	0.03**	0.02.	0.04***	0.03*	0.02*	0.01	0.01	0.01	0.04	0.04***	0.40***	1.00					
Motor sub-domain																	
13.Fine motor ability	0.01	0.02	0.03***	0.03**	0.02.	0.02.	0.00	0.02*	0.01	0.01	0.14***	0.12***	1.00				
14.Gross motor ability	0.03*	0.01	0.03*	0.01	0.01	0.03*	0.00	0.01	0.01	0.01	0.13***	0.15***	0.18***	1.00			
15.Cognitive-motor domain	0.04***	0.03**	0.07***	0.05***	0.05***	0.05***	0.01	0.03**	0.04	0.05***	**0.66*** **	**0.64*** **	**0.51*** **	**0.54*** **	1.00		
Emotional sub-domain																	
16.Prosocial ability	0.07***	0.01	0.05***	0.03**	0.01	0.05***	0.01	0.01	0.00	0.02*	0.08***	0.06***	0.12***	0.09***	0.15***	1.00	
Social sub-domain																	
17.Total psychological difficulties	0.18***	0.14***	0.09***	0.09***	0.07***	0.11***	0.10***	0.12***	0.04	0.13***	0.15***	0.17***	0.09***	0.06***	0.17***	0.38***	1.00
18. Socio-Emotional domain	0.15***	0.09***	0.08***	0.07***	0.04	0.10***	0.06***	0.08***	0.02	0.09***	0.14***	0.14***	0.13***	0.09***	0.19***	**0.83*** **	**0.83*** **

Table 9:8 Pearson's correlation coefficients between baseline Sub-Domain, Domain and Well-Being Index scores

	1	2	3	4	5	6	7	8	9
1.Health sub-domain	1.00								
2.Physical development sub-domain	0.04***	1.00							
3.Health and Physical development	0.72***	0.72***	1.00						
4.Motor sub-domain	0.12***	0.04***	0.11***	1.00					
5.Cognitive sub-domain	0.06**	0.05***	0.07***	0.48***	1.00				
6.Cognitive-motor domain	0.11***	0.04**	0.11***	0.86***	0.86***	1.00			
7.Social sub-domain	0.09***	0.04**	0.08***	0.47***	0.48***	0.55***	1.00		
8.Emotional sub-domain	0.11 ***	0.03	0.07***	0.05***	0.09***	0.08***	0.10***	1.00	
9.Socio-emotional domain	0.14***	0.02	0.10***	0.35***	0.38***	0.43***	0.74***	0.74***	1.00
10.Well-being Index	0.44***	0.39***	0.55***	0.67***	0.67***	0.78***	0.67***	0.42***	0.73***

Table 9:9 Pearson's correlation coefficients between follow-up Sub-Domain, Domain and Well-Being Index scores

	1	2	3	4	5	6	7	8	
1.Health sub-domain	1.00								
2.Physical development sub-domain	0.02*	1.00							
3.Health and Physical development	0.65***	0.78***	1.00						
4.Motor sub-domain	0.04***	0.01	0.02*	1.00					
5.Cognitive sub-domain	0.03**	0.05***	0.05***	0.20***	1.00				
6.Cognitive-motor domain	0.05***	0.04***	0.05***	0.77***	0.77***	1.00			
7.Social sub-domain	0.05***	0.00	0.02*	0.14***	0.09***	0.15***	1.00		
8.Emotional sub-domain	0.17 ***	0.04***	0.13***	0.07***	0.19***	0.17***	0.38***	1.00	
9.Socio-emotional domain	0.13***	0.02.	0.09***	0.13***	0.17***	0.19***	0.83***	0.83***	1.00
10.Well-being Index	0.38***	0.39***	0.53***	0.49***	0.53***	0.66***	0.55***	0.61***	0.70***

Table 9:10 Baseline and Follow-up Domain Scales and Well-being Indices - univariate associations with developmental determinants representing Individual Characteristics

Individual characteristics	Health and Physical development		Socio-emotional		Cognitive-motor		Well-being Index	
	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline	Follow-up
Gender								
Male	ref	ref	ref	ref	ref	ref	ref	ref
Female	0.79(0.52:1.06) ***	0.19(-0.69:0.46)	0.72(0.44:1.04)***	2.19(1.86:2.52)***	0.38(0.05:0.71)*	2.72(2.40:3.03)***	1.3(0.91:1.7)***	3.69(3.28:4.1)***
Birth-weight	0.001(0:0.001)***	0.0005(0:0.001)***	0.001(0.001:0.002)***	0.0004(0:0.001)**	0.002(0.002:0.002)***	0.001(0.001:0.001)***	0.003(0.002:0.003)***	0.001(0.001:0.002)***
Gestational age	0.45(0.38:0.52)***	0.2(0.14:0.27)***	0.52(0.45:0.58)***	0.1(0.02:0.18)*	0.93(0.85:1)***	0.37(0.29:0.44)***	1.11(1.02:1.21)***	0.42(0.32:0.52)***
Mode of delivery								
Normal delivery	ref	ref	ref	ref	ref	ref	ref	ref
Assisted delivery	-0.02(-0.41:-0.36)	-0.27(-0.66:-0.1)	0.49(0.08:0.90)*	0.15(-0.32:0.62)	0.34(-0.14:0.83)	0.36(-0.09:0.82) ns	0.15(-0.41:0.72)	-0.14(-0.74:0.45)
Emergency caesarean	-1.34(-1.75:-0.93)***	-1.2(-1.6:-0.8)***	-0.42(-0.85:-0.02)*	-0.17(-0.67:0.32)	-0.81(-1.39:-0.3)**	-0.46(-0.95:0.02).	-1.5(-2.10:-0.9)***	-0.91(-1.55:-0.27)**
Planned/Elective caesarean	-0.53(-0.95:0.11)*	-0.43(-0.84:-0.03)*	-0.36(-0.8:0.07)	0.87(0.36:1.38)***	-1.73(-2.25:-1.22)***	-0.57(-1.06:-0.08)*	-1.5(-2.11:-0.89)***	-0.04(-0.68:0.59)
Breastfeeding duration	0.004(0.002:0.005)***	0.004(0.002:0.005)***	-0.002(-0.005:0) ns	0.001(-0.002:0.004) ns	0.005(0.003:0.009)***	0.001(-0.001:0.004)	0.005(0.002:0.009)**	0.007(0.006:0.1)***
Fresh fruit (weekly)								
Not at all		ref				ref		ref
Once		0.73(-0.04:0.97)**		1.74(1.14:2.34)***		0.71(0.13:1.3)*		1.77(2.2:3.62)***
More than once		1.04(0.15:1.09)***		2.45(1.89:3.02)***		1.66(1.12:2.21)***		2.91(2.19:3.62)***
Raw vegetables (weekly)								
Not at all						ref		ref
Once		0.58(0.25:0.92)***		1.04(0.62:1.458)**		0.6(0.2:1.02)***		1.59(1.06:2.12)***
More than once		0.39(-0.12:0.92)		0.94(0.29:1.58)***		0.54(-0.1:1.12)***		1.36(0.5:2.12)**
Number of sleep hours/ night	0.28(0.09:0.37)***	N/A	0.78(0.69:0.88)***	N/A	-0.04(-0.15:0.08)	N/A	0.57(0.44:0.71)***	
Number of sleep hours/ day	0.11(-0.02:0.25).	N/A	0.03(-0.10:0.171)	N/A	-0.07(-23:0.9)	N/A	0.03(-0.16:0.22)	

Table 9:11 Baseline and Follow-up Domain Scales and Well-being Indices - univariate associations with developmental determinants representing Child's interactions

Child's interactions	Health and Physical development		Socio-emotional		Cognitive-motor		Well-being Index	
	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline	Follow-up
Other children in the home								
Yes	ref	ref	ref	ref	ref	ref	ref	ref
No	-0.09(-0.37:0.18)	-1.1(-1.43:-0.76)***	1.42(1.13:.70)***	-0.68(-1.09:-0.26)**	1.85(1.51:2.19)***	0.13(-0.27:0.54)	1.96(1.56:2.36)***	-0.98(-1.51:-0.44)***
Relationship with PCG								
Quality of attachment score	0.19(0.14:0.24)***		0.75(0.7:0.8)***		0.11(0.04:0.17)***		0.65(0.58:0.73)***	
Pianta positive scale		0.11(0.04:0.18)**		1.5(1.42:1.58)***		0.63(0.55:0.72)***		1.47(1.36:1.58)***
Contact with grandparents								
Yes	ref	ref	ref	ref	ref	ref	Ref	ref
No	0.13(-0.75:1.02)	-0.07(-0.96:0.81)	-1.39(-2.3:-0.48)**	-1.77(-2.87:-0.68)**	-0.06(-1.14:1.021)	-2.93(-4:-1.85)***	-0.95(-2.25:0.33)	-2.95(-4.37:-1.53)***
All grandparents live abroad	0.50(0.009:1)*	-0.93(-1.43:-0.44) ***	-1.47(-1.98:-0.95)***	-0.99(-1.6:-0.37)**	2.46(1.84:3.08)***	-2.63(-3.33:-1.93)	1.04(0.29:1.79)**	-1.69(-2.6:-0.78)***
Talk to the child								
Never	ref		ref		ref		Ref	
Rarely	-1.81(-4.3:0.67)		-7.84(-10.3:-5.4)***		-7.29(-10.25:-4.33)***		-9.72(-13.25:-6.2)***	
Sometimes	0.31(-1.31:0.69)		-5.22(-6.23:-4.22)***		-4.69(-5.9: -3.48)***		-6.41(-7.83:-4.98)***	
Often	-0.65(-1.56:0.25)		-3.39(-4.31:-2.48)***		-3.18(-4.28:-2.08)***		-4.63(-5.98:-3.38)***	
Always	-0.43(-1.31:0.44)		-0.6(-1.49:0.29)		-0.79(-1.86:0.26)		-1.28(-2.54:-0.02)*	
Read to the child (days/week)		-0.01(-0.08:0.05)		0.6(0.52:0.68)***		0.63(0.54:0,71)***		0.85(0.74:0.96)***
Childcare interactions								
Centre childcare	ref	ref	ref	ref	ref	ref	Ref	ref
Parental childcare	1.04(0.6:1.48)***	0.45(0.14:0.77)**	-0.07(-0.53:0.39)	-0.71(-1.1:-0.31)***	-0.31(-0.86:0.23)	-0.95(-1.33:-0.57)***	0.73(0.08:1.39)*	-0.14(-0.64:0.34)
Small-setting childcare	1.16(0.68:1.64)***	1.12(0.75:1.49)***	1.06(0.56:1.55)***	-0.16(-0.62:0.3)	-0.21(-0.812:0.38)	-0.12(-0.56:0.31)	1.55(0.85:2.25)***	0.84(0.26:1.41)**

Table 9:12 Baseline and Follow-up Domain Scales and Well-being Indices - univariate associations with developmental determinants representing Primary Caregiver and family factors

Primary Caregiver and family factors	Health and Physical development		Socio-emotional		Cognitive-motor		Well-being Index	
	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline	Follow-up
PCG age at baseline	0.04(0.01:0.06)**	0.1(0.08:0.13)***	-0.02(-0.04:0.001).	0.14(0.11:0.17)***	-0.03(-0.06:-0.005)*	0.08(0.06:0.11)***	-0.016(-0.05:0.019)	0.2(0.17:0.24)***
PCG's health								
Poor	ref	ref	ref	ref	ref	ref	ref	ref
Fair	0.84(-0.79:2.47)	1.15(-0.46:2.78)	0.35(-1.29:1.99)	0.64(-1.17:2.46)	-1.24(-3.23:0.74)	-1.12(-2.94:0.68)	-0.23(-2.57:2.11)	1.79(-0.81:4.4)
Good	1.89(0.32:3.45)*	1.87(0.32:3.42)*	0.84(-0.72:2.41)	1.25(-0.46:2.97)	-0.11(-2.01:1.77)	0.07(-1.64:1.78)	1.35(-0.88:3.6)	3.01(0.51:5.5)*
Very Good	2.79(1.24:4.35)***	2.87(1.33:4.41)***	1.71(0.15:3.27)*	2.54(0.84:4.25)**	0.09(-1.8:1.97)	0.53(-1.16:2.23)	2.7(0.48:4.9)*	5.14(2.66:7.62)***
Excellent	3.44(1.89:5)***	3.54(2:5)***	3.41(1.85:4.97)***	4.11(2.4:5.82)***	0.84(-1.05:2.72)	1.08(-0.62:2.78)	4.59(2.36:6.81)***	6.56(4.07:9.05)***
Education								
Lower secondary or less	ref	ref	ref	ref	ref	ref	ref	ref
Post secondary	0.5(0.03:0.96)*	0.75 (0.24:1.26)**	0.51(0.04:0.99)*	0.62(-0.008:1.25).	0.95(0.39:1.52)***	2.04(1.43:2.65)***	1.47(0.81:2.14)***	2.27(1.47:3.07)***
Non Degree	0.55(0.05:1)*	1.47(0.94:2)***	1.19(0.67:1.71)***	1.50(0.85:2.16)***	1.9(1.29:2.52)***	2.74(2.1:3.37)***	2.08(1.35:2.81)***	3.4(2.58:4.13)***
Degree	0.55(0.1:1)*	1.72(1.22:2.22)***	0.26(-0.2:0.73)	2.07(1.46:2.69)***	1.72(1.16:2.28)***	3.25(2.67:3.84)***	1.17(0.50:1.84)***	4.52(3.73:5.3)***
Parental stress score	-0.07(-0.09:-0.05)***	-0.13(-0.16:-0.9)***	-0.32(-0.34:-0.30)***	-0.7(-0.74:-0.67)***	-0.07(-0.09:-0.04)***	-0.13(-0.17:-0.09)***	-0.29(-0.32:-0.26)***	-0.64(-0.69:-0.59)***
PCG's depression score	-0.15(-0.19:-0.12)***	-0.16(-0.2:-0.11)***	-0.29(-0.32:-0.25)***	-0.49(-0.54:-0.44)***	-0.06(-0.11:-0.02)**	-0.11(-0.16:-0.6)***	-0.30(-0.35:-0.24)***	-0.5(-0.56:-.44)***
BMI	-0.03(-0.05:0.006)*	-0.12(-0.15:-0.1)***	0.03(0.006:0.06)*	-0.006(-0.04:0.2)	-0.03(-0.07:-0.003)*	-0.06(-0.09:-0.02)***	-0.006(-0.04:0.03)	-0.08(-0.12:-0.04)***
SCG in the house								
No	ref	ref	ref	ref	ref	ref	ref	ref
Yes	1.2(0.79:1.62)**	1.69(1.29:2.1)***	0.32(-0.1:0.75)	2.19(1.7:2.69)***	0.33(-0.17:0.84)	1.47(0.99:1.96)***	0.83(0.23:1.43)**	3.62(2.98:4.25)***
Dyadic adjustment	0.02(-0.02:0.05).	0.03(-0.03:0.08).	0.23(0.2:0.26)***	0.35(0.29:0.4)***	0.17(0.137:0.21)***	0.13(0.08:0.18)***	0.28(0.24:0.32)***	0.39(0.32:0.46)***
Overall support								
I get enough help	ref	ref	ref	ref	ref	ref	ref	ref
I don t get enough help	-0.63(-1.09:-0.16)**	-0.28(-0.7:0.13)	-2.61(-3.09:-2.14)***	-2.12(-2.63:-1.61)***	-0.40(-0.98:0.17)	-1(-1.5:-0.5)***	-2.33(-3.01:-1.65)***	-2.31(-2.96:-1.66)***
I don t get any help at all	-0.27(-0.88:0.33)	-0.31(-0.77:0.14)	-1.54(-2.17:-0.91)***	-1.28(-1.85:-0.71)***	0.25(-0.49:1.01)	-1.33(-1.89:-0.77)***	-0.70(-1.61:0.19)	-2.17(-2.9:-1.44)***
I don t need any help	0.89(0.29:1.5)**	-0.41(-0.93:0.1)	-0.24(-0.86:0.37)	-0.22(-0.87:0.41)	0.36(-0.37:1.1)	-1.17(-1.82:-0.53)***	0.61(-0.26:1.49)	-0.64(-1.48:0.19)
Family not in the country	0.04(-0.45:0.54)	Missing level	-2.09(-2.61:-1.58)***	Missing level	1.54(0.91:2.16)***	Missing level	-0.00 1(-0.73:0.73)	Missing level

Table 9:13 Baseline and Follow-up Domain Scales and Well-being Indices - univariate associations with developmental determinants representing Socio-demographic and economic factors

Socio-demographic and economic factors	Health and Physical development		Socio-emotional		Cognitive-motor		Well-being Index	
	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline	Follow-up
Equivalised income								
Lowest quintile	Ref	Ref	Ref	Ref	Ref	ref	ref	Ref
2nd quintile	0.58(0.13:1.03)*	0.18(-0.25:0.62)	-0.13(-0.59:0.32)	-0.32(-0.86:0.22)	-0.32(-0.87:0.22)	0.22(-0.31:0.76)	0.07(-0.56:0.72)	1.05(0.34:1.77)***
3rd quintile	0.82(0.38:1.27)***	1.03(0.59:1.46)***	0.2(-0.25:0.65)	0.24(-0.29:0.77)	-0.21(-0.75:0.32)	0.85(0.33:1.37)**	0.46(-0.17:1.11)	2.02(1.32:2.71)***
4th quintile	0.63(0.2:1.07)**	1.36(0.93:1.8)***	0.6(0.15:1.04)**	1.38(0.84:1.92)***	-0.41(-0.94:0.11)	1.73(1.21:2.22)***	0.4(-0.22:1.02)	3.2(2.53:3.87)***
Highest quintile	0.33(-0.1:0.78)	1.22(0.8:1.64)***	0.62(0.16:1.08)**	1.89(1.36:2.42)***	0.46(-0.08:1.02).	2.12(1.62:2.63)***	0.87(0.22:1.52)**	3.71(3.03:4.4)***
Social class								
Professional/managerial	ref	ref	ref	ref	ref	ref	ref	ref
Semi-skilled/ skilled manual	0.13(-0.35:0.62)	-0.74(-1.24:-0.25)**	0.30(-0.2:0.80)	-1.64(-2.22:-1.07)***	-0.04(-0.64:0.55)	-1.31(-3.20:-2.04)***	0.54(-1.75:-0.44)	-1.65(-2.43:-0.87)***
Other non-/skilled manual	0.01(-0.29:0.33)	-0.41(-0.72:-0.1)***	0.35(0.03:0.67)*	-1.06(-1.43:-0.68)***	0.11(-0.26:0.5)	-0.94(-1.30:-0.58)***	0.23(-0.22:0.69)	-1.91(-2.39:-1.43)***
Never worked-no designation	-1.34(-1.79:-0.89)***	-0.89 (-1.4:-0.38)***	-0.77(-1.24:-0.31)***	-2.34(-2.94:-1.75)***	-1.24(-0.9:0.19)	-2.62(-3.20:-2.05)***	-1.09(-0.17:1.25)***	-2.25(-3.05:-1.44)***
Ethnicity								
Irish	ref		ref	ref	ref	ref	ref	ref
Other background	0.45(-1.11:0.79)**	-0.27(-0.61:0.07) ns	-1.17(-1.52:0.82)***	-0.74(-1.16:-0.32)***	2.15(1.74:2.57)***	-1.41(-1.85:-0.96)***	1.01(0.51:1.5)***	-1.1(-1.68:-0.52)***
Neighbourhood safe for play								
Strongly agree	ref	ref	ref	ref	ref	ref	Ref	ref
Agree	-0.34(-0.65:-0.04)*	-0.07(-0.36:0.21)	-1.2(-1.52:-0.89)***	-1.28(-1.63:-0.92)***	-0.32(-0.7:0.05).	-0.72(-1.07:-0.38)***	-1.13(-1.17:-0.87)***	-1.61(-2.06:-1.16)***
Disagree	-0.82(-1.32:-0.32)**	-0.43(-0.91:0.04).	-1.8(-2.3:-1.29)***	-1.51(-2.11:-0.92)***	-0.77(-1.38:-0.15)*	-1.36(-1.93:-0.78)***	-2.02(-2.75:-1.3)***	-2.2(-2.95:-1.45)***
Strongly disagree	-0.51(-1.27:0.25)	-0.8(-1.59:-0.01)*	-0.77(-1.57:0.01).	-2.74(-3.73:-1.75)***	0.08(-0.85:1.02)	-1.4(-2.37:-0.44)**	-0.5(-1.61:0.6)	-3.21(-4.47:-1.97)***
Household member on SW benefits								
Yes	ref	ref	ref	ref	ref	Ref	Ref	ref
No	0.64(0.31:0.97)**	1.3(1.03:1.57)***	0.6(0.24:0.92)***	1.9(1.53:2.21)***	0.5(0.09:0.91)*	1.08(0.75:1.41)***	1.03(0.55:1.52)***	2.56(2.12:2.99)***

Table 9:14 Baseline and Follow-up Domain Scales and Well-being Indices univariate associations with developmental determinants representing Pre-natal factors

Pre-natal factors	Health and Physical development		Socio-emotional		Cognitive-motor		Well-being Index	
	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline (N=10,134)	Follow-up (N=9,475)	Baseline	Follow-up
Intake of folic acid								
Yes	ref	ref	ref	ref	ref	ref	Ref	ref
No	0.6(0.06:1.14)*	-0.7(-1.24:-0.16)*	-0.37(-0.92:0.18) ns	-0.93(-1.59:-0.26)**	0.1(-0.54:0.76)	-1.39(-2.06:-0.72)***	0.46(-031:1.25)	-1.7(-2.58:-0.82)***
Intake of iron								
Yes	ref	ref	ref	ref	ref	ref	Ref	ref
No	-0.07(-0.37:0.22)	0.03(-0.26:0.32) ns	-0.35(-0.65:-0.03)*	-0.28(-0.65:0.07)	-0.006(-0.37:0.36)	0.33(-0.02:0.68).	-0.35(-0.79:0.9)	0.16(-0.29:0.63)
PCG smoking								
Yes	ref	ref	ref	ref	ref	ref	ref	ref
No	0.87(0.5:1.23)***	0.82(0.46:1.18)***	-0.07(-0.45:0.3)	1.89(1.45:2.34)***	0.85(0.40:1.30)	1.02(0.59:1.46)***	0.87(0.34:1.39)**	2.66(2.09:3.22)***
PCG alcohol consumption								
Yes	ref	ref	ref	ref	ref	ref	ref	ref
No	0.09(-0.24:0.43)	-0.65(-0.98:-0.32)***	0.67(0.31:1.02)***	0.4(-0.01:0.81).	0.73(0.31:1.15)***	-0.42(-0.82:-0.03)*	0.92(0.42:1.42)***	-0.07(-0.58:0.43)
PCG stress								
A great deal	ref	ref	ref	ref	ref	ref	ref	ref
Some	0.9(0.38:1.4)***	1.33(0.83:1.84)***	0.3(-0.22:0.81)	0.89(0.26:1.51)**	-0.28(-0.9:0.34)	0.56(-0.03:1.17).	0.46(-0.27:1.19)	1.66(0.88:2.45)***
Not much	1.53(1.02:2)***	1.8(1.28:2.31)***	0.89(0.36:1.42)***	1.57(0.94:2.21)***	0.01(-0.62:0.64)	0.88(0.27:1.5)**	1.44(0.69:2.19)***	2.87(2.07:3.68)***
None at all	2.17(1.63:2.7)***	1.64(1.12:2.17)***	2.55(2:3.1)***	3.03(2.37:3.69)***	0.41(-0.24:1.07)	0.52(-0.11:1.16)	3.32(2.54:4.09)***	3.70(2.88:4.53)***

Chapter 10 Applications of the Domain Scales and Well-Being Index

10.1 Background

The Domain Scales and Well-being Index were presented in two forms: an interval version, showing standardized scores (mean 100 and standard deviation of 10) and an ordinal version distinguishing between very poor (lowest 5%), poor (>5-15%), good (>15-85%) and very good outcomes (>85%). The distributions of the children's scores or development category for each Domain Scale (Health and Physical Development, Socio-Emotional and Cognitive-Motor Domain Scale) were presented in Chapters 5-7. Similarly, distributions of children based on their well-being scores or category were presented in Chapter 8.

The Domain Scales and Well-being Index are useful to rank (interval form) or classify (ordinal form) children relative to each other. They facilitate: 1. comparisons between sub-groups of children with differing outcomes or backgrounds; 2. identification of significant aspects from children's lives associated with better development and well-being; and 3. due to the longitudinal nature of this study, investigation of the relationship between well-being and domain development across time

This chapter illustrates some practical applications of the two forms of the Domain Scales and the Well-Being Index. These can be employed for descriptive or analytical purposes. The applications of the **interval form** vary from simple visual representations (distribution of scores or mean scores across groups) and analysis of variance or tests of differences in the mean to more complex unadjusted and fully adjusted regression analysis (examining associations with determinants that can promote or constrain development). The **ordinal form** adds to the descriptive applications mentioned above. This is particularly useful for closer investigation of the children with negative (very poor and poor outcomes) or positive (very good) development and well-being. Finally, the two forms can be used in combination and availing of the longitudinal nature of this project, distributions of the follow-up Domain and Well-Being scores can be presented and investigated across corresponding baseline categories from the ordinal forms.

10.2 Methods

10.2.1 Procedure

10.2.1.1 Applications of the interval version of the Domain Scales and Well-Being Index

For **descriptive purposes** the interval form of the Domain Scales and Well-Being Index can be used to show distribution of scores or mean score differences across *geographic regions* or *sub-groups* such as income quintiles, sex, type of childcare, birth-weight category and others. The following four examples were selected:

Example 1: The distribution of mean Domain and Well-Being scores shown across the eight regions of Ireland: Border, West, Midlands, Mid-East Regional Authority, Dublin, South-East, South-Wes, Mid-West region

Example 2: The distribution of the mean Domain and Well-Being scores shown across income quintiles

Example 3: The distribution of Domain and Well-Being scores by gender

Example 4: The distribution of Domain and Well-Being scores by birth-weight group (low: <=2,500 grams, normal: 2,500-4,500 grams and high: >=4,500 grams)

To demonstrate the application of the interval form of the Domain and Well-Being scales for inferential purposes some of the examples above were used to examine if the observed differences were statistically significant. One Way Analysis of Variance was carried out for Examples 2 and 4, while Welch two samples T-test of difference in the mean was employed for Example 3. The interval form can also be used for more complex analysis and applications of the scales and the index in univariate linear regression models were presented in Chapter 9. Additionally, the interval Domain Scales and Well-Being Index can be employed to establish the totality of factors that can promote or constrain health and physical, socio-emotional, cognitive-motor development and well-being, at baseline and follow-up. For this, 8 *fully adjusted linear regression models* (4 for baseline and 4 for follow-up) were constructed. The outcome variables for these models were each Domain Scale and Well-Being Index from baseline and follow-up. All developmental determinants significantly associated with the scales or index in unadjusted analysis were initially included as explanatory variables. The models were developed using automatic step-wise regression and a *forward selection approach* was employed. Aikaike Information Criterion (AIC)[10] was used to select variables for the final models.

10.2.1.2 Applications of the ordinal version of the Domain Scales and Well-Being Index

The applications of the ordinal form for descriptive purposes are particularly meaningful when closer examination of the children from extreme groups is desired. The ordinal Domain Scales and Well-being Index can be used to investigate sample trends (monitor changes) from baseline to follow-up. For children with Very Poor, Poor and Very Good well-being, a socio-demographic profile, using similar criteria to those from Cheevers et al. (for comparative purposes) can be created[14]. In addition, using cross-tabulation, the ordinal version of the Domain Scales can be employed for cross-sectional sample summaries showing the distribution of children across a number of domains scoring in the top and bottom 15%. Given that similar results were previously presented for Australian children (0-1 year-old and 4 year-olds) and 9 year-old Irish children this representation offers scope for national and international comparisons.

10.2.1.3 Combination of the two versions of the Domain Scales and Well-Being Index

Availing of the longitudinal nature of this project, the ordinal and interval forms of the Domain Scales and Well-Being Indices from baseline and follow-up can be used together. Combining the baseline interval form with the follow-up ordinal form would show the distribution of baseline Domain and Well-Being scores across corresponding follow-up Domain and Well-Being classes (Very poor, Poor, Good and Very good). For completeness differences between classes can be investigated using One Way Analysis of Variance tests.

10.2.2 Statistical analysis

To illustrate the descriptive use of the Domain Scales and the Well-Being Index bar charts generated in Excel and density plots generated with the help of functions `plot(density())` and `lines()` from R were used. Differences in the mean were investigated with the function `t.test()` in R while variances across groups was examined using the function `aov()`. The function `lm()` from the `package ltm` in R was used to construct linear regression models and the function `step()` was used to determine the model that best fits the data.

[10] AIC is a model comparison criterion and lower values are indicative of improvement in the model.

10.3 Results and discussion

Some applications of the continuous and categorical versions of the Domain Scales and Well-Being Indices are presented in discussed in comparison to other national and international studies.

10.3.1 Interval version

In Example 1, we show baseline and follow-up differences between mean Domain and Well-Being Index scores across the eight geographic regions of Ireland (Figures 10.1). The highest well-being mean scores at baseline and follow-up were observed in the Midlands, while the lowest were recorded in the South-East. Regional representation of well-being scores can serve to highlight regions in need of targeted interventions to improve child well-being. The circumstances of children with best well-being could be further investigated and results could be used for local and national policy.

In Example 2, baseline and follow-up differences between mean domain and well-being scores across the corresponding equivalised family income quintiles are shown (Figure 10.2). A One Way Analysis of Variance was performed to test the relationship between equivalised income quintiles and Well-Being Indices at: 1. baseline ($F(9,148)=2.24$, p-value=0.06) and 2. follow-up ($F(8,390)=124.8$, p-value<0.001). The Tukey post-hoc comparison test indicated that: 1. At baseline: mean Well-Being Index scores did not differ significantly across income quintiles and 2. At follow-up: the increase in mean Well-Being Index across income levels was significant for all quintiles (except from the small increase observed between 1st and 2nd respectively 4th and 5th quintiles). A similar gradient in the relationship between Well-Being Index and income quintiles was observed by Sanson et al in Australian 4-year-olds and by Cheevers et al. in Irish 9 year-old children[14, 47, 66]. This can suggest that the influence of income disparities on child well-being is seen more as the child grows. However, these findings should be interpreted with caution as the baseline data was collected at the end of an economic boom period, while follow-up data was collected during a period of economic recession.

As per Example 3 (Figures 10.3 and 10.4), mean Domain and Well-Being Index scores are higher for girls. Welch two samples T-tests of differences in the mean showed that girls mean WI was significantly higher at both baseline and follow-up (1. Baseline: $T(9,810)=-6.02$, p-value<0.001; 2. Follow-up: $T(8,776)=-16.39$, p-value<0.001). These findings are consistent with previous studies showing similar well-being gender differences[14, 38, 47]. Results reported by Cheevers et al. showing that 9 year-old Irish boys score significantly higher than girls on the Physical Health and Educational Attainment Domains and lower on the Socio-Emotional Domain, contradict our findings suggesting that gender differences might not be consistent at all ages[14].

Example 4 (Figures 10.5 and 10.6) shows baseline and follow-up distribution of domain and Well-Being Index scores across the three birth-weight groups. Results from One Way Analysis of Variance showed that both baseline and follow-up mean Well-Being Index scores differ significantly across birth-weight groups (1. Baseline: $F(8,840)=196,9$, p-value<0.001 and 2. Follow-up: $F(8,743)= 32.12$, p-value<0.001). The Tukey post-hoc comparison test indicated baseline Well-Being Index mean increased significantly across the following pairs of birth-weight groups: Low and Normal birth-weight and Low and High birth-weight. No significant difference was observed between the Normal and High birth-weight sub-groups. Follow-up results were consistent with the baseline findings. These results are in line with previous research showing poorer overall developmental outcomes for low birth-weight children[89].

Knowing what are the associations between domain development or well-being and various aspects from children's life context is important. In general, public policies aimed at improving child well-being often do so in an indirect manner by targeting aspects from children's life (e.g. poverty, neighbourhood safety, access to healthcare)[49]. The developmental determinants significantly associated with the Domain Scales and Well-Being Indices are presented in Table 10.1 (baseline) and Table 10.2 (follow-up). The two tables report complete results from the 8 fully adjusted linear regression models (4 at baseline and 4 at follow-up) that were best fitted to the data. Selected results considered relevant to current national topics of debate (e.g. childcare, mental health) are presented and discussed below. A more detailed discussion (including comparisons with findings from other similar studies) is presented in Chapter 11.

Type of childcare

Childcare facilities (associated costs in particular) are topical issues concerning Irish parents and policy makers. Findings from our analysis can contribute by highlighting possible implications of the type of childcare on children's outcomes.

Results from fully adjusted regression analysis show that 9-month old children in parental care had significantly higher (p-value<0.001) health and physical development scores and well-being scores (p-value=0.05) than children in centre-based care. Reported to the same reference category (centre-based childcare) 9-month-olds in small-setting childcare facilities had significantly better outcomes on all three domains and the Well-Being Index. At 3 years, children in parental or small setting childcare had better health and physical development outcomes but worse socio-emotional and cognitive-motor scores. These results are consistent with previous studies suggesting better health status for children cared for in small-setting facilities or at home, better cognitive outcomes for children in centre-based settings and mixed childcare implications on socio-behavioural outcomes (often negative for children in centre-based childcare)[89]. Researchers agree that the early exposure to infections through contact with larger groups of children specific to centre-based childcare has long-term benefits through improved immune system development[124, 125, 130].

Parental mental health and emotional status

Mental health is a topic of current debate in Ireland. Results from this study show significant associations between parental mental health and emotional status and child development on all domains. Higher levels of PCG parental stress were negatively associated with follow-up scores on the Health and Physical Development and Cognitive-Motor domains and with baseline and follow-up scores on the Socio-Emotional Domains and Well-Being Indices. Previous studies have shown similar relationships between the impact of parental stress on parenting and children's socio-emotional and cognitive development[89]

Consistent with previous research increased PCG depression scores were significantly associated with worse outcomes on the health and physical development and socio-emotional dimensions and lower well-being scores at 3 years[89].

Good PCG-SCG relationship (accounted for by Dyadic Adjustment scores) was significantly associated with improved socio-emotional and well-being baseline and follow-up and better baseline cognitive-motor outcomes. Relationship satisfaction has been shown to play an important part in parent-child interactions promoting good cognitive and socio-emotional development[33, 89, 92, 116, 119].

Home learning environment

Previous research showed that early home learning experience has a great contribution to child's future learning abilities[41, 92]. According to results from this PhD project limited talking to the 9 month-old child was negatively associated, while increased frequency of reading to the 3 year-old child was positively associated with the corresponding cognitive-motor scores. Furthermore, similar associations were observed for the baseline and follow-up Socio-Emotional Domains and Well-Being Indices. This is of great relevance to Irish parents and suggests that engaging in such activities (frequent talking and reading) is also beneficial to the child's social and emotional development.

During pregnancy behaviours and childbirth

The negative effects of during pregnancy behaviours like smoking or increased stress on child's health were previously documented. Similarly, we observed a negative association between smoking during pregnancy and baseline health and physical development scores. Additionally, reduced stress during pregnancy was strongly associated with better health and physical development scores at baseline and follow-up.

The childbirth experience including medications administered can have short or long-term effects on physical and mental development. Accordingly, we observed that children born through Caesarean section had significantly lower baseline health and physical development, cognitive-motor and well-being scores. Similar negative association between Caesarean section and health and physical development scores was also observed at follow-up. These findings can be of relevance to future mothers and health workers who are the main caregivers to expectant mothers.

Gender differences

Previous studies, including micro-level indicators research, has shown that boys are more predisposed to developmental difficulties and are more affected by behavioural and learning disorders[14, 38, 41, 47, 89, 91-93]. Accordingly, our results show that 9 month-old girls had better scores on all domains and the Well-Being Index. Consistent to baseline, 3 year-old girls had better socio-emotional, cognitive-motor and well-being outcomes but scored lower than boys on the Health and Physical Development Domain.

Results from fully adjusted analysis contribute to a more comprehensive image of national child well-being where children's individual characteristics and certain life aspects are examined together. The associations observed confirm previous developmental theories (bio-ecological model of child development and Barker hypothesis) and findings from other child development studies (presented in Tables 9.1-9.5, Chapter 9). In addition, for all three Domain Scales and the Well-Being Index, baseline scores are significant (p-value<0.001) predictors of future outcomes. This demonstrates that while being a measure of current functioning the Domain Scales and the Well-Being Index are also reflective of children well-becoming.

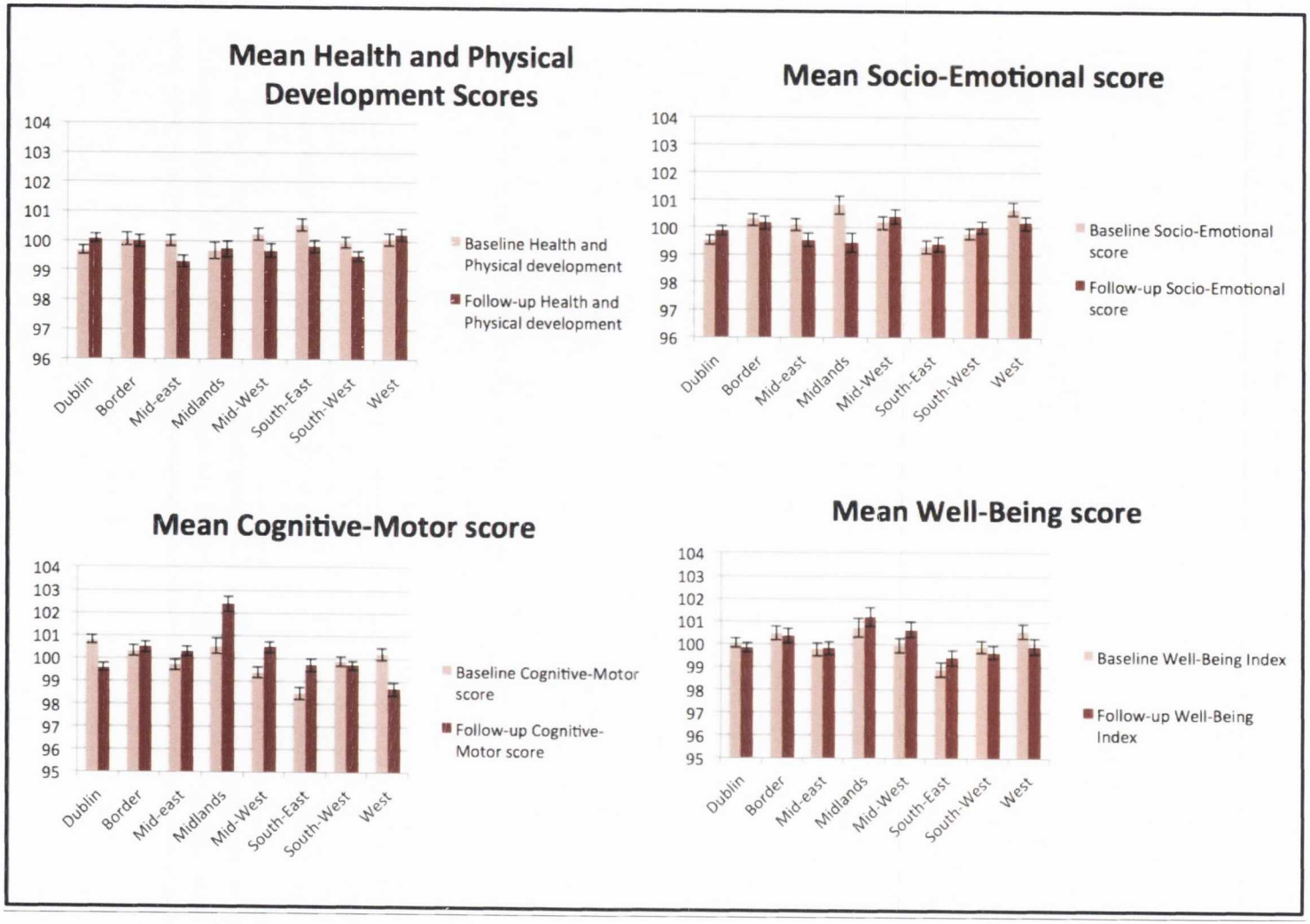

Figure 10.1 Example 1. Baseline and Follow-up Domain Scales and Well-Being Index mean scores per region

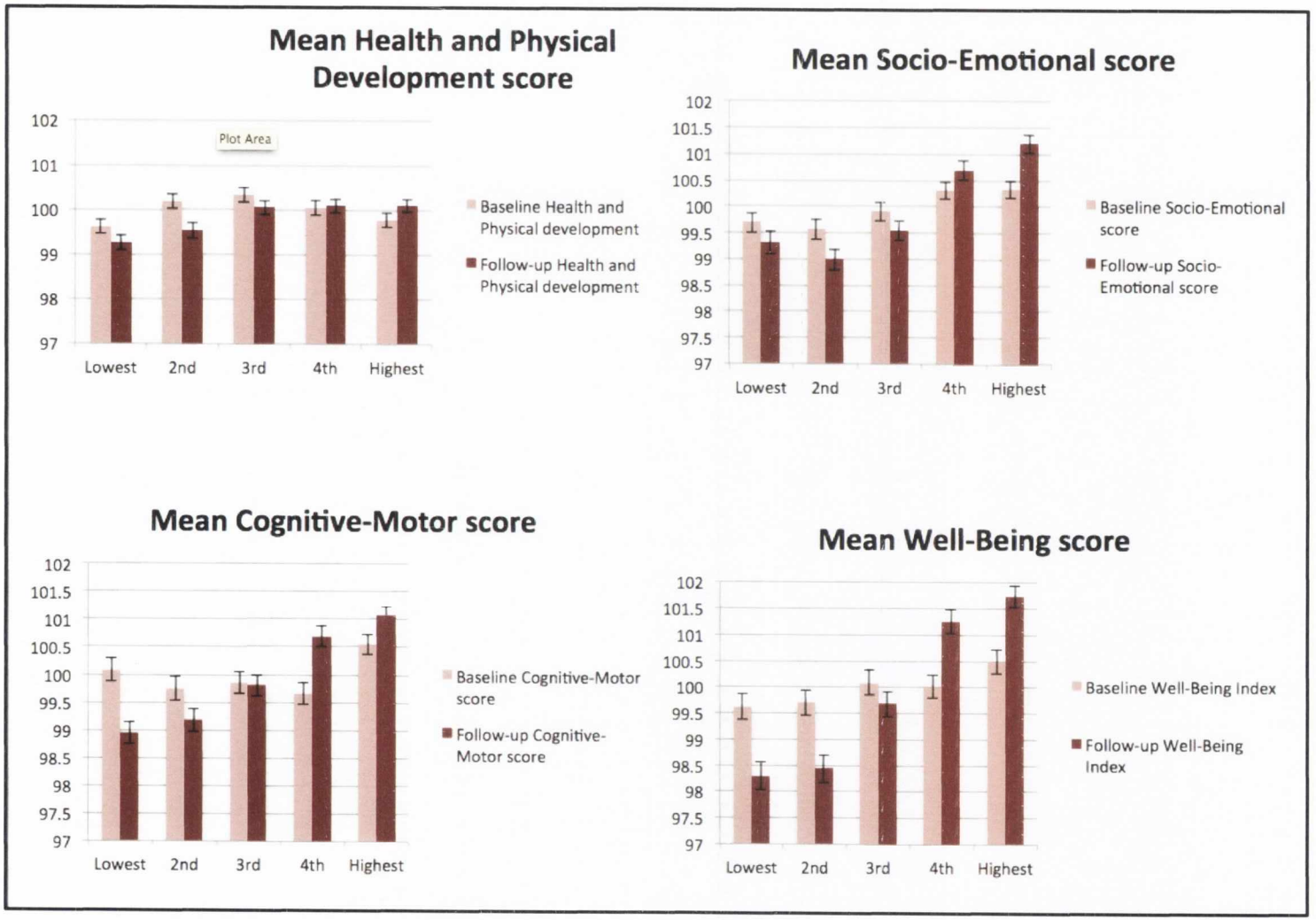

Figure 10.2 Example 2 Baseline and Follow-up Domain Scales and Well-Being Index mean scores per equivalised income quintile

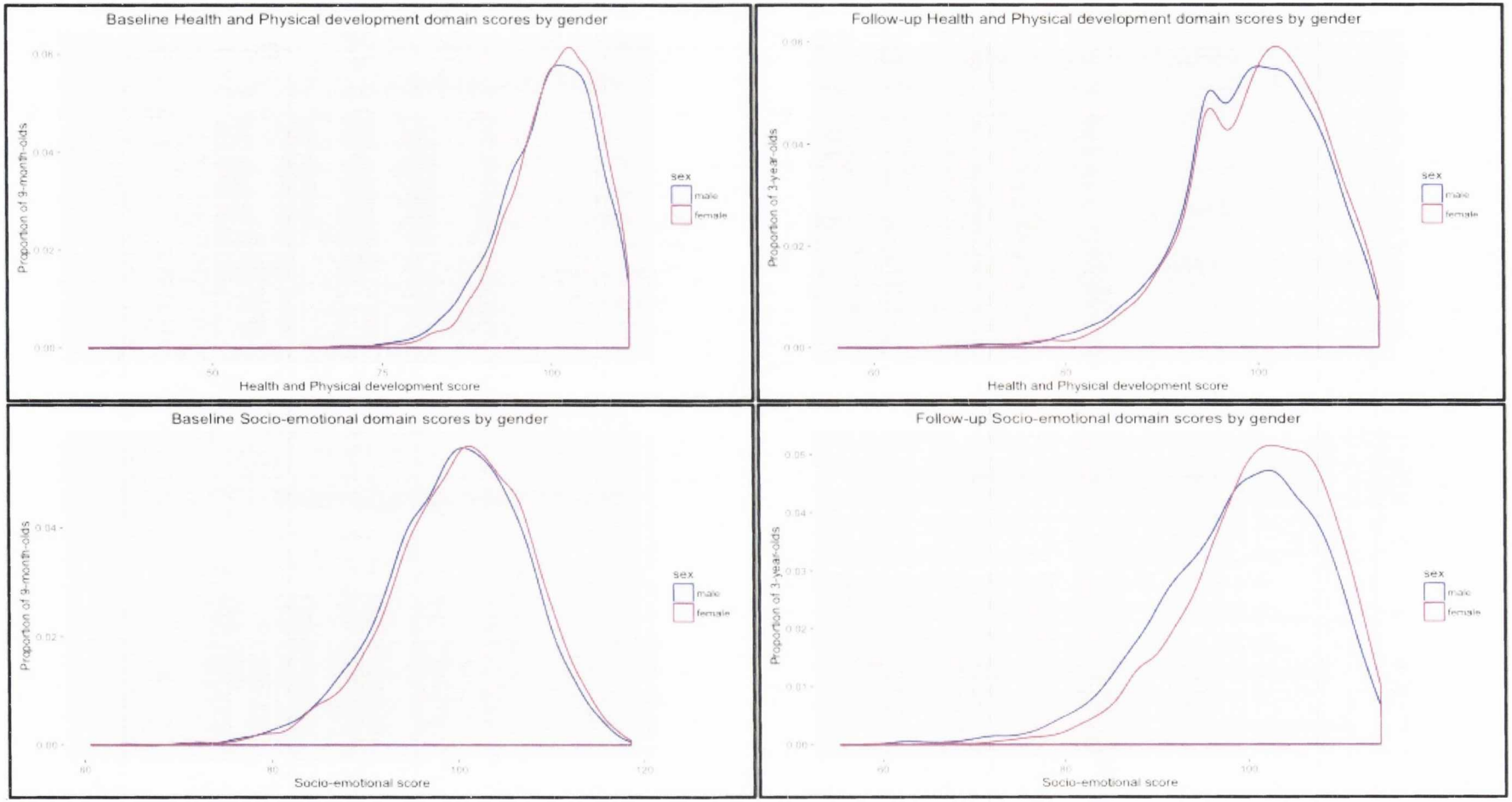

Figure 10.3 Example 3.A Baseline and follow-up Health and Physical Development and Socio-Emotional Domain Scales by gender

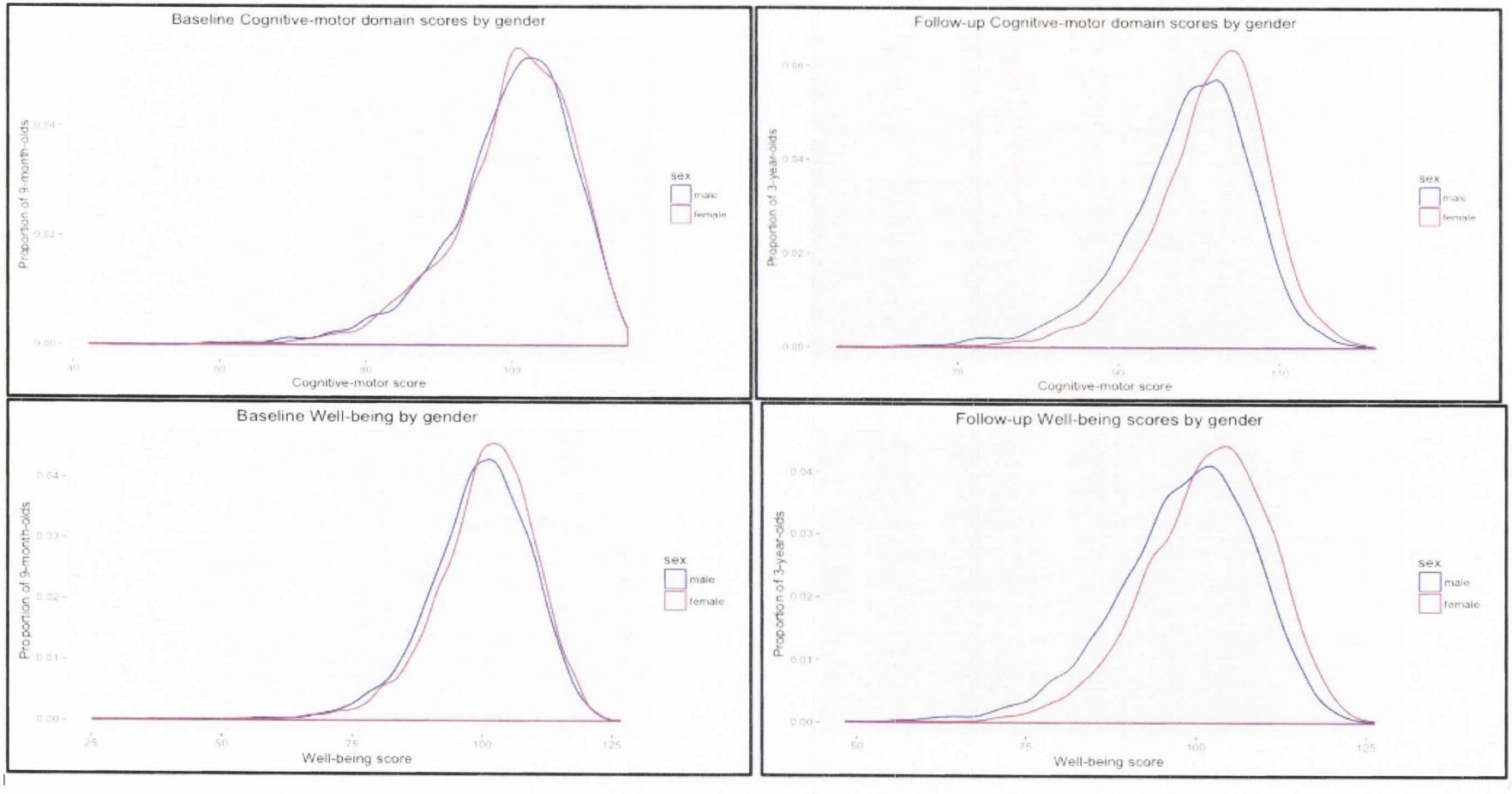

Figure 10.4 Example 3.B Baseline and follow-up Cognitive-Motor Domain Scales and Well-Being Indices by gender

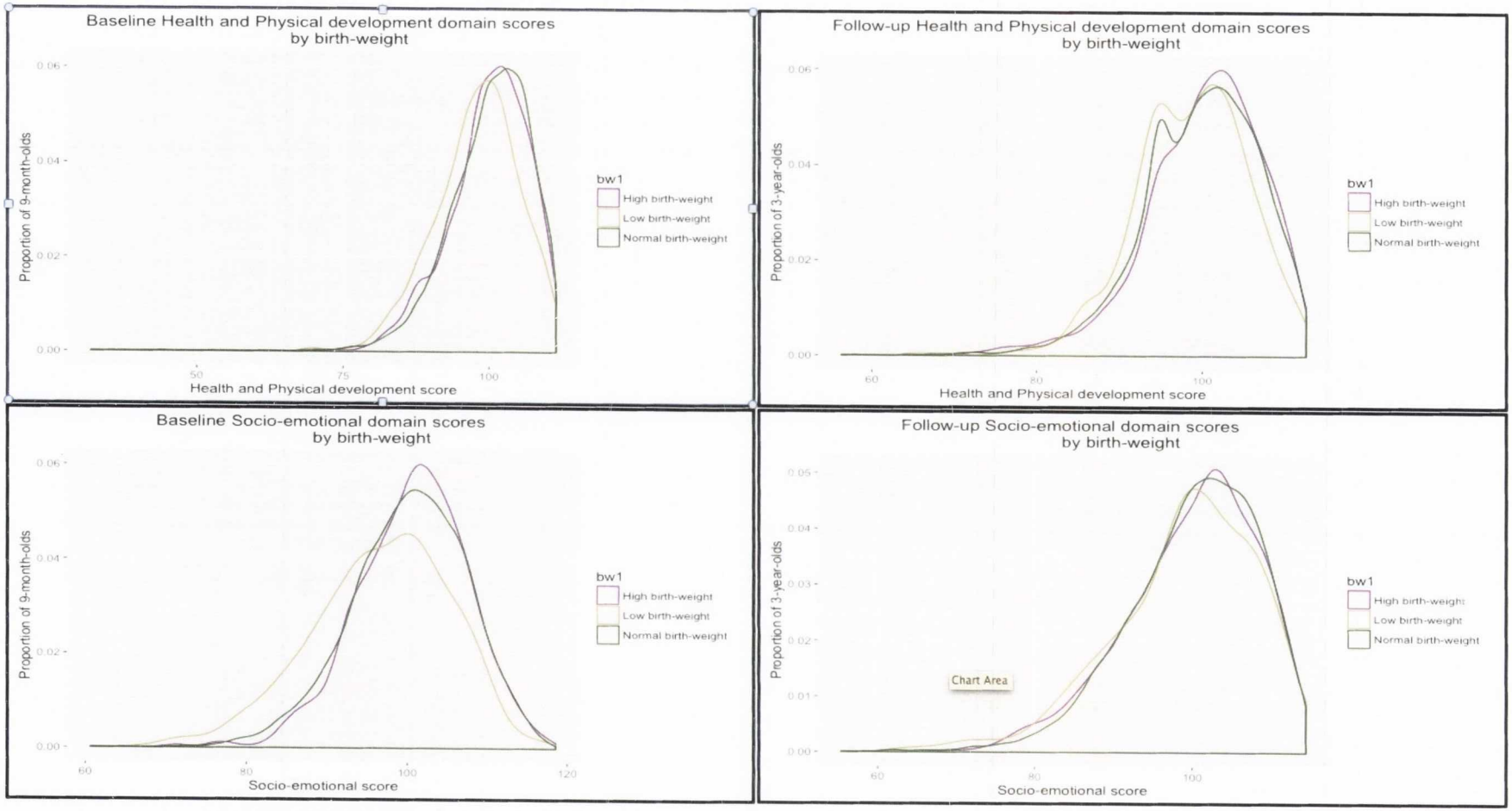

Figure 10.5 Example 4. A Baseline and follow-up Health and Physical Development and Socio-Emotional Domain Scales by birth-weight

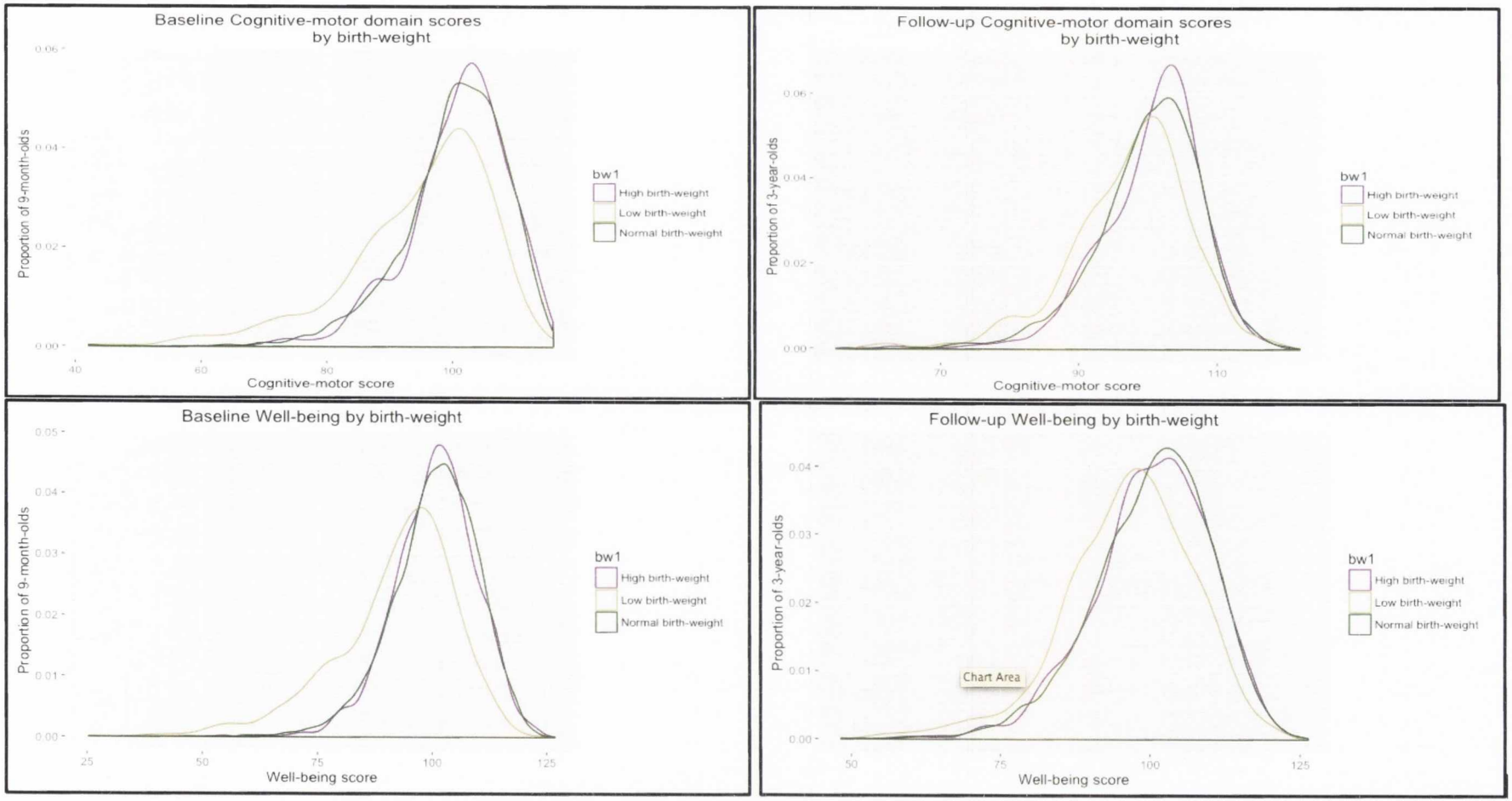

Figure 10.6 Example 4.B Baseline and Follow-up Cognitive-Motor Domain Scales and Well-Being Indices by birth-weight

Table 10:1 Developmental determinants for baseline Domain Scales and Well-Being Index

Baseline Developmental determinants	Health and Physical development (N=10,879)	Socio-emotional (N=10,751)	Cognitive-motor (N=10,134)	Well-being Index (N=9,793)
Individual characteristics				
Gender				
Male	ref	ref	ref	ref
Female	0.77(0.46:1.08)***	0.62(0.33:0.9)***	0.46(0.01:0.81)*	1.25(0.83:1.66)***
Birth-weight		0.001(0.001:0.002)***	0.001(0.001:0.002)***	0.001(0.001:0.003)***
Gestational age	0.44(0.36:0.52)***	0.29(0.21:0.38)***	0.78(0.68:0.89)***	0.94(0.81:1.07)***
Mode of delivery				
Normal delivery	ref		ref	ref
Assisted delivery	-0.07(-0.53:0.39)		-0.36(-0.9:0.18)	-0.54(-1.18:0.09)
Emergency caesarean	-0.83(-1.32:-0.34)***		-0.04(-0.6:0.52)	-0.51(-1.17:0.14).
Planned/Elective caesarean	-0.08(-0.57:0.4)		-0.62(-1.16:-0.08)*	-0.66(-1.29:-0.03)*
Breastfeeding duration	0.002(0.002:0.005)**		0.01(0:0.01)***	0.003(0.002:0.009)**
Number of sleep hours/ night	0.22(0.1:0.33)***	0.59(0.49:0.69)***	-0.05(-0.18:0.09)	0.45(0.29:0.6)***
Number of sleep hours/ day			-0.33(-0.53:-0.13)	
Child's interactions				
Other children in the home				
Yes		ref	ref	ref
No		1.34(1.03:1.65)***	1.58(1.18:1.98)***	1.8(1.32:2.27)***
Relationship with PCG				
Quality of attachment score	0.11(0.05:0.18)***	0.44(0.38:0.5)***		0.34(0.25:0.43)***
Contact with grandparents				
Yes			ref	
No			0.08(-1.26:1.43)	
All grandparents live abroad			0.94(0.12:1.76)*	
Talk to the child				
Always		ref	ref	ref
Often		-1.8(-2.14:-1.46)***	-2.28(-2.71:-1.86)***	-2.61(-3.10:-2.11)***
Sometimes		-2.98(-3.55:-2.42)***	-3.66(-4.35:-2.97)***	-3.97(-4.79:-3.14***
Rarely		-4.42(-6.62:-2.21)***	-7.10(-9.85:-4.36)***	-6.79(-10.07:-3.44)***
Never		0.91(-0.03:1.86).	1.08(-0.08:2.25).	2.13(0.77:3.49)**
Childcare interactions				
Centre childcare	ref	ref		
Parental childcare	1.4(0.89:1.91)***	-0.36(-0.82:0.11)		0.77(0.08:1.45)*
Small-setting childcare	1.23(0.7:1.76)***	0.56(0.08:1.04)*		1.18(0.47:1.88)**
Primary Caregiver and family factors				
PCG age at baseline	0.03(0:0.06).	-0.06(-0.09:-0.03)***	-0.08(-0.12:-0.04)***	
PCG's health				
Poor	ref	ref		ref
Fair	0.42(-1.69:2.52)	0.75(-1.1:2.61)		-1.06(-3.84:1.72)
Good	0.92(-1.09:2.94)	0.39(-1.38:2.17)		-0.58(-3.24:2.08)
Very Good	1.66(-0.35:3.67)	0.35(-1.42:2.12)		-0.11(-2.76:2.54)
Excellent	1.98(-0.04:4).	0.98(-0.8:2.75)		0.69(-1.97:3.35)
Education				
Lower secondary or less	ref	ref	ref	ref
Post secondary	-0.44(-1.08:0.19)	0.02(-0.55:0.59)	0.43(-0.26:1.12)	-0.5(-1.33:0.33)

Baseline Developmental determinants	Health and Physical development (N=10,879)	Socio-emotional (N=10,751)	Cognitive-motor (N=10,134)	Well-being Index (N=9,793)
Non Degree	-0.83(-1.53:-0.13)*	0.61(-0.01:1.23).	1.74(1:2.48)***	0.49(-0.4:1.39)
Degree	-1.04(-1.74:-0.34)**	-0.19(-0.81:0.43)	1.09(0.37:1.81)**	-0.63(-1.53:0.26)
Parental stress score		-0.16(-0.19:-0.14)***		-0.12(-0.16:-0.08)***
BMI			-0.04(-0.08:0)	
Dyadic adjustment		0.12(0.09:0.15)***	0.12(0.08:0.15)***	0.15(0.1:0.19)***
Overall support				
I get enough help	ref			
I don t get enough help	-0.51(-1.06:0.05).			
I don t get any help at all	-0.12(-0.86:0.61)			
I don t need any help	0.7(-0.01:1.4).			
Family not in the country	-0.27(-0.97:0.43)			
Socio-demographic and economic factors				
Social class				
Professional/managerial	ref	ref		ref
Semi-skilled/ skilled manual	0.27(-0.37:0.9)	0.74(0.19:1.3)**		0.69(-0.13:1.52).
Other non-/skilled manual	-0.12(-0.52:0.27)	0.21(-0.14:0.56)		0.25(-0.27:0.76)
Never worked-no designation	-1.69(-2.72:-0.65)**	-0.68(-1.57:0.2)		-1.24(-2.57:0.1).
Ethnicity				
Irish	ref	ref	ref	ref
Other background	0.45(-0.06:0.96).	-0.48(-0.86:-0.1)*	0.96(0.4:1.52)***	0.92(0.33:1.52)*
Neighbourhood safe for play				
Strongly agree		ref	ref	Ref
Agree		-0.55(-0.86:-0.23)***	0.02(-0.37:0.41)	-0.4(-0.86:0.07).
Disagree		-0.7(-1.23:-0.18)**	-0.85(-1.5:-0.19)*	-1.18(-1.95:-0.4)**
Strongly disagree		-0.02(-0.84:0.8)	0.16(-0.87:1.19)	0.12(-1.1:1.34)
Household member on SW benefits				
Yes	ref			Ref
No	0.46(0.02:0.9)*			0.6(0.03:1.18)*
Pre-natal factors				
Intake of folic acid				
Yes	ref			
No	0.62(-0.13:1.36)			
PCG smoking				
Yes	ref			
No	0.57(0.08:1.06)*			
PCG stress				
A great deal	ref	ref		
Some	0.47(-0.16:1.1)	-0.39(-0.95:0.17)		
Not much	0.73(0.08:1.37)*	-0.51(-1.08:0.06).		
None at all	1.21(0.53:1.88)***	0.02(-0.58:0.62)		

Table 10:2 Developmental determinants for follow-up Domain Scales and Well-Being Index

Follow-up Developmental determinants	Health and Physical development (N=9,429)	Socio-emotional (N=9,785)	Cognitive-motor (N=9,046)	Well-being Index (N=8,843)
Individual characteristics				
Baseline domain score	0.28(0.26:0.3)***	0.21(0.19:0.23)***	0.21(0.18:0.23)***	0.28(0.26:0.31)***
Gender				
Male	ref	ref	ref	ref
Female	-0.38(-0.67:-0.09)**	1.58(1.26:1.89)***	2.43(2.09:2.77)***	2.4(1.96:2.85)***
Birth-weight		0.001(0.001:0.002)***	0.001(0.001:0.002)***	0.001(0.001:0.003)**
Gestational age	0.07(-0.01:0.14).			
Mode of delivery				
Normal delivery	ref	ref		
Assisted delivery	-0.39(-0.82:0.03).	-0.01(-0.47:0.46)		
Emergency caesarean	-0.65(-1.11:-0.2)**	0.17(-0.31:0.66)		
Planned/Elective caesarean	-0.28(-0.73:0.17)	0.75(0.27:1.22)**		
Breastfeeding duration	0.002(0.002:0.005)*			0.003(0.002:0.01)*
Fresh fruit (weekly)				
Not at all	ref	ref	ref	ref
Once	0.48(-0.07:1.02).	0.76(0.17:1.36)*	0.08(-0.57:0.72)	0.58(-0.25:1.41)
More than once	0.55(0.03:1.06)**	0.67(0.1:1.23)*	0.43(-0.17:1.04)	1.01(0.22:1.8)*
Raw vegetables (weekly)				
Not at all	ref	ref		
Once	0.44(0.07:0.82)*	0.39(-0.02:0.8)*		
More than once	0.26(-0.32:0.84)	0.36(-0.27:0.99)		
Child's interactions				
Other children in the home				
Yes	ref			
No	-0.69(-1.09:-0.29)***			
Relationship with PCG				
Pianta positive scale		1.15(1.06:1.24)***	0.43(0.33:0.53)***	0.99(0.87:1.12)***
Contact with grandparents				
Yes	ref			
No	0.83(-0.35:2.02)			
All grandparents live abroad	-0.9(-1.51:-0.28)**			
Read to the child (days/week)		0.23(0.14:0.32)***	0.33(0.24:0.43)***	0.27(0.14:0.39)***
Childcare interactions				
Centre childcare	ref	ref	ref	
Parental childcare	0.55(0.2:0.91)***	-0.83(-1.23:-0.44)***	-0.52(-0.94:-0.1)*	
Small-setting childcare	0.72(0.33:1.12)***	-0.84(-1.28:-0.4)***	-0.63(-1.1:-0.16)**	
Primary Caregiver and family factors				
PCG age at baseline	0.07(0.04:0.1)***	0.07(0.04:0.11)***		0.1(0.05:0.14)***
PCG's health				
Poor	ref			
Fair	-0.27(-2.28:1.75)			
Good	-0.19(-2.14:1.75)			
Very Good	0.14(-1.8:2.07)			
Excellent	0.38(-1.56:2.32)			
Education				

Follow-up Developmental determinants	Health and Physical development (N=9,429)	Socio-emotional (N=9,785)	Cognitive-motor (N=9,046)	Well-being Index (N=8,843)
Lower secondary or less		ref	ref	ref
Post secondary		-0.07(-0.76:0.63)	1.32(0.58:2.07)***	0.79(-0.19:1.77)
Non Degree		-0.24(-0.97:0.49)	1.4(0.63:2.17)***	0.92(-0.1:1.95).
Degree		0.3(-0.43:1.03)	1.94(1.19:2.68)***	1.57(0.54:2.6)**
Parental stress score	-0.04(-0.08:0)**	-0.49(-0.53:-0.45)***	-0.04(-0.08:0.01)	-0.39(-0.45:-0.33)***
PCG's depression score	-0.05(-0.1:0)*	-0.13(-0.19:-0.08)***		-0.12(-0.19:-0.05)**
BMI	-0.09(-0.12:-0.06)***			-0.09(-0.14:-0.04)***
Dyadic adjustment		0.09(0.04:0.14)***		0.12(0.05:0.19)***
Overall support				
I get enough help			ref	
I don t get enough help			-0.87(-1.41:-0.32)**	
I don t get any help at all			-0.67(-1.27:-0.07)*	
I don t need any help			-0.72(-1.44:-0.01)*	
Socio-demographic and economic factors				
Ethnicity				
Irish		ref	ref	ref
Other background		0.58(0.14:1.02)**	-1.22(-1.73:-0.71)	-0.9(-1.59:-0.21)*
Neighbourhood safe for play				
Strongly agree		ref	ref	Ref
Agree		-0.58(-0.92:-0.24)***	-0.42(-0.78:-0.05)*	-0.85(-1.33:-0.38)***
Disagree		-0.26(-0.84:0.32)	-0.9(-1.52:-0.27)**	-0.74(-1.56:0.09).
Strongly disagree		-0.87(-1.88:0.14).	-0.35(-1.45:0.74)	-0.5(-1.89:0.88)
Household member on SW benefits				
Yes	ref	ref		Ref
No	0.3(-0.3:0.65).	0.51(0.14:0.88)**		0.76(0.25:1.28)**
Pre-natal factors				
Intake of folic acid				
Yes			ref	
No			-0.62(-1.44:0.2)	
PCG stress				
A great deal	ref	ref		
Some	0.71(0.14:1.29)*	-0.38(-1:0.24)		
Not much	0.89(0.3:1.47)**	-0.51(-1.15:0.12)		
None at all	0.54(-0.08:1.16).	-0.01(-0.68:0.66)		

10.3.2 Ordinal version

When examining longitudinal sample trends in well-being category from baseline to follow-up (Figure 10.7) it was observed that from children with Good Well-Being Index at baseline, 72 % remained in the same follow-up well-being group, 14% moved to the Very good Well-Being Index follow-up category while 10% and respectively 4% moved to the Poor and Very poor Well-Being Index follow-up categories. Most of the children with Very good baseline Well-Being Index (67%) were categorized as Good well-being at follow-up, with 3% and respectively 2% being categorized as Poor and Very poor well-being. Interestingly, only 16% of the children with Very poor well-being at baseline remained in the same follow-up WI category. The vast majority (62%) of this group was classified as Good well-being at follow-up. A Chi-square test of independence showed a significant association between baseline and follow-up Well-Being Index in ordinal form (X-squared = 641.7907, df = 9, p-value < 2.2e-16).

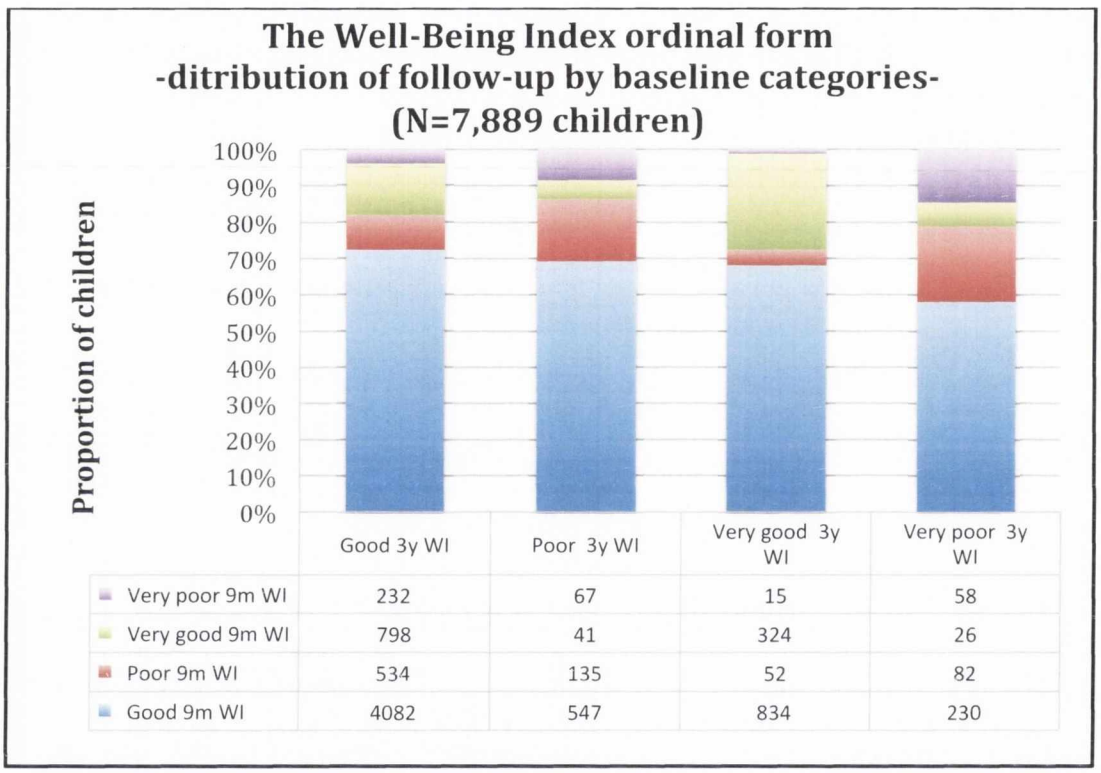

Figure 10.7 Well-Being Index ordinal form: sample trends from baseline to follow-up

Table 10.3 (baseline) and Table 10.4 (follow-up) show socio-demographic profiles of the children with Very poor, Poor and Very good well-being. Results are discussed in relation to similar findings for 9 year-old Irish children. Higher proportions of boys, single-parent households, with a member on social welfare benefit, urban location and lower PCG education level were observed for the baseline negative well-being categories (very poor and poor). These findings were consistent and more evident at follow-up. Very good well-being, on the other hand, was overrepresented by females, two-parent households from rural areas, higher levels of PCG education and social class and lower proportion of social welfare benefit. Similar to negative well-being, differences in proportions were more evident at follow-up. Our findings were similar to results from a previous study carried out with 9 year-old Irish children[14].

Tables 10.5 (baseline) and 10.6 (follow-up) present distributions of the children by the number of domains (1,2 or 3) in which children were categorized as being in either the top (Very good)

or bottom 15% (Very poor and Poor). A value of 0 domains indicated the group of children categorized as Good development on all three domains with no extreme results. Baseline results (Table 10.5) showed that almost a third of the children (31.92%) were categorized as Good development on all three domains. Less than 1% of the children were categorized in either the top or bottom 15% on all three domains. A total of 38.26% of the children scored in the bottom 15% on one domain, while 39.7% scored in the top 15% on one domain. Almost 15% of children were categorized in either the bottom extreme on one domain while scoring in the top extreme on another domain. The follow-up results (Table 10.6) were mostly similar to baseline findings. The proportion of children categorized as top 15% on one domain increased from 39.7% at baseline to 47.41% at follow-up. Similarly, the proportion of children scoring in the bottom 15% on one, two or three domains decreased from an overall figure of 42.37% at baseline to 38.73% at follow-up. Therefore, development only occurs uniformly for a third of the children at both time-points (0 top or bottom 15% domains) and children that are doing poorly on one domain can compensate by doing very well in others.

Baseline findings from this application of the ordinal version of the Domain Scales mirror results obtained with the Well-being Index for 9-years-old Irish children[14]. The follow-up proportions of children observed were similar with regards to the number of domains scoring in the bottom 15%. However, we recorded a higher proportion of 3-year-old children scoring in the top 15% in one domain.

Our results were then compared to findings from similar applications of the LSAC Outcome Index[47] (Figures 10.8 and 10.9). Our baseline results were compared to the categorical version of LSAC Outcome Index for the infant sample (children less than 1 year old), while follow-up results were compared to those from 4 year-old Australian children. The ordinal version of the Physical domain for the child sample (equivalent to the Health and Physical Domain from this study) did not have a top 15% category and this was due to the fact that 58.6% of the sample obtained an "Excellent" health rating[47]. At both time points, the proportion of Australian children that had 0 domains with top 15% scores was higher. The proportion of Irish 3 year-olds scoring in the top 15% in one domain exceeded that of Australian 4 year-olds. Regarding the number of negative domains (bottom 15%) we observed that at both ages the proportions of Australian children scoring in the bottom 15% on one domain was lower and on two domains was higher than corresponding results for Irish children.

Table 10:3 Demographic profile of the children with Very poor (lowest 5%), Poor (>5-15%) and Very good (>=85%) in comparison with entire baseline sample (children with scores on all three baseline Domains)

Baseline*	Very poor WI (N=491)	Poor WI (N=981)	Very good WI (N=1,472)	All sample (N=9,812)
Gender				
Male	274(56%)	566(58%)	701(48%)	4812(49%)
Female	217(44%)	415(42%)	771(52%)	5000(51%)
Education				
Lower secondary or less	77(16%)	143(15%)	139(10%)	1162(12%)
Post secondary	182(37%)	319(33%)	486(33%)	3225(33%)
Non Degree	78(16%)	168(17%)	341(23%)	1913(19%)
Degree	154(31%)	351(35%)	506(34%)	3509(36%)
Household location				
Urban	235(48%)	423(43%)	608(41%)	4251(43%)
Rural	254(52%)	557(57%)	860(59%)	5536(57%)
Social class				
Never worked-no designation	82(17%)	140(14%)	144(10%)	1115(11%)
Other non-/skilled manual	139(28%)	293(30%)	499(34%)	3025(31%)
Semi-skilled/ skilled manual	47(10%)	85(9%)	153(11%)	900(9%)
Professional/managerial	463(45%)	463(47%)	676(46%)	4772(49%)
Household member on SW benefits				
Yes	138(28%)	233(24%)	301(21%)	2079(21%)
No	353(72%)	746(76%)	1165(79%)	7718(79%)
Household type				
Single parent, 1 child	31(6%)	52(5%)	78(5%)	546(6%)
Single parent, 2 children	49(10%)	87(9%)	84(6%)	672(7%)
Two parents, 1 child	104(21%)	254(26%)	581(39%)	3244(33%)
Two parents, 2 children	307(63%)	588(60%)	729(50%)	5350(54%)
Income quintile				
Lowest	127(27%)	211(23%)	319(23%)	1991(22%)
2nd	91(20%)	177(19%)	237(17%)	1720(19%)
3rd	83(18%)	172(18%)	275(20%)	1773(19%)
4th	94(20%)	193(21%)	298(22%)	1968(22%)
Highest	67(15%)	158(17%)	246(18%)	1701(19%)

*Repeated Chi-square tests of independence between baseline socio-demographic variables and the ordinal version of the Well-being Index were carried out. All variables except household location (p-value= 0.07) were significantly (p-value<0.001) associated with the ordinal Well-being Index at baseline.

Table 10:4 Demographic profile of the children with Very poor (lowest 5%), Poor (>5-15%) and Very good (>=85%) in comparison with the entire baseline sample (children with scores on all three follow-up Domains)

Follow-up*	Very poor WI (N=443)	Poor WI (N=884)	Very good WI (N=1,327)	All sample (N=8,843)
Gender				
Male	313(71%)	548(62%)	493(37%)	4457(50%)
Female	130(29%)	336(38%)	834(63%)	4386(50%)
Education				
Lower secondary or less	84(19%)	105(12%)	65(5%)	765(9%)
Post secondary	153(34%)	307(35%)	308(23%)	2526(28%)
Non Degree	83(19%)	174(20%)	301(23%)	1953(22%)
Degree	123(28%)	296(34%)	653(49%)	3591(41%)
Household location				
Urban	202(46%)	377(43%)	536(40%)	3763(43%)
Rural	239(54%)	506(57%)	791(60%)	5060(57%)
Social class				
Never worked-no designation	99(22%)	132(15%)	75(6%)	664(8%)
Other non-/skilled manual	133(30)	279(32%)	367(28%)	2420(27%)
Semi-skilled/ skilled manual	52(11%)	87(10%)	81(6%)	710(8%)
Professional/managerial	159(36%)	386(44%)	804(61%)	5049(57%)
Household member on SW benefits				
Yes	245(55%)	382(43%)	363(27%)	3135(35%)
No	198(45%)	502(57%)	964(73%)	5706(65%)
Household type				
Single parent, 1 child	39(8%)	72(8%)	36(3%)	467(5%)
Single parent, 2 children	63(14%)	91(10%)	52(4%)	613(7%)
Two parents, 1 child	60(14%)	122(14%)	179(13%)	1249(14%)
Two parents, 2 children	281(64%)	599(68%)	1060(80%)	6514(74%)
Income quintile				
Lowest	116(27%)	194(23%)	116(27%)	1577(19%)
2nd	104(25%)	191(23%)	104(25%)	1506(18%)
3rd	96(23%)	170(20%)	96(23%)	1685(20%)
4th	56(13%)	137(16%)	56(13%)	1705(20%)
Highest	51(12%)	144(17%)	51(12%)	1919(23%)

* Repeated Chi-square tests of independence between follow-up socio-demographic variables and the ordinal version of the Well-being Index were carried out. All variables, except household location (p-value= 0.07), were significantly (p-value<0.001) associated with the ordinal Well-being Index at follow-up.

Table 10:5 Baseline distribution of children across domains scoring in the top and bottom 15%

Number of domains scoring in the bottom 15%	Number of domains scoring in the top 15%				
	0*	1	2	3	All
0	3132 (31.92%)	2319 (23.63%)	182 (1.85%)	33 (0.33%)	5655 (57.73%)
1	2165 (22.06%)	1454 (14.82%)	136 (1.38%)	-	3766 (38.26%)
2	196 (1.99%)	123 (1.25%)	-	-	319 (3.24%)
3	72 (0.31%)	-	-	-	72 (0.31%)
All	5541 (56.47%)	3920 (39.7%)	318 (3.23%)	33 (0.33%)	9812 (100%)

*0 indicates scores between 15-85% or Good development on all domains with no results in the top or bottom 15%

Table 10:6 Follow-up distribution of children across domains scoring in the top and bottom 15%

Number of domains scoring in the bottom 15%	Number of domains scoring in the top 15%				
	0*	1	2	3	All
0	2632 (29.76%)	2696 (30.49%)	290 (3.28%)	28 (0.32%)	5646 (61.27%)
1	1310 (14.81%)	1238 (14%)	30 (0.33%)	-	2578 (32.03%)
2	294 (3.32%)	259 (2.92%)	-	-	553 (5.99%)
3	66 (0.73%)	-	-	-	66 (0.71%)
All	4302 (47.89%)	4193 (47.41%)	320 (3.61%)	28 (0.32%)	8843 (100%)

*0 indicates scores between 15-85% or Good development on all domains with no results in the top or bottom 15%

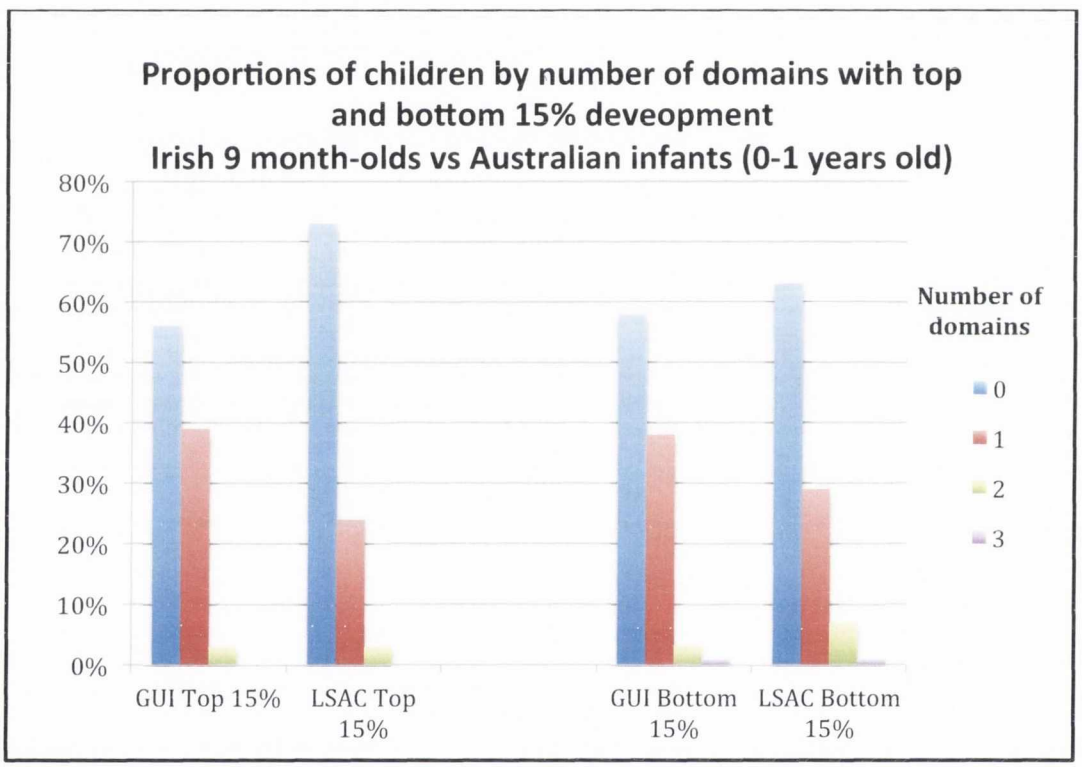

Figure 10.8 Number of domains with top and bottom 15% development Irish 9 month-olds vs. Australian children (0-1 year-olds)

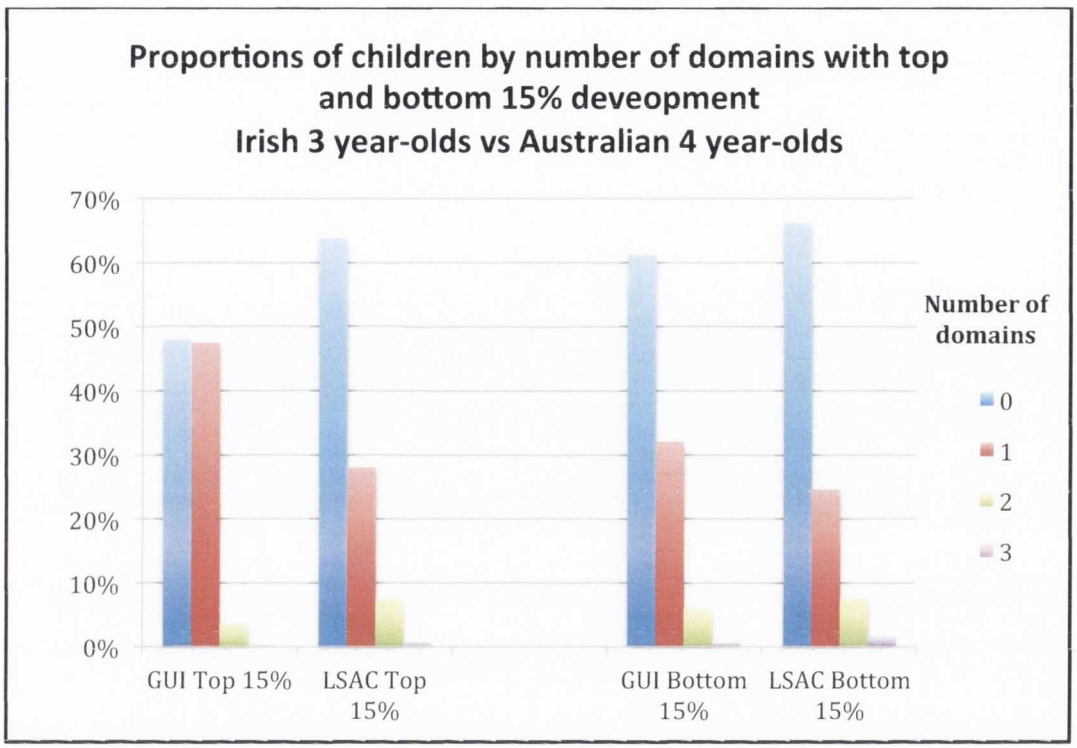

Figure 10.9 Number of domains with top and bottom 15% development Irish 3 year-olds vs. Australian 4 year-olds

10.3.3 Combination of the interval and ordinal versions

Figure 10.10 shows the distribution of follow-up Domain and Well-Being Index scores across the four baseline categories from the corresponding Domain or Well-being Index. Results from One Way Analysis of Variance (limited to Well-Being Index) showed that follow-up Well-Being Index scores differ significantly across the baseline Well-Being categories ($F(7,885) = 284.5$, p-value<0.001). The Tukey post-hoc comparison test indicated that follow-up Well-Being Index scores differed significantly across all groups of baseline Well-Being. These findings confirmed the association between child's previous and subsequent well-being.

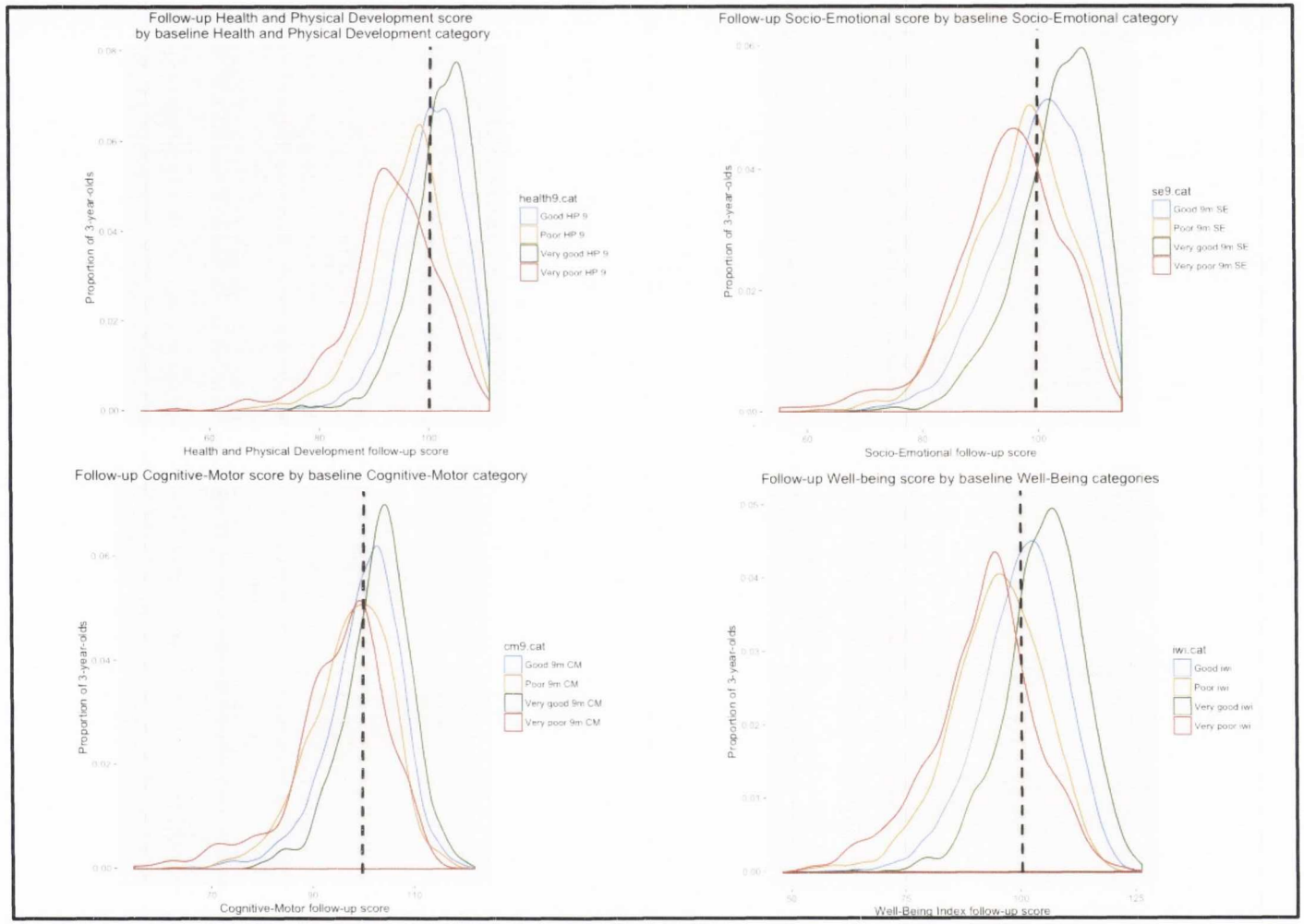

Figure 10.10 Distribution of follow-up Domain and Well-being scores by corresponding baseline Domain or Well-being categories

10.4 Summary and conclusions

This chapter presented several applications of the interval and ordinal forms of the Domain Scales and the Well-being Index highlighting their flexibility of use. The interval form allowed ranking of children based on Domain or Well-Being scores, while the ordinal version was used to classify children in four groups: Very poor, Poor, Good and Very good for each Domain Scale and the Well-Being Index. The following observations can be made:

The interval form:

1. Can be used for descriptive and simple inferential analysis to show differences between children sub-groups (within or across the two cohorts) to more complex univariate (results showed and discussed in Chapter 9) and multivariate linear regression models highlighting significant developmental determinants.
2. Some comparisons between findings from sub-group analysis and other national and international results were made. However, these were limited by findings available from other studies.
3. Results from regression analysis (unadjusted and fully adjusted) are particularly important as some of the significant determinants of development identified represent areas of current national concern. Moreover, results from this study confirmed that point-in-time domain development and well-being are significant predictors of subsequent outcomes, underling the importance of early intervention. A more detail discussion (including comparisons with findings from other child development and micro-level well-being indices studies) is presented in the following chapter.

The ordinal form:

1. Is mainly useful for descriptive purposes
2. Is helpful in investigating characteristics (e.g. socio-demographic profile) of extreme development groups (Very Poor, Poor and Very good development) in relation to Good development
3. Serves to account for the number of domains with negative (Very poor and Poor), positive (Very good) and Good outcomes and sample summaries showing distribution of children with good, top 15% and bottom 15% development are helpful to show that development is not always uniform, underlying the importance of using the Domain Scales in conjunction with the Well-Being Index
4. Some comparisons (in terms of proportions of children) with other national and international results were possible

Both versions of the Domain Scales and Well-Being Indices are versatile and useful. This chapter showed that findings from the applications of the Domain Scales and Well-Being Indices can inform researchers, various stakeholders (e.g. public policy makers at a national and regional level, physical and mental health professionals) and are also relevant for Irish present and future parents. Showing that current domain development and well-being are predictors of subsequent outcomes reinforces the importance of early intervention. We hope that information from this research will serve as a platform for policy initiatives (in areas like childcare, mental health and education) and new campaigns to educate parents in relation to healthy pre-natal and post-natal behaviours.

Chapter 11 Discussion and Conclusions

This chapter presents a summary of the index development experience and a discussion of results and their implications. Aspects regarding development, structure and validation and important findings resulted from illustrating the application of the Domain-Scales and the Well-Being Index are addressed.

The index development journey, from conceptualization to constructing the Domain Scales and the Well-Being Index, is discussed in relation to previous micro-level child well-being research. Special consideration is given to the way this project dealt with previously identified challenges and weaknesses of similar work highlighted in Chapter 1. Addressing these issues here is important as it is widely agreed that lack of consistency in conceptualization and development is one of the major difficulties emerging in this field of research. Further, we discuss some of the findings from Domain Scales and Index validation and applications, and compare these with results from similar work. The relevance of the Domain Scales and the Well-being Index to various stakeholders is underlined and some examples are given.

The strengths and limitations of this project are outlined, followed by future direction, brief general conclusions and recommendations sections.

11.1 Summary of findings

This PhD is a longitudinal study, which developed a child-centred Well-being Index for two pivotal time-points in children's lives (9 months and 3 years). In accordance with international and national trends well-being was assessed from a "whole child" perspective. The Well-Being Index was designed as a measure of development and the following main domains were included: health and physical development, socio-emotional status and cognitive-motor development. This project used baseline (9 months) and follow-up (3 years) data from the Infant Cohort of the Growing Up in Ireland study. Outcomes showing child functioning on each domain were identified and summarized. At each time-point, children with complete outcome data for a domain were assigned a domain score resulting in health and physical development, socio-emotional and cognitive-motor scores. Children's scores on the three developmental domains formed corresponding scales. The Well-Being Index was generated as a summary of the three scales. This facilitated classification of children based on their outcomes on main dimensions of development and overall well-being at age 9 months and later at 3 years. We presented the Domain Scales and the Well-Being Index in two ways: an interval version represented by child-scores and an ordered four-category version allowing to distinguish between children with very poor, poor, good and very good development.

All Domain Scales and the Well-Being Index showed structural and construct validity. The sound structure of the Domain Scales was demonstrated by showing that all child outcomes considered were included in the correct domain and were representative of aspects of development specific for the domain. Additionally, observing satisfactory relationships between the Well-Being Index and each Domain Scale verified the structure of the index. As expected, each Domain Scale or Well-Being Index were strongly associated with several pre-established developmental determinants from the following five groups: individual characteristics, child's interactions, primary caregiver and family factors, socio-demographic and economic factors and pre-natal factors. This confirmed the construct validity of the Domain Scales and Well-Being Index and it allowed us to verify the application of widely accepted theories of development in the Irish context.

Presenting the scales and the Well-Being Index in two versions (interval and ordinal) allows for flexibility and makes them easy to communicate and understand. The *interval version* (each child is assigned a score) of the Domain Scales and the Well-being Index is versatile and can be employed to rank children based on their development or well-being and to present and examine differences across groups (e.g. gender, regions, income etc.). This research investigated significant relationships with pre-established developmental determinants and underlined the factors that can contribute to or undermine well-being or development on each of the three main domains. Some of the important findings were that the male gender or higher levels of primary-caregiver (PCG) stress and depression were significantly associated with poorer outcomes at both time-points on all dimensions including the overall well-being. In contrast, a more positive relationship between primary caregiver and child, primary and secondary caregiver (SCG) or a home environment supportive of learning activities were associated with improved development. Child scores from each baseline Domain Scale and the Well-being Index were positively associated with corresponding results at follow-up. The *ordinal version* allowed classification of children into four groups: Very poor (lowest 5% of the sample), Poor (above the 5^{th} percentile and lower or equal to the 15^{th} percentile), Good (above the 15^{th} percentile and lower than the 85^{th} percentile) and Very good (highest 15% of the sample) domain development or well-being. This version can be used: to monitor sample trends and show longitudinal changes from one category to the other over time, to create demographic profiles for children from extreme domain development or well-being groups (Very poor, Poor and Very good) and to generate sample summaries showing distribution of children with good, top 15% and bottom 15% domain development and well-being. Findings from the applications of the ordinal version of the Well-Being Index confirmed the significant association between baseline and follow-up well-being results. Additionally, this version showed that development might not occur uniformly across all three domains (for instance a child can have very good development on one domain and poor development on another domain).

In brief, this PhD project developed Domain Scales and Well-Being Indices with:

1. sound structure, constructed on components that are measuring what they were thought to be measuring and are relevant to the traits assessed by the domains and implicitly the index.
2. demonstrated validity ensuring that they can discriminate between children with differing outcomes and life context
3. ability to provide valuable insight into children's development
4. flexibility of use ensured by the two versions available (interval- child scores and ordinal- child ranking)

Findings from the applications of the Domain Scales and the Well-being Index:

1. attest that *current domain development and well-being are predictors of subsequent outcomes* (demonstrated with both interval and ordinal versions, individually and combined) suggesting that early interventions could improve future outcomes for children at risk of poor development
2. suggest that development is *not necessarily uniform across domains* (sample summaries generated using the ordinal versions of the Domain Scales showed that children with very poor results on one domain can have good or very good results on another domain), reinforcing the importance of the Domain Scales as stand alone instruments.
3. can serve for *national and international comparisons* between children sub-groups. However, these are limited by the available data

4. can *inform* researchers, various stakeholders (e.g. public policy makers at a national and regional level, physical and mental health professionals etc.) and are also relevant for present and future parents.

We recommend that the scales representative for main developmental dimensions should be used in conjunction with the Well-Being Index, particularly when more detailed analysis is required.

The index development process employed in this project is in line with other two previous studies involving retrospective analysis of data of similar type: large nationally representative samples of children[14, 47]. This approach differs slightly from that of another study specifically designed to investigate child well-being[60, 61]. However, results from the applications of the Domain Scales and Well-being are similar to findings from most previous micro-level child well-being indices irrespective of the methods of index development used. Moreover, they are in line with results from some macro-level child well-being indices and other child development studies. More detailed comparisons and discussions are presented in the following sections of this chapter.

11.2 Discussion of well-being conceptualization and index development

Investigating child well-being is important as children of today are the society of tomorrow. The main merit of micro and macro-level children well-being indices is that they allow evaluation of how children are doing overall. Macro-level indices are generally composed on statistical data aggregated at national level and include indicators like low birth-weight rates, obesity rates and others. Micro-level indices are composed from indicators relevant for the individual child like overall rating of health, math or reading ability scores, pro-social behavior scores and others. Both macro and micro-level indices help draw conclusions about status of the children at a national or individual level. They facilitate comparisons between the well-being of children from different countries (mostly macro-level indices) or from different geographic areas. In addition, as previously shown in Chapter 10, micro-level indices allow comparisons between various sub-groups of children (e.g. boy vs. girls, income quintiles etc.). Micro-level indices can be also used to examine trends of well-being across time (e.g. baseline to follow-up) and if data was available could be used to compare between different cohorts of children. Well-being Indices are composite summary measures reported as a single number or category (e.g. very good, poor, problem, no problem etc.), therefore they are easier to "digest" by policy makers and the general public than complex reports based on several individual child well-being indicators[49].

Responding to calls for a "common consensual framework" this project strived to keep consistent with recommendations emerging from the Child Indicators Movement and previous reviews of child micro-level indices[14, 27, 29, 37, 38, 40, 41, 46, 47].

Therefore, we ensured that the *child was the unit of analysis* and the index was strictly constructed on child outcomes. This was similar to the work of Sanson et al and Cheevers et al[14, 47]. Examining other previous work it was observed that the boundaries between child outcomes and developmental determinants are somewhat fuzzy as they depend on subjective decisions made by the researchers. Moore et al. (2008 and 2012) included variables like parent-child relationship (limited to communication) or involvement in physical activity in the well-being index[37, 38]. For this project, on the other hand such variables were not considered to be a direct measure of child development and were seen as better suited for developmental determinants.

The *multidimensionality of child development* was acknowledged and the Well-Being Index was constructed on three domains assessing the child's Heath and Physical Development, Socio-Emotional status and Cognitive-Motor development. This was in line with developmental theories and the work of Sanson et al and Cheevers et al., although the domain names differed slightly[14, 41, 47]. For instance, the LSAC Outcome Index used the name "Physical" for the domain assessing the health status of the child and "Learning" instead of Cognitive-Motor. Using the names like Health and Physical Development and Cognitive-Motor is self-explanatory and highlights the main aspects of development (sub-domains) that were included in the domain. Other micro-level well-being indices considered four domains as the social and emotional status were accounted for separately[37, 38]. Ultimately, it is important to note that the aspects of child development covered by all micro-level studies were similar.

A "whole child" perspective was adopted and the PhD project was developed based on the *bio-ecological model of human development*[18]. This implies that the child and his/her development are at the centre of human ecology, receiving multiple influences from various life contexts. Therefore, first we used child outcomes to construct Domain Scales and Well-being Indices and then the relationships between these and developmental determinants with previously recognized associations with development were examined. This approach was similar to research from Moore et al (2008, 2012), Sansoon et al (2005, 2010) and Cheevers et al (2013), but different to macro-level research studies[50, 51, 53, 54]. Macro-level indices use data aggregated at a national level and are composed from domains reflecting both children's outcomes and aspects from their lives (e.g. socio-economic factors, family and neighbourhood factors etc.)[50, 51, 53, 54]. Consistent with recommendations from Moore et al (2008, 2012), it was considered important to separate how children are faring, hence their well-being, from resources that might improve or impede their well-being. Including child outcomes and contextual measures in the same index assumes causal relationship between the two implying a pre-established model by which children inherit their parents' circumstances[14]. In the case of micro-level indices this can be avoided and the relationship between pre-established developmental determinants and well-being can be tested empirically.

Consistent with research by Sanson et al and Cheevers et al the outcomes selected were representative of *current well-being* but also *relevant for well-becoming* or development into healthy, functional citizens (e.g. general health, emotional indicator, cognitive indicator etc.)[14, 47]. Most outcomes considered were either directly measurable throughout childhood, adolescence and into adulthood or covered developmental aspects that are relevant across time. In line with recommendations from Moore et al (2005, 2012) and consistent with the LSAC Outcome Index and the GUI Well-being Index for 9-year-old Irish children, the outcomes selected represented either positive (e.g. very good health) or negative (e.g. almost always unwell) development[37, 46]. Three types of variables were considered: objective (e.g. diagnosed chronic conditions), subjective (e.g. child's general health- PCG reported) and observable (e.g. indicators resulting from administration of the Strengths and Difficulties Questionnaire, weight, height). Wherever possible all three types of variables were considered for each domain.

Similar to previous work, the developmental determinants were selected to *reflect conditions and processes affecting development* as stated by the ecological model of child development and other research (as presented in Tables 9.1-9.5). These were used to assess relationships with Domain Scales or Well-being Indices and findings from these analyses had a dual role: to validate the domain scale and the index, and to provide results with public policy relevance. On the other hand, Moore et al. combined developmental determinants into a Contextual Well-being Index and this was used in conjunction with the Child Well-being Index to generate an Overall Well-being Index[38, 40]. We decided against this approach and as suggested by

Bronfrenbrenner et. al. we agree that most often the effects of determinants on child development are not purely additive[18]. It was believed that investigating interactions between development and developmental determinants separately, or in fully adjusted models, would provide valuable information about factors with positive or detrimental effect on children's lives.

The development of the Well-Being Index used mainly Classical Test Theory (CTT) methods and involved the four-stage process, with stage 3 representing Domain Scales development, similar to Sansoon et al[41, 47, 73]. Two differences can be noted: first, the reliability of each Sub-Domain Scale was verified prior to index development, and second, Item Response Theory (IRT) methods were used to improve on the Health Sub-Domain Scale[73]. For most sub-domains and domains, with the exception of the Health Sub-domain Scale[k], an equal indicator weighting system was employed. This was similar to most micro- and macro-level child well-being studies and the general opinion is that in absence of a more appropriate statistically or theoretically based weighting mechanism, equal weighting is the best approach[14, 38, 41, 50, 51, 66, 70]. Fernandes et al on the other hand, argues that using "real weights" for indicators based on their relative importance for each individual child led to improved results when investigating determinants of well-being[60].

Consequently, the Well-Being Index and the Domain Scales were: developed on Sub-Domains with good evidence of reliability, had sound structure and demonstrated validity ensuring that they can discriminate between children with differing outcomes and life context. Additionally, Domain Scales proved to be important in their own right and depending on the form (interval or ordinal), they facilitate ranking or classifying children on the three main aspects of development. Research from Moore et al. (2012) underlines the role of domain-specific indices in partially attenuating the risk of masking divergent trends that comes with constructing overall indices[37]. The authors recommend that where possible, "child outcome domain (health, education and socio-emotional well-being)" should be used and combining these domains in a single index should be postponed until "stronger data" and "greater agreement" regarding indicators is reached[37]. Therefore, we recommend that the Domain Scales resulted from this project should accompany the Well-Being Index in future presentations and analysis.

11.3 Discussion of results from the Domain Scales and Well-Being Index

Presenting the Domain Scales and the Well-Being Index in an interval and an ordinal version ensured the flexibility in descriptive and analytical uses desired for such measures [14, 47]. Results from the interval version were reported in a standardized format to facilitate presentation and understanding. This version was used for construct and structural validation. Additionally, the interval version facilitated comparisons between sample sub-groups relative to each other and was also used to determine significant developmental determinants. The ordinal version had an additional category to those used in other studies (Cheevers et. al. and Sansoon et. al.)[14, 47] and this accounted for very poor development. This version was used to show trends of domain development and well-being across time and significant associations between baseline and follow-up children well-being category was noted. Next the socio-demographic profile for children with negative (poor and very poor) and positive (very good) well-being was established. When compared with similar findings (Cheevers et. al.) it was observed that 3 year-olds and 9 year-olds with positive well-being have a similar profile[14]. Finally, we have shown that development is not uniform across domains by generating baseline and follow-up summaries showing the distribution of children based on the number of domains with top and bottom 15% results. Therefore, the descriptive and inferential applications of the Well-Being

[k] By using IRT methods to generate Health scores the corresponding indicators were assigned weights based on how difficult it is to endorse the item.

Index and the Domain Scales are numerous. Showing that well-being does not occur uniformly across domains confirms the importance of using the Domain Scales together with the Well-Being Index.

Findings from unadjusted and adjusted analysis of associations between developmental determinants and each Domain Scale or Well-Being Index have scientific and public policy relevance. As previously explained (in Chapter 10) developmental determinants can be viewed as inputs to child development and well-being. These are modifiable factors that are most often targeted by public policy makers aiming to improve children well-being and development.

Although the main role of findings from univariate analysis (presented in Chapter 9) was to demonstrate the construct validity of the Domain Scales and Well-being Index, some of the unadjusted associations observed might be of interest for future research or policies. For instance, micro-nutrient supplementation, including during pregnancy folic acid intake, has been previously linked with improved cognitive development in children[143, 144]. Follow-up results from unadjusted analysis showed that children from mothers who did not take folic acid during pregnancy scored significantly lower (-1.3 points) on the Cognitive-Motor Domain Scale and on the Well-being Index (-1.7 points). Consistent with previous studies findings from unadjusted analysis show that children born through Caesarean section are at risk of poorer health outcomes[102-105, 145]. Observing improved socio-emotional development in 3 year-olds born through planned Caesarean section is intriguing. However, similar results were reported for children aged 6 to 7 from an Australian cohort study[145]. It was suggested that this association could be explained by the fact that when faced with increased perinatal risk or birth complications parents might be more attentive or protective of their child[146]. Previous research has shown that intrauterine exposure to stress and tobacco smoke can have long-term negative effects on the child[147-150]. We observed a significant increase in Health and Physical Development, Socio-Emotional and Well-being scores (baseline and follow-up) for children of primary caregivers reporting lower levels of stress and who did not smoke during pregnancy. The effects of maternal smoking during pregnancy were stronger at follow-up. These findings can be used to inform future pre-natal care campaigns. Public health nurses, General Practitioners and Midwifes, who are the main points of contact for future mothers during pregnancy could be trained to address modifiable behaviours (e.g. stress reduction classes, healthier during pregnancy lifestyle promotion classes).

Some of the developmental determinants that showed significant associations (in fully adjusted models) with child development or well-being in had been previously included and investigated as potential predictors of other macro- and micro-level child well-being indices. Comparisons between findings from this project and previous studies are presented below.

Observing better results for girls (except Health and Physical development at follow-up) is consistent with similar findings from More et al 2007,2008 and Land 2001,2007[38, 40, 67, 68]. Fernandes et al on the other hand, found that while gender was not a significant predictor of overall child well-being, girls scored significantly higher on the school and the physical and psychological indices. Showing that boys are more susceptible to poor developmental outcomes on most domains and the Well-being Index could serve to inform health and education policymakers[15, 66]. Additionally, campaigns targeted at improving caregivers-child interactions might help improve boys' socio-emotional outcomes.

Socio-demographic and economic factors are important contributors to children's lives. Previous studies suggest that belonging to family with one or both caregivers of foreign nationality or with primary caregiver's of other ethnicity than that of the country where the study is carried out is negatively associated with child's overall well-being[40, 61, 67, 68] as well as

individual well-being dimensions like material and school well-being[61]. Fully adjusted analysis from this research showed mixed results. Children with primary caregivers of other ethnicity than Irish scored higher on the baseline Well-being Index, Heath and Physical development and Cognitive-Motor Domains as well as the Socio-Emotional follow-up Domain. This determinant was negatively associated with baseline socio-emotional scores and follow-up cognitive-motor and well-being scores.

Children from households with no members on social welfare showed significantly better health and physical development (at baseline and follow-up), socio-emotional development (at follow-up) and improved well-being at both time points. Belonging to a household in receipt of social welfare benefit was previously associated with poorer well-being in American children[40]. In univariate analysis, lower income was significantly associated with poorer well-being and domain development (on all three domains) at both time points. Previous studies carried out by Moore et al and Bradshaw et al. reached similar conclusions[40, 50, 51]. According to Fernandes et al belonging to a low income family is negatively associated with the school, the physical and psychological and the overall well-being of children from Northern Portugal[61]. Results from the eight fully adjusted models developed in this study found no significant associations between income and well-being or domain development. Some disparities in children's development and well-being were also observed in relation to their social class and neighbourhood safety, reinforcing once again the need for policy initiatives to offer sustained support for children from disadvantaged backgrounds.

A positive association was observed between children's cognitive motor development and the level of education of the primary caregiver (represented by child's mother in most instances). This is consistent with findings from Fernandes et al showing that mother's education is a positive predictor of school and overall well-being in children aged 8 to 13 from the Northern region of Portugal[54].

Some of the novel associations between developmental determinants and child development or well-being investigated and confirmed as significant in this study are presented below.

A better relationship between primary caregiver and child was associated with better socio-emotional and well-being scores at baseline and follow-up. This was also associated with improved health and physical development at baseline and better cognitive-motor results at follow-up. In addition, talking to the child more often (recorded at baseline) and increased number of weekly days when the primary caregiver reads to the child (recorded at follow-up), which are also expressions of positive inside the home interactions were significantly associated with improved socio-emotional, cognitive-motor and well-being scores. The significant positive impact of the quality of PCG-child relationship and inside the home learning environment can be of interest to caregivers and inform their future behaviour towards the child.

At both time points, higher primary caregiver stress scores were negatively associated, while a better relationship between primary and secondary caregivers were positively associated with socio-emotional and well-being scores. The primary caregiver depression score had a significant negative effect on child's well-being and socio-emotional and health and physical development at follow-up. This suggests that parental stress might have a point in time effect on child well-being, while the effect of parental depression is observed over time as the child develops. Mental health is a prominent issue in Ireland and findings showing decrease in domains and well-being scores for children with PCG's reporting higher stress (at both time-points) and depression levels (at follow-up) are consistent with previous research[151] and serve to reinforce the need for improved services to address mental health issues.

Findings from this project can serve to raise further awareness about the importance of healthy nutrition for caregivers and their children. For instance, in this study, breastfeeding duration had a small but significant effect on the health and physical development and overall well-being. The positive associations observed were consistent from baseline to follow-up. Additionally, children breastfed for longer durations had better cognitive-motor development at baseline. Moreover, Primary Caregiver's BMI was negatively associated with the health and physical development and well-being of the child. Interestingly, this negative effect was only observed at follow-up. Increased adult BMI is often related to poor nutrition and reduced physical exercise. Findings from this study may suggest that such parental behaviors have a cumulative effect on development, manifested over time. The role of good child nutrition for the health and physical development of the child is further supported by the positive associations noted between the follow-up health and physical development score and more frequent weekly intake of fresh fruits and of raw vegetables. The importance of child nutrition was previously underlined by Fernandes et al. when investigating the well-being of Portuguese children[61].

Results from fully adjusted analysis showed that baseline scores are significant predictors of future development. Therefore, timely interventions might improve the child's current situation with possible long-term effect on their development. The Domain Scales and Well-being Index can be used as a signalling element and help identify certain groups of children with detrimental development or poor well-being (e.g. geographic areas, low birth weight children, low income). Moreover, results from fully adjusted models of development (all determinants were considered together) can help to highlight significant aspects of a child's life that influence each domain as well as overall well-being for each time-point investigated. Observing significant and consistent detrimental effects for certain determinants (e.g. boys are faring significantly poorer that girls on all scales and both indices) could serve to prioritize the areas that need to be addressed and could inform policy makers on the modifiable aspects from children lives (significant developmental determinants) that could be targeted in order to improve outcomes.

It is important to note that although contextual factors might act as "inputs" to child well-being the relationships observed here should not be interpreted as direct causality. However, knowing the potential early-life developmental determinants that are significant in the Irish context is important, as these are often the focus of policymakers aiming to improve child well-being[49]. Some of the data used in this study, in particular regarding developmental determinants, are based on primary caregiver self-report and could be subject to reporting bias. Wherever possible, observable or standardized measures were considered (e.g. primary caregiver's BMI derived from direct measures collected during the interview was used instead of self-reported BMI, primary caregiver's stress score resulted from Parental Stress Scale which is a standardized measuring instrument, etc.). Therefore, it is advised that results are interpreted with some level of caution as some of the associations observed might have been influenced by variations according to self-report.

Findings from this study will be disseminated through papers and conferences presentations and this can serve to inform future research projects nationally and internationally. The Well-being Index and the Domain Scales are also relevant for the larger public and for policy makers and other stakeholders. The results of this project can serve policy makers in identifying necessary interventions for children at risk of detrimental development (very poor and poor results). Investigation of the Well-being Index and Domain Scales with future waves of data can serve as a monitoring instrument and help evaluate the efficacy of previous policies. Results from this study including index development methodology and findings from extended

analysis will be presented at future Growing Up in Ireland annual conferences. This draws a large audience including state authorities and child development experts. The potential of the Domain Scales and Well-being Index to serve as development or well-being monitoring instruments (at a national or regional level) will be emphasised. Through adequate mass-media dissemination, the caregivers of Irish children may gather useful information from the findings of this study that could prompt them to modify their behaviour regarding interactions with the child, dietary habits in the home and others. At the same time, future mothers can be made aware of the harmful long-term effect of increased stress during pregnancy on the health of the child and prompted to ask for assistance if needed. They can be educated on the importance of a healthy lifestyle during pregnancy without smoking or alcohol and adequate micronutrient supplementation; or on the benefits of breastfeeding, and of normal term birth. Interventions targeted to improve early life aspects have an increased potential to prevent or ameliorate some of the health and well-being problems often seen in adult life.

11.4 Strengths

In line with national and international trends, this longitudinal research study is child-centred and offers a comprehensive image of Irish children's well-being by summarizing their outcomes on the main developmental dimensions and investigating the influences of various child life aspects.

This project used data from Growing Up in Ireland, a large national longitudinal study containing comprehensive information on children's developmental outcomes and their life context. Similar to this project, the Growing Up in Ireland study was designed based on the bio-ecological model of child development. This ensured that sufficient data on development and children's life in general was available. Participants were investigated at two important time-points of their life (baseline: 9-months and follow-up: 3 years) and data from both samples were used in this project. Both GUI samples were large and this ensured a high number of participants for this study, even after excluding cases with incomplete information. Consequently, data manipulation and imputation was avoided. Given the longitudinal nature of the data used for this PhD study, we were able to investigate development and well-being in a longitudinal manner. Follow-up results from the Domain Scales and Well-Being Index obtained when the children were 3 years old were analysed in relation to baseline results at the age of 9 months. As expected, when using the interval form we observed that baseline scores on each Domain Scale and the Well-Being Index were significant predictors of corresponding development at 3 years. Finally, by using data from a nationally representative cohort we were able to reach conclusions that are relevant at a national level and can form a platform for future regional or national policies.

In response to calls for a "common consensual framework" of child well-being[27], the conceptualization of well-being (a summary of development on three main domains) is in line with developmental theories and consistent with previous research in the field. Additionally, the three domains are also reflective of the WHO holistic definition of health as overall well-being, ensuring that the domains are relevant across all ages. Wherever possible, the indicators selected to represent child developmental outcomes were reflective of those used for previous similar indices. The methodology employed in calculating index scores can influence the results[37] and to facilitate comparisons between findings it was decided to employ similar index development and validation methods as two previous studies[14, 47].

Constructing and presenting results for Domain-Scales in conjunction with the Well-Being Index is another strength of this research. This reduces the potential risk of averaging divergent domain trends (for instance averaging a very high domain score with two low

domain scores could result in good well-being scores) by allowing identification of children with poor development on each developmental dimension separately. Moreover, each Domain-Scale taps into a different aspect of child well-being and is relevant to different stakeholders (e.g. Health and Physical Development Domain to public health policymakers, Socio-Emotional Domain to primary caregiver and other family members, Cognitive-Motor Domain to education policymakers). Therefore, the Domain Scales have their own importance as measurement instruments of child development and can be used separately or together with the Well-Being Index.

Presenting the Domain-Scales and the Well-Being Index in an interval version and an ordinal version is easy to understand by interested stakeholders and allows for flexibility in their application. An additional strength is given by the ability to compare findings for different sub-groups of children (e.g. gender, income quintiles etc.) or the developmental determinants significantly associated with each Domain-Scale or the Well-being Index with similar national or international results. In addition, The Well-being and Domain scores can be used to generate regional statistics that can be further aggregated in national statistics. For instance, the percentage of regions with above average (using the national average of 100 set for this sample) development can be calculated.

Finally, two widely recognized strengths of composite summary indices of this kind are the ability to facilitate progress monitoring and to facilitate comparisons of trends across space and time. Two simple examples were used to illustrate these applications. First, we used the interval version to show differences in the mean scores of domain development and overall well-being across the eight regions of Ireland. Second, using the ordinal version of the Well-Being Index we illustrated and analysed sample trends in domain development and overall well-being from baseline to follow-up.

11.5 Limitations

While the Growing Up in Ireland study contains comprehensive information on child development and life aspects, the use of pre-collected data imposed certain limitations regarding indicators availability. For instance, questionnaires purposely designed to collect main developmental outcomes could have included standardized instruments to assess child's health or motor development at follow-up. Additionally, test-retest or inter-rater reliability estimations for the sub-domain scales or domain and index criterion validity testing were not possible. Purposely designed studies focused on capturing and assessing child well-being as a summary of developmental outcomes would offer a way to overcome this limitations. In this project, observing moderate correlations between baseline and follow-up results could be considered satisfactory evidence of test-retest reliability.

Previous to constructing the Domain Scales, when assessing Sub-Domains reliability, it was observed that some of the inter-indicator correlations exceeded the desired values of between 0.2 and 0.4. However, similar to other studies, domain-specific indicators considered theoretically meaningful to the domain trait were retained and included in Sub-Domain scores calculation. An additional limitation of the Health and Physical Development Domain Scale at both time-points was its reduced discrimination ability at the positive end of the spectrum. This was also observed in previous studies[41, 47]. In an attempt to overcome this issue more complex Item Response Theory methods were employed to calculate child's Health Sub-Domain scores. While the results from this method are not perfect, the resulting Health Sub-Domain Scales had improved interval properties and performed better at discriminating between children scores from the positive end of the health spectrum.

The equal weights applied to indicators, sub-domains and domains is another limitation of this project. It is possible that some developmental aspects are more important to child well-being than others and this relative importance may change over time. For instance, one can argue that being diagnosed with a chronic condition that impacts a child's functionality severely has greater implications for a child's health and physical development than primary caregiver's general health rating. This implies that differing indicators weighting might be more appropriate. However, a study investigating the effects of differential index items weighting concluded that equal weighting is the optimal approach in absence of results from surveys built to estimate the importance placed by the population on particular life areas[70]. In this project, we were able to overcome this limitation for the Health Sub-Domain Scale, by employing the Item Response Theory methods to generate child scores that are dependent on "difficulty" of each indicator (or probability of endorsing a bad outcome represented by a lower ordinal category on an indicator).

Although the child was at the centre of this study, including subjective indicators directly reported by the child was not possible due to the age of the participants. Instead, subjective outcomes like the *general health status* of the child reported by the primary caregiver were included. We recommend that subjective indicators accounting for the child's opinion on their development should be included as soon as the age of the child permits this (possible at 6 or 7 years of age).

Given that the Domain Scales and the Well-being Index were mainly developed through Classical Test Theory methods, the results obtained are sample dependent and are important because they allow comparison of children relative to each other. However, direct comparisons between children's scores from this study with other national or international scores are not possible. Instead, findings from the applications of the Domain Scales and the Well-Being Index can be compared with results from similar investigations carried out in other national or international studies (some of these were exemplified in Chapter 10 and previous sections from this chapter). While presenting the Domain-Scales and Well-being Index in an ordinal version adds to their flexibility of use, the cut-offs selected to generate this version (lowest 5% for very poor, 5-15% for poor, 15-85% for good and above 85% for very good development) were arbitrary. These are statistically based and we were unable to ascertain that these were clinically meaningful. Conclusions that would state that a certain proportion of the children from the total sample have detrimental development on one domain or another are not informative as the limits of each group were pre-defined. It is however possible to give a summary of longitudinal sample trends from baseline to follow-up (proportion of children that moved from one category to another). Moreover, the profiles of the children in each category (Very poor, Poor, Good or Very good) can be compared to findings from other studies.

Finally, as previously underlined, some researchers question the adequacy of summary composite indices as they are believed to attenuate trends within the composing indicators[14, 38, 40] leading to opacity and masking critical areas of well-being[27, 53]. However it has been previously explained that similarly to economic indices, the averaging effect of creating such measures reduces the volatility within the data[14, 38]. For this project we present Domain-Scales in conjunction with the Well-being Index in an attempt to reduce averaging of opposing results if these exist.

11.6 Conclusions

In line with national and international trends, this PhD project represented the complexity and multidimensionality of children's development in a way that can be easily communicated and understood by relevant stakeholders.

This longitudinal study constructed a Well-being Index for Irish children at two pivotal time-points of early life development: 9 months and 3 years. An ecological, "whole child" approach was adopted, and well-being was seen as a broad multidimensional concept, which cannot be directly assessed through a single test or value. The Well-being Index was constructed from three Domain Scales generated as a summary of Health and Physical Development, Socio-Emotional and Cognitive-Motor outcomes. All Domain Scales and the Well-being Index demonstrated sound structure and validity. As anticipated, the scales and the index act as useful instruments that classify or rank children based on their outcomes. They are capable of discriminating between children with differing outcomes or life context and can be employed in various cross-sectional or longitudinal investigations.

Constructing the Well-being Index on three Domain Scales provided insight into the main dimensions of child development and overall well-being. The Domain Scales reflect key aspects of development and should be used in conjunction with the index for more detailed conclusions. Two versions (interval and ordinal) of the Domain Scales and the Well-being Index were generated and their versatility and flexibility of use was exemplified.

Due to the broadness of a child's life experience, complete representation of developmental outcomes and trajectories is not possible. However, composite measures like the Well-being Index and the Domain Scales play an important role in providing a point-in-time account of child development, ascertain relationships between this and life context and offer scope for further cross-sectional or longitudinal analysis. The Well-being Index facilitates the use of child well-being data for relevant stakeholders. It can serve to create a platform for further research, inform public policy and monitor changes across time.

11.7 Future direction

The Domain Scales and the Well-Being Indices cover broad concepts of fundamental importance to a child's life and offer a point in time assessment of their development and well-being. This study offers scope for more in-depth cross-sectional and longitudinal analysis.

The Domain Scales and Well-Being Indices could be used to investigate in more detail the development and well-being of children from specific geographic areas or demographic sub-groups. For instance, local authorities might be interested in what are the specific development and well-being determinants for their respective areas. In addition, the development and well-being of sub-groups of children with certain detrimental conditions like asthma or low birth-weight could be investigated separately. Similarly, more sensitive issues like belonging to a family with one or two members suffering from substance abuse could be addressed and the domain and well-being scores of these children could be investigated.

Moreover, data from this study can be used for extended longitudinal research. For instance, differences in child domain development or well-being for sub-groups of children where the family background changed from baseline to follow-up (e.g. marked change in economic status, divorce, loss of one of the parents) can be investigated. Similarly, the groups of children with marked baseline to follow-up decline or improvement in development or well-being could be identified. In-depth analysis to identify: first, the domain-specific indicators and then, the developmental determinants associated with marked changes over time could be carried out.

The methods used in this research can be employed with future waves of data collection for the Infant Cohort of the Growing Up in Ireland Study. In addition to 9 months and 3 years domain development and well-being can also be assessed for the age of 5 (access to data is currently being sought) 7 years and 9 years. Moreover, similar Domain Scales and Well-Being Indices can be developed with data from the Child Cohort of the Growing Up in Ireland study collected at the age of 13 and 17. Similar index development methods were previously applied with the first wave of the Child Cohort collected when the children were 9 years of age. That study used fewer indicators for the Health sub-domain and the corresponding scale was developed through Classical Test Theory methods. It would be interesting to see if the domain and Well-Being Index results would change if Item Response Theory methods were employed. By extending this research we would be able to construct age-specific Domain Scales and Well-Being Indexes for both cohorts at multiple time points. This would allow us to describe development and well-being over the entire childhood period, from infancy to adulthood, in a nationally representative sample of Irish children. Well-being trajectories could be investigated in a truly longitudinal fashion, as we would have data for each child at 4 or 5 time-points. The age overlap between the Infant and Child Cohorts at the age of 9 years would allow us to examine the differences in 9-year-olds well-being in 2008/09 (child cohort) and 2017/18 (infant cohort) and particular wider circumstances, such as the impact of the last economic recession (2009-2014) on developmental outcomes.

This project and future child well-being work of the kind could benefit from research aimed at developing a more appropriate weighting system for indicators, sub-domains and domains. Data from this project could be then used to develop new expert-established weighted Domain Scales and Well-Being Indices. Results for the expert-established weighted scales and indices can be compared to findings from this PhD project to establish which approach is better at distinguishing between children with differing outcomes from both ends of the spectrum. We feel this would be particularly relevant for the Health sub-domain as using an expert-established weighting system in this case might eliminate the need to employ more complicated Item Response Theory methods.

Finally, the benefits of employing Item Response Theory methods to assess children's health warrant further investigation. To our knowledge, only a few standardised instruments aiming to capture children's health exist. Two of the widely used such instruments are focused on identifying negative aspects like chronic conditions and assessing special health care needs. New research interested in developing a standardized instrument for assessing children's Health (including positive and negative aspects) could emerge from this PhD project. Using IRT methods would allow assessment of children's health as a latent construct and this is appropriate, as children's health cannot be measured directly. Results from the application of IRT methods in this project like Item Characteristics and Information Curves and Test Information Curves in conjunction with inter-item correlations and alpha coefficients could be investigated. This would help identify items that are not useful and should be removed (e.g. are too difficult and not sufficiently endorsed or that measure similar aspects to others) if development of a new health-measuring instrument is desired.

11.8 Recommendations

The well-being index development process from this project could serve to inform future research in the field. The Domain Scales and Well-being Indices were developed under Classical Test Theory considerations. If similar methods were to be applied to other samples of children the reliability and validity of the resulting scales or indices should be estimated and investigated.

It is recommended that the Domain Scales would be presented and made available separately from the Well-Being Index. This would provide o more comprehensive image of child well-being accounting for differential domain development if this exists. In addition, this would enable researchers and policy makers in the various early development fields to avail of results (child scores or category) that are relevant to their area of expertise. For instance, experts in child psychology might choose to limit their use to children scores or categories from the Socio-Emotional Domain Scale in their research projects.

If similar methods were to be applied to cohorts of older children allowance should be made for including additional indicators or domains to account for their involvement in progressively more complex activities (e.g. civic participation, school results and others). At least one additional domain accounting for the child's subjective well-being should be included whenever possible. Depending on available data, the Subjective Well-Being Domain could be organized in sub-domains reflecting the child's opinion about his/hers own health, social and emotional status, learning abilities and education. It is believed important to keep the child's opinions separate from primary caregiver reports. Analysing subjective sub-domains in relation to results from the other three domains would bring further insight into the way children perceive their own development.

New research aimed at developing a differential weighting system for indicators and domains included in measuring child well-being should be carried out. When investigating early childhood well-being (before the age of 6) the opinion of early life development experts' opinion about the importance of each indicator, sub-domain and domain for children's lives could provide an objective estimation of their weight in generating the well-being index. For older cohorts (aged 6 and over) children's subjective reports regarding the importance they place on various aspects from their lives should also be considered.

The development of a standardised instrument to assess children's health would be beneficial. Preferably, this would differ from previous such measures by including both positive and negative aspects of health. Such new research could stream from this project. The questionnaires investigating child health could be composed of items with four response options similar to the health indicators used here. The questionnaires should be administered and tested on a new sample of children and their primary and secondary caregivers. The study should be designed in such a way as to allow for inter-rater reliability estimations (by administering the questionnaire to both caregivers) and for retests to show improvements in questionnaire performance that could result from changing or adding items.

As discussed, results from the application of the Domain Scales and Well-being Indices are widely relevant and informative. The Domain Scales and Well-being Indices should be viewed as instruments that help to highlight the groups of children in need of intervention (e.g. geographic areas that are doing poorer than others, income groups, gender differences). This can be done on a domain-to-domain or overall well-being basis. Using these data in conjunction with knowledge about significant developmental determinants for each domain or overall well-being can inform policy makers on what are the areas from children's life that could be changed to improve their outcomes.

The baseline and follow-up domain and well-being scores should be made available with data from current (Wave 1- 9 months and Wave 2- 3 years) and subsequent Waves (5,7 and 9 years) of the GUI Infant Cohort. This would benefit future research studies. The domain and well-being scores generated here could be used to control for children's early life development status.

Lastly, the Domain Scales and Well-Being Index should be extended to future waves of GUI data to allow longitudinal analysis of trajectories of development and well-being. In addition this would allow investigation of the factors associated with growth or decline over time.

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Appendix A

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ESRI

Office of the Minister for Children and Youth Affairs

University of Dublin
Trinity College
College Green
Dublin 2

NATIONAL LONGITUDINAL STUDY OF CHILDREN IN IRELAND (NLSCI)
INFANT QUESTIONNAIRE
STRICTLY CONFIDENTIAL
MOTHER or LONE FATHER QUESTIONNAIRE

GROUP ☐☐ HHOLD ☐☐☐☐ RESPONDENT ☐☐

INTERVIEWER NAME _____ INTERVIEWER NO: ☐☐☐☐☐☐

Time Section Started ☐☐☐☐ (24 hour clock) DATE: __dd__mm__yy

We are seeking to interview the parents/guardians of <baby>. The whole interview with the parents/guardians and child will take about 110-120 minutes to complete [INTERVIEWER: Adjust as appropriate for you in the field]. All the information you and your family provide will be treated in the strictest confidence and will not be released in any way which would allow the information you provide to be identified with you or your family. If however, we are told something which might suggest that a child or other vulnerable person is at risk we may have to act on it.

The Department of Health and Children is funding the study through the Office of the Minister for Children and Youth Affairs (OMC), in association with the Department of Social and Family Affairs and the Central Statistics Office. The Department of Education and Science is represented on the Steering Group which oversees the Study. A group of researchers led by the Economic and Social Research Institute (ESRI) and The Children's Research Centre at Trinity College Dublin is carrying out the study

A. INTRODUCTION AND HOUSEHOLD COMPOSITION

X1a. Record <baby's> name: _____

X1b. Record <baby's> gender Male ☐1 Female ☐2

X1c. Record <baby's> date of birth ___dd___mm_____yyyy

X1d. Do you have a resident spouse / partner Yes ☐1 No ☐2

A1. Are you the legal parent / guardian of <baby> who usually provides the most care to him / her.

Yes ☐1 No ☐2

A1a. Are you in a position to answer in respect of <baby>
Yes ☐1 No ☐2 → Int. Terminate interview, reschedule

A2. *[Int: Record gender of respondent]* Male ☐1 Female ☐2

A3. ***[Card A3]*** **Looking at Card A3, can you tell me which of the following best describes your relationship to <baby>?** [Interviewer use codes only]

1. Biological mother/ father ☐1
2. Adoptive mother/ father ☐2
3. Step-mother / Step-father / Partner of child's parent ☐3
4. Foster mother / father ☐4
5. Grand parent ☐5
6. Aunt/uncle ☐6
7. Other relative/ in law ☐7
8. Unrelated guardian ☐8

A4. How many people in total (including yourself and all children of all ages) live here regularly as members of this household?

persons

In this section, I would like to ask you a few details about yourself and the others in your household.

A5. For each member of the household could you tell me:

a) their gender?

b) their Date of Birth (DOB)

c) if ***DOB not available*** - their age last birthday

d) their relationship to the child's mother / or lone father and <baby>?

e) tick one box to best describe their current economic status

		(A)	(B)	(C)	(D)			(E) Show Card A5E						
No.	First name/Initial	Sex	Date of Birth	If DOB not available	Relationship of each member to mother and child.			Pre-school	School/Education	At Work / Training	Unemployed	Retired	Home Duties	Other
Person No.	INT: Put respondent (mother or lone father) on line 1 and Study Child on line 2	M F	dd mm yr	Age last birthday	Person No.	R'SHIP TO: CARD A5D1 Mother	R'SHIP TO: CARD A5D2 Study Child							
1		☐1 ☐2	__ __ __	yrs	1	///		☐1	☐2	☐3	☐4	☐5	☐6	☐7
2		☐1 ☐2	__ __ __	yrs	2		///	☐1	☐2	☐3	☐4	☐5	☐6	☐7
3		☐1 ☐2	__ __ __	yrs	3			☐1	☐2	☐3	☐4	☐5	☐6	☐7
4		☐1 ☐2	__ __ __	yrs	4			☐1	☐2	☐3	☐4	☐5	☐6	☐7
5		☐1 ☐2	__ __ __	yrs	5			☐1	☐2	☐3	☐4	☐5	☐6	☐7
6		☐1 ☐2	__ __ __	yrs	6			☐1	☐2	☐3	☐4	☐5	☐6	☐7
7		☐1 ☐2	__ __ __	yrs	7			☐1	☐2	☐3	☐4	☐5	☐6	☐7
8		☐1 ☐2	__ __ __	yrs	8			☐1	☐2	☐3	☐4	☐5	☐6	☐7
9		☐1 ☐2	__ __ __	yrs	9			☐1	☐2	☐3	☐4	☐5	☐6	☐7

Interviewer: Mother or lone father should be on line 1. Study Child should be on line 2. Father / Partner on line 3 (if relevant).

A6. Do you have any other biological children who live outside the household [Full or half brother/sister of the Study Child]?

Yes ..... ☐1 No ..... ☐2

A6a. How many children ____ n

A6b. For each biological child living outside the household can you please indicate their gender and date of birth.

	Male	Female	Date of Birth
1.	☐1	☐2	__ __ / __ __ / __ __ __ __
2.	☐1	☐2	__ __ / __ __ / __ __ __ __
3.	☐1	☐2	__ __ / __ __ / __ __ __ __

B. PARENTING, CHILD'S FUNCTIONING AND RELATIONSHIPS

Time Section Started ☐☐☐☐ **(24 hour clock)**

Now I'd like to ask you some questions about your relationship with <baby>

B1. ***[Card B1]*** **When you leave <baby> with someone else (not you or your partner), how does he/she usually react?**

Is happy and settled by the time you leave ..... ☐1
Is unhappy at first but quickly settles down ..... ☐2
Remains unsettled and unhappy during your entire absence ..... ☐3
Have never left <baby> with someone else ..... ☐4 **Go to B3**

B2. ***[Card B2]*** **And when you return, having left <baby> with someone else, how does he or she usually act?**

With delight ..... ☐1
With a mixture of delight and annoyance ..... ☐2
Hard to tell, no particular emotion ..... ☐3
Seems to be annoyed/angry with me for leaving him/her ..... ☐4

B3. *[Card B3]* The next questions are about the different sorts of feelings parents might have when caring for young children. For each one please say which is closest to how you feel *attachment scale*

a.

b.

c.

d.

e.

f.

g.

h.

i.

B4a. A one-year-old knows right from wrong. Do you agree or disagree?

Agree ..... ☐1 Disagree ..... ☐2

B4b. Would a child be younger or older than one year when he/she first knows right from wrong? Or are you not sure?

Younger ..... ☐1 Older ..... ☐2 Not sure ..... ☐3

B4c. When <baby> cries how often does he/she get on your nerves?

Never/ Almost never	Rarely	Sometimes	Often	Always / Almost always
☐1	☐2	☐3	☐4	☐5

B5. *[Card B5]* I would like you to look at the questions on this card. Please tell me where you would rate your baby on a scale of '1' to '7' for each question. *temperament scale*

A.

B.

C.

D.

E.

F.

G.

H.

I.

J.

K.

L.

M.

N.

O.

P.

Q.

R.

S.

T.

U.

V.

W.

X.

C. BABY'S DEVELOPMENT

Time Section Started | | | | | **(24 hour clock)**

Now I'd like to ask you some questions about <baby's> development

Communication	Yes	Sometimes	Not Yet

Gross Motor	**Yes**	**Sometimes**	**Not Yet**
Fine Motor	**Yes**	**Sometimes**	**Not Yet**

Problem Solving	**Yes**	**Sometimes**	**Not Yet**
Personal - Social	**Yes**	**Sometimes**	**Not Yet**

CX1. Do you talk to your baby while you are busy doing other things? (eg. while you do housework).

Never ☐1 Rarely ☐2 Sometimes ☐3 Often ☐4 Always ☐5

CX2a. Do you have any other concerns about any aspects of baby's behaviour or development?

Yes ☐1 No ☐2

CX2b. What concerns do you have?

_____

_____

D. BABY'S HABITS

Time Section Started ☐☐☐☐ **(24 hour clock)**

Now I'd like to ask you some questions about <baby's> habits and routines.

D1. How many hours sleep do you get on an average night, at the present time? _____ hours

D2. In general, what time in the evening does your baby usually go to sleep? _____(24 hour clock)

D3. Approximately how many hours sleep does your baby have during

(a) the day? _____ hours (b) the night ?_____ hours

D4. On a normal day what time does your baby usually get up at in the morning? _____(24 hour clock)

D5. Is your baby ever difficult when put to bed?

Most of the time ☐1 Often ☐2 At times ☐3 Rarely ☐4 Never ☐5

D6. How often does your baby wake at night?

Never ☐1 Occasionally ☐2 Most nights ☐3 Every night ☐4 More than once per night ☐5

D7. How many times per night on average? _____

D8. Do you ever wake <baby> for a feed during the night?

Yes, usually ☐1 **Yes, sometimes** ☐2 **No, not at all** ☐3

D9. How do you normally put <baby> down to sleep?

On his/her stomach ☐1 On his/her side ☐2 On his/her back ☐3

D10. Does <baby> usually sleep:

In a room on his/her own ☐1
In a room with other children ☐2
In your bedroom ☐3
Elsewhere ☐4

D11. Where does <baby> sleep for most of the night?

In his/her own bed/cot ☐1
In bed/cot with other children ☐2
In your bed ☐3
Other (specify) ☐4

D12. Approximately how many nights per week would <baby> spend at least some part of the night in your bed? _____N

D13. Do you feel that <baby's> crying is a problem for you?

Yes ☐1 No ☐2

D14. How much is <baby's> sleeping pattern or habits a problem for you?

A large problem	A moderate problem	A small problem	No problem at all
☐1	☐2	☐3	☐4

D15. Have you ever taken <baby> to a doctor, or consulted a pharmacist for a sleeping problem?

Yes ☐1 No ☐2

D16. Have you used a soother / dummy with <baby> in the last week?

Yes ☐1 No ☐2

E. CHILDCARE ARRANGEMENTS

Time Section Started ☐☐☐☐ **(24 hour clock)**

Now I'd like to ask you some questions about childcare arrangements

E1. Is <baby> currently being minded by someone else, other than you or your resident spouse / partner, on a regular basis each week?

Yes ☐1 No ☐2

E2. Can you indicate (a) who else minds <baby> on a regular basis,
(b) number of days per week (<baby> spends in each type of childcare,
(c) number of hours per week <baby> spends in each type of childcare,
(d) how much you pay for this childcare for <baby> per week
(e) whether this is your main type of childcare

	[Tick all that apply]	Number of days	Number of hours	Cost per week	Main type of care
a. A relative in your home	☐1 Go to E3a	____N	____N	€____	☐4
b. A non-relative in your home	☐2 Go to E4a	____N	____N	€____	☐4
c. A relative in their home	☐3 Go to E3b	____N	____N	€____	☐4
d. A non-relative in their home	☐4 Go to E4b	____N	____N	€____	☐4
e. Centre-based caregiver (e.g.Crèche / Day nursery)	☐5 Go to E5	____N	____N	€____	☐4
f. Other (please specify)	☐6 Go to E6	____N	____N	€____	☐4

E3a. Please specify how this person is related to <baby>

a. Grandmother of <baby> ☐1
b. Grandfather of <baby> ☐2
c. Aunt /Uncle of <baby> ☐3
d. Brother / Sister of <baby> ☐4
e. Non-resident Parent ☐5
f. Cousin of <baby> ☐6
g. Other relative ☐7

E3b. Please specify how this person is related to <baby>

a. Grandmother of <baby> ☐1
b. Grandfather of <baby> ☐2
c. Aunt /Uncle of <baby> ☐3
d. Brother / Sister of <baby> ☐4
e. Non-resident Parent ☐5
f. Cousin of <baby> ☐6
g. Other relative ☐7

E4a. Which of the following best describes that person?

a. Au pair / Nanny ☐1
b. Friend or parent ☐2
c. Neighbour ☐3
d. Registered childminder ☐4
e. Unregistered childminder ☐5
f. Other ☐6

E4b. Which of the following best describes that person?

a. Au pair / Nanny ☐1
b. Friend or parent ☐2
c. Neighbour ☐3
d. Registered childminder ☐4
e. Unregistered childminder ☐5
f. Other ☐6

E5. What type of centre is it?

a. Work-based crèche ☐1
b. Other crèche/nursery ☐2
c. Montessori ☐3
d. Playschool or pre-school ☐4
e. Naoinra ☐5
f. Other ☐6

E6. What age was <baby> when you started to use the main childcare arrangement? _____months

E7. How many children (excluding <baby>) are looked after in this main type of care?

_____ **number of children**
[Int. if answer at E2 is a or b please go to E9]

E8a. Do you personally drop <baby> to this main type of care on your way to work?

Yes..... ☐1 No..... ☐2 Don't work..... ☐3

E8b. Do you personally collect <baby> from this main type of care on your way home from work?

Yes..... ☐1 No..... ☐2 Don't work..... ☐3

E8c. What distance do you travel from home to this main type of care?

Carer lives on my street / road ..... ☐1
Less than ½ mile (1 kilometre) ..... ☐2
½ to 1 mile (1 – 1.5 kilometres) ..... ☐3
1 to 5 miles (1.5 – 8 kilometres) ..... ☐4
6 to 10 miles (9 –16 kilometres) ..... ☐5
More than 10 miles (more than 16 kilometres) ..... ☐6

E8d. On average how long does it take to travel from home to where <baby> is cared for?
[Int. if time differs between getting there and coming home record the longer of the two]

_____ minutes

E8e. On a typical day, what time in the morning does <baby> leave home to go to the main type of care?

_____ 24 hour clock

E8f. On a typical day, what time does <baby> return home from the main type of care?

_____ 24 hour clock

E9a. *[Card E9a]* What was the single most important reason for you choosing this main form of childcare?

It was the only one I could afford ..... ☐1
Convenient to my home ..... ☐2
Linked to my job ..... ☐3
The quality of the care provided ..... ☐4
It was the only one available to me ..... ☐5
Other (please for describe) _____ ☐6

E9b. To what extent was your choice of childcare determined by financial constraints?

Completely	To a large degree	To some degree	Only a little	Not at all
☐1	☐2	☐3	☐4	☐5

E10a. How satisfied are you with these arrangements?

Very satisfied	Fairly satisfied	Neither satisfied nor dissatisfied	Fairly dissatisfied	Very dissatisfied
☐1	☐2	☐3	☐4	☐5

E10b. Why are you dissatisfied?

_____
_____

E10c. Why do you not change the arrangement?

_____
_____

E11.What are your intentions for childcare when <baby> is 3 years old? [Tick all that apply]

Baby minded by me on a full-time basis ..... ☐1
Baby minded by my partner on a full-time basis ..... ☐2
Shared by my partner and me ..... ☐3
Part-time child-care ..... ☐4
Full-time child-care ..... ☐5

E12. Which type of childcare?

A relative in your home ..... ☐1
Someone else in your home ..... ☐2
A relative in their home ..... ☐3
Someone else in their home ..... ☐4
A professional caregiver (e.g crèche/day nursery) ..... ☐5
Other (please specify) ..... ☐6

E13. *[Card E13]* Since <baby> was born has difficulty in arranging childcare ever.... [Tick all that apply]

a. prevented you looking for a job ..... ☐1
b. made you turn down or leave a job ..... ☐2
c. stopped you from taking on some study or training ..... ☐3
d. made you leave a study or training course ..... ☐4
e. restricted the hours you could work or study ..... ☐5
f. prevented you from engaging in social activities ..... ☐6
g. Other please specify _____ ☐7

F. SIBLINGS AND TWINS

Int: ask only if siblings recorded on household grid

F0. Does <baby> have brothers/sisters [include step, foster or adoptive siblings living in the household].

Yes ..... ☐1 No ..... ☐2

F1. Have any of the other children in your household been particularly jealous/unhappy about the baby (e.g. hitting etc.)?

Yes ..... ☐1 No ..... ☐2

F2a. Was <baby> a single birth, twin, triplet etc. Single child..... ☐1 Twin..... ☐2 Triplet..... ☐3

F2b. Does his/her twin live here in this household?

Yes ..... ☐1 Lives elsewhere ..... ☐2 Deceased..... ☐3

F3. Are <baby> and <twin> identical twins or fraternal (non-identical) twins? :

Identical twins ..... ☐1 Fraternal (i.e. non-identical twins) ..... ☐2

F4. Has this been confirmed by a medical professional?

Yes ..... ☐1 No ..... ☐2

F5. How do you dress them?

in matching clothes each day ..... ☐1
in matching clothes sometimes ..... ☐2
never in matching clothes ..... ☐3

F6. How does <baby> react to his / her twin?

	Yes, most of the time	Yes, some of the time	No, hardly ever
a) he/ she likes to be with his / her twin	☐1	☐2	☐3
b) he/she doesn't seem to notice his / her twin	☐1	☐2	☐3
c) he/she is upset if she is parted from his/her twin	☐1	☐2	☐3

G. PRENATAL CARE

Time Section Started ☐☐☐☐ **(24 hour clock)**

Now I'd like to ask you some questions about your pregnancy with <baby>

[INT: Only ask G1 to G5 if biological mother]

G1. How was your Ante-natal care provided?

Shared care (between GP and other professional'.) ☐1
Private consultant alone ☐2
Hospital clinic alone ☐3
Midwives clinic alone ☐4
Independent midwife alone ☐5
Had no ante-natal care ☐6
Other [Please specify] ☐7

G2. At how many weeks did you first become aware that you were pregnant? ____ weeks

G3. How many weeks into your pregnancy did you have your first ante-natal booking appointment with your GP or hospital? ____weeks

G4. And who was this appointment with?

GP/Family physician ☐1
Private consultant alone ☐2
Hospital clinic alone ☐3
Midwives clinic alone ☐4
Independent midwife alone ☐5
Had no ante-natal care ☐6

G5. How many ultrasound scans (i.e. where you and the doctor/consultant see an image of the baby on screen) did you have in total during the course of your pregnancy? ____ No. of scans [If none enter '0']

G6. Did you know the sex of your baby before the birth? Yes ☐1 No ☐2

[INT: Only Ask G7 if biological mother]

G7. How much weight did you gain during the course of your pregnancy?
____stone ____lbs OR _____kgs Don't Know ☐99

G8. *[Card G8]* Were there any of the following complications with the pregnancy? [Tick all that apply]

a. Raised blood pressure (in isolation) ☐1
b. Raised blood pressure and protein in the urine (Pre-eclampsia) ☐2
c. Urinary or kidney infection ☐3
d. Persistent vomiting or nausea ☐4
e. Gestational diabetes (diet treated) ☐5
f. Gestational diabetes (insulin treated) ☐6
g. Bleeding during the second half of pregnancy ☐7
h. Vaginal Infection during pregnancy ☐8
i. Intrauterine Growth Restriction (small baby on scan) ☐9
j. Rhesus Incompatibility ☐10
k. Influenza ☐11
l. Placenta praevia ☐12
m. Miscarriage in a multiple pregnancy ☐13
n. Other [please specify] ☐14

[INT: Only ask G9 to G12 if biological mother]

G9. During pregnancy, before you went into labour, were you admitted to hospital for a pregnancy related condition?

Yes ☐1 No ☐2

G10. How many separate admissions did you have? _____No. of admissions

G11a. Did you take Folic acid/Folate prior to becoming pregnant with <baby>?

Yes ☐1 No ☐2

G11b. Did you take Folic acid/Folate during the first 3 months of pregnancy with <baby>?

Yes ☐1 No ☐2

G11c. Did you take Iron during your pregnancy with <baby>?

Yes ☐1 No ☐2

G12. During your pregnancy, how many members of the household [including yourself] smoked? _____ N

H. INFANT'S HEALTH AND PHYSICAL DEVELOPMENT

Time Section Started ☐☐☐☐ **(24 hour clock)**

Now I'd like to ask you some questions about the birth of <baby>

H1. Where was <baby> born?

Home birth [planned] ☐1 In hospital ☐2 Other [please specify] _____ ☐3

H2. Please give (a) the name and (b) address of the maternity hospital or unit where <baby> was born.

a. Name: _____

b. Address _____

[INT: Only Ask H3 if biological mother]

H3. Did you have any form of pain relief in labour?

Yes ☐1 No ☐2 Did not have any labour ☐3

H4. *[Card H4]* What was the final mode of delivery?

Normal delivery ☐1
Suction assisted birth ☐2
Forceps assisted birth ☐3
Planned / Elective Caesarean ☐4
Emergency Caesarean ☐5
Vaginal breech delivery ☐6
Other [please specify] _____ ☐7

H5a. After how many weeks of pregnancy was <baby> born? _____ Wks Don't Know ☐77

H5b. Was <baby> born late, on time or early?

Late birth (42 weeks or more) ☐1
On time (37-41 weeks) ☐2
Somewhat early (33-36 weeks) ☐3
Very early (32 weeks or less) ☐4

H6. How much did <baby> weigh at birth? ___lbs ___ounces OR ___kgs

H7. What was <baby's> length at birth? ___inches OR ____cms

H8. *[Card H8]* Were there any complications during the <baby's> birth? [Tick all that apply]

A. No complications ☐1
B. Very long labour (more than 12 hours) ☐2
C. Very rapid labour (less than 2 hours) ☐3
D. Foetal distress – Abnormal Heart rate tracing ☐4
E. Foetal distress - Meconium or other sign ☐5
F. Foetal blood sample taken in labour ☐6
G. Birth injury – nerve injury / fracture / bruising ☐7
H. Other complication [please specify] _____ ☐8

H9. Did <baby> have to go to a Neonatal Intensive Care Unit or Special Care Nursery after he/she was born?

Yes ☐1 No ☐2

H10. Did <baby> need any help with his/her breathing from a ventilator?

Yes ☐1 No ☐2

H11. How many days or parts of days were you in hospital after the birth? ____days

H12. How many days or parts of days was <baby> in hospital after the birth? ____days

H13a. Was <baby> ever breastfed? INCLUDE COLUSTRUM IN FIRST FEW DAYS AFTER BIRTH

Yes ☐1 No ☐2 → Go to H15d

H13b. Was <baby> still being breastfed when you brought him/her home from hospital?

Yes ☐1 No ☐2

H14a. Was <baby> ever exclusively breastfed?
[Exclusive breastfeeding means that the infant receives only breast-milk without any additional food or drink]

Yes ☐1 No ☐2 → Go to H15a

H14b. How old was <baby> when he/she stopped being exclusively breastfed?
[Int: Accept answer in Days OR Weeks OR Months]

____Days ____Weeks ____Months <Baby> still being exclusively breastfed ☐999 → Go to H20

H15a. Are you currently breastfeeding <baby> (include partial/complementary breastfeeding)?

Yes ☐1 → Go to H16 No ☐2

H15b. How old was <baby> when he/she completely stopped being breastfed?
[Int: Accept answer in Days OR Weeks OR Months]

____Days ____Weeks ____Months

[INT: Only ask H15c if biological mother]

H15c. *[Card H15c]* What were the main reason(s) you stopped breastfeeding <baby> [Tick all that apply]

a. Not enough milk/hungry baby ☐1
b. Inconvenience/fatigue ☐2
c. Difficulty with breast feeding techniques ☐3
d. Sore nipples/engorged breast ☐4
e. Mother's illness ☐5
f. Planned to stop at this time ☐6
g. Baby weaned himself/herself ☐7
h. Physician told me to stop ☐8
i. Returned to work ☐9
j. Partner/father wanted me to stop ☐10
k. Formula feeding preferable ☐11
l. Wanted to drink alcohol ☐12
m. Embarrassment/social stigma ☐13
n. Other, please specify ☐14

[INT:Only ask H15d if biological mother]

H15d. *[Card H15d]* Why did you choose not to breastfeed <baby> [Tick all that apply]

a. Not enough milk ☐1
b. Inconvenience/fatigue ☐2
c. Difficulty with breast feeding techniques ☐3
d. Sore nipples/engorged breast ☐4
e. Mother's illness ☐5
f. Physician advised me not to ☐6
g. Partner/father did not want me to breastfeed ☐7
h. Formula feeding preferable ☐8
i. Wanted to drink alcohol ☐9
j. Embarrassment/social stigma ☐10
k. Other, please specify ☐11

H16. I'm now going to ask when <baby> first had (other) different types of milk. Please include any eaten with cereal. How old was <baby> when he/she first had:

Formula milk, such as Cow & Gate or SMA?	____Days	____Weeks	____Months	☐999 Hasn't Had
Cow's milk?	____Days	____Weeks	____Months	☐999 Hasn't Had
Any other type of milk, such as soya milk?	____Days	____Weeks	____Months	☐999 Hasn't Had

H17. What else does <baby> drink apart from milk or formula? [Tick all that apply]

Water ☐1
Baby Juice ☐2
Fruit juices/Cordial/Squash ☐3
Fizzy or soft drinks (e.g. lemonade, coke) ☐4
None of the above ☐5
Herbal drinks ☐6
Tea ☐6
Coffee ☐7
Other [please specify] ☐8

H18. Can I check, has <baby> had any solid food on a regular basis?
REGULARLY – MORE THAN TWICE A DAY FOR SEVERAL CONTINUOUS WEEKS
SOLID FOOD – BABY CEREALS, PUREED FRUITS ETC. – NOT MILKS OR DRINKS

Yes ☐1 No ☐2

H19. How old was <baby> when he/she first had solid food regularly?
[Int: Accept answer in Days OR Weeks OR Months]

____Days ____Weeks ____Months

H20. In general, how would you describe (a) <Baby's> Health at Birth (i.e. the first two weeks after birth) and (b) <Baby's> Current Health

	(a) Health at birth	(b) Current health
Very healthy, no problems	☐1	☐1
Healthy, but a few minor problems	☐2	☐2
Sometimes quite ill	☐3	☐3
Almost always unwell	☐4	☐4

H21. Can you tell me whether <baby> has received: [Tick all that apply]

Their six-week checkup ☐1
Vaccines at 2 months ☐2
Vaccines at 4 months ☐3
Vaccines at 6 months ☐4
No vaccinations ☐5

H22. ***[Card H22]*** **Has a medical professional ever told you that <baby> has any of the following conditions?**
[Tick all that apply]

a. Respiratory disease [including asthma] ☐1
b. Heart abnormalities ☐2
c. Digestive allergies (e.g. lactose intolerant) ☐3
d. Eczema or any kind of skin allergy ☐4
e. Difficulty hearing or deafness (Do not include a temporary loss of hearing due to a cold or congestion) ☐5
f. Difficulty seeing ☐6
g. A problem with mobility or using his/her arms/legs to get around ☐7
h. A problem with using his/her hands or arms ☐8
i. Cerebral palsy ☐9
j. Kidney disease ☐10
k. Diabetes ☐11
l. Any developmental delay ☐12
m. Down syndrome ☐13
n. Spina bifida / Hydroencephalis ☐14
o. Cleft lip and/or palate ☐15
p. Other long-term condition [please specify] _____ ☐16
q. None of the above ☐17

H23. *If yes to any of the above:* **You said that <baby> has/or has had [NAMES OF CONDITIONS]. Would you describe his/her health condition(s) as minor, moderate, or severe?**
IF THE RESPONDENT ASKS WHICH HEALTH CONDITION TO CONSIDER IF THE CHILD HAS MULTIPLE CONDITIONS, INSTRUCT THE RESPONDENT TO CONSIDER [CHILD]'s MOST SEVERE CONDITION.

Minor ☐1 Moderate ☐2 Severe ☐3

H24. ***[Card H24]*** **We would like to know about any health problems or illnesses for which <baby> has been taken to the GP, Health Centre or Public Health Nurse or to Accident and Emergency. What were these problems?** [TICK ALL THAT APPLY]

a. Snuffles/common cold ☐1
b. Chest infections ☐2
c. Ear infections ☐3
d. Feeding problems ☐4
e. Sleeping problems ☐5
f. Dental problems (e.g. teething) ☐6
g. Wheezing or asthma ☐7
h. Skin problems ☐8
i. Persistent nappy rash ☐9
j. Undescended testicle ☐10
k. Tight foreskin ☐11
l. Hernia ☐12
m. Sight or eye problems ☐13
n. Failure to gain weight or to grow ☐14
o. Persistent or severe vomiting ☐15
p. Persistent diarrhea or constipation ☐16
q. Fits or convulsions ☐17
r. Meningitis ☐18
s. Colic ☐19
t. Other health problems [please specify] ☐20
u. None of the above ☐21

H25 Since <baby> was born, how many times have you seen, or talked on the telephone with any of the following about <baby's> physical health? (exclude at time of birth)
IF NONE THEN ENTER 0 – DO NOT LEAVE BLANK

A general practitioner (GP), or family physician ..... _____N
A paediatrician ..... _____N
A public health nurse or practice nurse ..... _____N
Another medical doctor (such as a hearing specialist) ..... _____N
Accident and Emergency or Outpatient ..... _____N

H26 Has <baby> ever been admitted to a hospital ward because of an illness or health problem?

Yes ..... ☐1 No ..... ☐2

H27. Not including when he/she was born, approximately how many nights has <baby> spent in hospital? NOT HOSPITAL OUTPATIENT OR EMERGENCY DEPARTMENT VISITS. _____ **Nights**

H28. Since <baby> was born, was there any time, in your opinion, when he/she needed a medical examination or treatment but did not receive it?

Yes ..... ☐1 No ..... ☐2

H29. Why did <baby> not get the medical care or treatment? Was this because:
[TICK YES OR NO TO EACH]

	Yes	No
You couldn't afford to pay	☐1	☐2
The necessary medical care wasn't available or accessible to you	☐1	☐2
You could not take time off work to visit the doctor	☐1	☐2
You wanted to wait and see if the problem got better	☐1	☐2
The child is still on the waiting list	☐1	☐2
Other (specify)	☐1	☐2

H30. Is the family (you, your spouse/partner and child(ren)) covered by a medical card?
Yes, full card ..... ☐1 Yes, GP only ..... ☐2 Not covered ..... ☐3

H31. Does the family have private medical insurance?

Yes ..... ☐1 No ..... ☐2

H32. Does that insurance include the cost of GP visits?

Yes, in full ..... ☐1 Yes, partially ..... ☐2 No ..... ☐3

H33. Many babies have accidents at some time. Has <baby> ever had an accident, injury, or swallowed something that required a visit to the doctor, health centre or hospital?

Yes ..... ☐1 No ..... ☐2

J. PARENT'S HEALTH

Time Section Started ☐☐☐☐ **(24 hour clock)**

Now a few questions about your own health

J1. In general, how would you say your current health is?

Excellent ..... ☐1 Fair ..... ☐4
Very Good ..... ☐2 Poor ..... ☐5
Good ..... ☐3

J2. Do you have any on-going chronic physical or mental health problem, illness or disability?

Yes ☐1 No ☐2

J3. What is the nature of this problem, illness or disability? Please describe as fully as possible.
[Int. please record diagnosis – not symptoms of the problem.]

_____

_____

J4. Since when have you had this problem, illness or disability? _____(mth) _____(year)

J5. Are you hampered in your daily activities by this problem, illness or disability?

Yes, severely ☐1 Yes, to some extent ☐2 No ☐3

J6. *[Card J6]* Since <baby> was born have you suffered from any chronic illness or disability which made it difficult for you to look after <baby>? (E.g. feeding, changing nappy, lifting, bringing to doctor, communicating with baby)

	Some difficulty			
No Difficulty ☐1	Just a little ☐2	A moderate level ☐3	A lot of difficulty ☐4	Cannot do at all ☐5

J7. Does anyone in your household CURRENTLY have any chronic illness or disability which adversely affects <baby>?

Yes ☐1 No ☐2

J8. What is the relationship of that person to the Study Child? [Tick all that apply]

Parent ☐1 Brother / Sister ☐2 Other relative ☐3 Non relative ☐4

J9. Do you currently smoke daily, occasionally or not at all?

Daily ☐1 Occasionally ☐2 Not at all ☐3

J10. Have you ever smoked? Was it:

Daily ☐1 Occasionally ☐2 Never ☐3

J11. About how many cigarettes or cigars do/did you smoke on average each day?

_____ [Int. enter '0' if less than 1 on average]

J12. Including yourself, how many members of the household smoke? ____N

J13. *[Card J13]* Which of the following best describes how often you usually drink alcohol?

Never ☐1
Less than once a month ☐2
1-2 times a month ☐3
1-2 times a week ☐4
3-4 times a week ☐5
5-6 times a week ☐6
Every day ☐7

If currently drink alcohol between everyday and 1-2 times a month ask:
J14. And in an average week, how many pints of beer/cider, glasses of wine, measures of spirit, and bottles of alcopops would you drink?

Pints of Beer/Cider ____ **Glasses of Wine** _____ **Measures of Spirits** _____ **Bottles of alcopops** _____

J15. What is your height without shoes? _____feet _____inches **OR** Metres _____

J16. What is your weight without clothes and shoes? _____stones _____lbs OR _____Kilograms

K. FAMILY CONTEXT

Time Section Started ☐☐☐☐ **(24 hour clock)**

Now I'd like to ask you some questions about your family as a whole

K1. ***[Card K1]*** **Please rate how much you agree or disagree with each of the following statements in relation to how things are for you and <baby> now. Remember, there are no right and wrong answers, just try and be as honest as possible.**

	Strongly Agree	Agree	Not sure	Disagree	Strongly Disagree
A. I am happy in my role as a parent	☐1	☐2	☐3	☐4	☐5
B. There is little or nothing I wouldn't do for my child if it was necessary	☐1	☐2	☐3	☐4	☐5
C. Caring for my child sometimes takes more time and energy than I have to give	☐1	☐2	☐3	☐4	☐5
D. I sometimes worry whether I am doing enough for my child	☐1	☐2	☐3	☐4	☐5
E. I feel close to my child	☐1	☐2	☐3	☐4	☐5
F. I enjoy spending time with my child	☐1	☐2	☐3	☐4	☐5
G. My child is an important source of affection for me	☐1	☐2	☐3	☐4	☐5
H. Having a child gives me a more certain and optimistic view for the future	☐1	☐2	☐3	☐4	☐5
I. The major source of stress in my life is my child	☐1	☐2	☐3	☐4	☐5
J. Having a child leaves little time and flexibility in my life.	☐1	☐2	☐3	☐4	☐5
K. Having a child has been a financial burden	☐1	☐2	☐3	☐4	☐5
L. It is difficult to balance different responsibilities because of my child.	☐1	☐2	☐3	☐4	☐5
M. The behaviour of my child is often embarrassing or stressful to me.	☐1	☐2	☐3	☐4	☐5
N. If I had it to do over again, I might decide not to have a child	☐1	☐2	☐3	☐4	☐5
O. I feel overwhelmed by the responsibility of being a parent.	☐1	☐2	☐3	☐4	☐5
P. Having a child has meant having too few choices and too little control over my life.	☐1	☐2	☐3	☐4	☐5
Q. I am satisfied as a parent.	☐1	☐2	☐3	☐4	☐5
R. I find my child enjoyable	☐1	☐2	☐3	☐4	☐5

K2. Overall, how do you feel about the amount of support or help you get from family or friends living outside your household?

I get enough help	I don't get enough help	I don't get any help at all	I don't need any help
☐1	☐2	☐3	☐4

K3. Are you in regular contact with <baby's> grandparents?

Yes ☐1 No ☐2 All Grandparents are deceased ☐3 All Grandparents live abroad ☐4

K4. Here are some questions about how much support you receive from <baby's> grandparents

	Never	Less often than once every 3 months	At least once every 3 months	At least once a month	At least once a week	Every day or almost every day
How often do <baby's> grandparents babysit?	☐1	☐2	☐3	☐4	☐5	☐6
How often do <baby's> grandparents have <baby> to stay over night?	☐1	☐2	☐3	☐4	☐5	☐6
How often do <baby's> grandparents take <baby> out?	☐1	☐2	☐3	☐4	☐5	☐6
How often do <baby's> grandparents buy toys or clothes for <baby>?	☐1	☐2	☐3	☐4	☐5	☐6
How often do <baby's> grandparents help you around the house?	☐1	☐2	☐3	☐4	☐5	☐6
How often do <baby's> grandparents help you out financially?	☐1	☐2	☐3	☐4	☐5	☐6

K5. Did you work full-time, part-time or not at all immediately before you became pregnant with <baby>?

Full-time ..... ☐1 Part – time ..... ☐2 Not at all ..... ☐3 → Go to K16

K6. How many hours were you working per week? _____hours

K7. How long before you gave birth did you stop working? ____weeks OR ____months

K8. Are you currently at work outside the home?

Full-time ..... ☐1 Part – time ..... ☐2 No ..... ☐3

K9. What age was <baby> when you returned to work? _____ **months**

K10. Did you take any of the following types of leave? If yes, how many weeks did you take?

a. Paid maternity / paternity leave? .Yes → ☐1 How many weeks _____wks No....☐2

b. Unpaid maternity/ paternity leave? Yes → ☐1 How many weeks _____wks No....☐2

c. Annual leave? Yes → ☐1 How many weeks _____wks No....☐2
(Accumulated before or during maternity / paternity leave)

d. Sick leave? Yes → ☐1 How many weeks _____wks No....☐2

K11. What was your main reason for going back to work?

Financial ..... ☐1 Need an outlet outside the home ..... ☐4
Maintain a Career ..... ☐2 Other [please specify]..... ☐5
Job related benefits (pension, car, health insurance etc) ..... ☐3

Go to K21

K12. Do you intend to return to work outside the home?

Full-time ..... ☐1 Part – time ..... ☐2 No ..... ☐3 → Go to K21 Not sure yet... ☐4 Go to K21

K13. What age will <baby> be when you return to work? _____ **months**

K14. Did you or do you intend to take any of the following types of leave? If yes, how many weeks did you/will you take?

a. Paid maternity / paternity leave? Yes → ☐1 How many weeks _____wks No....☐2

b. Unpaid maternity /paternity leave? Yes → ☐1 How many weeks _____wks No....☐2

c. Annual leave? Yes → ☐1 How many weeks _____wks No....☐2
(Accumulated before or during maternity / paternity leave)

d. Sick leave? Yes → ☐1 How many weeks _____wks No....☐2

K15. What is your main reason for going back to work?

Financial ..... ☐1 Need an outlet outside the home ..... ☐4
Maintain a Career ..... ☐2 Other [please specify]..... ☐5
Job related benefits (pension, car, health insurance etc) ..... ☐3

Go to K21

K16. Did you ever work? Yes ☐1 No ☐2 → Go to Section L

K17. When were you last in paid employment outside the home? Month____ Year____

K18. Do you intend to return to work?

Yes, definitely ..... ☐1 Yes, probably ..... ☐2 No ..... ☐3 → Go to K21

K19. What age will <baby> be when you return to work? _____ **Months**

K20. What will be your main reason for going back to work?

Financial ..... ☐1 Need an outlet outside the home ..... ☐4
Maintain a Career ..... ☐2 Other [please specify]..... ☐5
Job related benefits (pension, car, health insurance etc) ..... ☐3

Go to K21

K21. If you have returned to work after the birth of <baby>, or if you have other children and have previously worked outside the home, can I ask you the extent to which you agree or disagree with the following statements?

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	N/A
Because of your work responsibilities:						
A. You have missed out on home or family activities That you would have liked to have taken part in	☐1	☐2	☐3	☐4	☐5	☐6
B. Your family time is less enjoyable and more pressured	☐1	☐2	☐3	☐4	☐5	☐6
Because of your family responsibilities:						
C. You have to turn down work activities or Opportunities that you would prefer to take on	☐1	☐2	☐3	☐4	☐5	☐6
D. The time you spend working is less enjoyable and more pressured	☐1	☐2	☐3	☐4	☐5	☐6

L: SOCIO-DEMOGRAPHICS

Time Section Started ☐☐☐☐ **(24 hour clock)**

Now I'd like to ask you some questions about the circumstances of your household.

L7a. I would now like to ask you some questions about your accommodation: Is this accommodation a:

House ☐1
Apartment / Flat/ Bedsit ☐2
Other (specify) _____ ☐3

L7b. Does your accommodation have access to a garden or common space (either private or shared)?

Yes ☐1 No ☐2

L8. *[Card L8]* From this card, please tell me which best describes your (and your partner's) occupancy of the accommodation?

Owner occupied (with or without a mortgage) ☐1
Being purchased from a Local Authority under a Tenant Purchase Scheme ☐2
Rented from a Local Authority ☐3
Rented from a Voluntary Body ☐4
Rented from a Private Landlord ☐5
Living with and paying rent to your (or your partner's) parent(s) ☐6
Occupied free of rent with your (or your partner's) parent(s) ☐7
Occupied free of rent from your (or your partner's) job ☐8

L9. How many separate bedrooms are in the accommodation? _____ bedrooms

L10. *[Card L10]* Which of these descriptions BEST describes your usual situation in regard to work? [Int. Note that if resp is on maternity leave and has a job which she intends to return to she should be coded as 'at work'].

Employee (incl. apprenticeship or Community Employment) ☐1
Self employed outside farming ☐2
Farmer ☐3
Student full-time ☐4
On State training scheme (FAS, Failte Ireland etc.) ☐5
Unemployed, actively looking for a job ☐6
Long-term sickness or disability ☐7
Home duties / looking after home or family ☐8
Retired ☐9
Other (specify) _____ ☐10

L11. How many hours do you normally work per week, including any regular overtime work? If you work at more than one job, please include the hours in all jobs.

_____ hours

L11x. On a typical work day, how much time in minutes do you spend commuting to and from work (outward and return journey combined)?

_____ **minutes** [Int. if respondent works at home enter '0' for minutes]

L12. ***[Card L 12]*** **What is your occupation in your main job?**

In all cases please describe the occupation fully and precisely giving the full job title.

Use precise terms such as:	Do not use general terms such as:
RETAIL STORE MANAGER	MANAGER
SECONDARY TEACHER	TEACHER
ELECTRICAL ENGINEER	ENGINEER

Civil servants and local government employees should state their grade e.g. SENIOR ADMINISTRATIVE OFFICER.
Members of the Gardai or Army should state their rank. Teachers should state the branch of teaching e.g. PRIMARY TEACHER.
Clergy and religious orders should give full description e.g. NUN, REGISTERED GENERAL NURSE.

Write in your main OCCUPATION

_____

L13. Do you supervise or manage any personnel in your job?

Yes ..... ☐1 No ..... ☐2

L14. How many? _____

L15. How many employees (if any) do you have?_____ employees N A .... ☐99

L15x. [Ask only if Farmer at L10.] **What is the acreage of the farm?** _____ **acres**

L16. If you were completely free to choose, how many hours a week (paid work) would you like to work overall? _____**hours per week**

Go to L22

L17. Apart from holiday or casual work, have you ever had a full-time job? Yes ... ☐1 No ... ☐2 Go to L21a

L18. In what year did you last work in that full-time job? _____ year

L19. When you last worked in that full-time job were you?

Employee (incl. apprenticeship or Community Employment) ..... ☐1 Self-employed outside farming ..... ☐2 Farmer ..... ☐3

L20. ***[Card L 12]*** **What (was) your occupation in your main job?**

In all cases describe the occupation fully and precisely giving the full job title.

Use precise terms such as:	Do not use general terms such as:
RETAIL STORE MANAGER	MANAGER
SECONDARY TEACHER	TEACHER
ELECTRICAL ENGINEER	ENGINEER

Civil servants and local government employees should state their grade e.g. SENIOR ADMINISTRATIVE OFFICER.
Members of the Gardai or Army should state their rank. Teachers should state the branch of teaching e.g. PRIMARY TEACHER.
Clergy and religious orders should give full description e.g. NUN, REGISTERED GENERAL NURSE.

Write in your main OCCUPATION

_____

L20x. [Ask only if Farmer at L19.] What was the acreage of the farm? _____ acres

L21a. Do you currently have a part time job outside the home? Yes ☐1 No ..... ☐2 Go to L21d

L21b. On average, how many hours per week do you work in that part-time job? _____ **hours**

L21c. ***[Card L 12]*** **What is your occupation in that job?**

In all cases describe the occupation fully and precisely giving the full job title.

Use precise terms such as:	Do not use general terms such as:
RETAIL STORE MANAGER	MANAGER
SECONDARY TEACHER	TEACHER
ELECTRICAL ENGINEER	ENGINEER

Civil servants and local government employees should state their grade e.g. SENIOR ADMINISTRATIVE OFFICER.
Members of the Gardai or Army should state their rank. Teachers should state the branch of teaching e.g. PRIMARY TEACHER.
Clergy and religious orders should give full description e.g. NUN, REGISTERED GENERAL NURSE.

Write in your main OCCUPATION

_____

If a farmer or a farm worker, write in the SIZE of the farm _____acres

Go to L22

L21d. ***[Card L21d]*** **From the reasons listed on this card could you tell me the most important reasons for you not working in a paid job outside the home? If more than one reason, please rank them in order of importance, where 1 is the most important reason, up to a maximum of 3.**

A. I can't find a job ___
B. I chose not to work ___
C. I am caring for an elderly or ill relative or friend ___
D. I prefer be at home to look after my children myself
E. I cannot earn enough to pay for childcare ___
F. I cannot find suitable childcare ___
G. There are no suitable jobs available for me ___
H. My family would lose Social Welfare or medical benefits if I was earning ___
I. Other reason (specify)_____ ___

L21e. Do you plan to start or return to paid work?

Yes, in the next 3 months ☐1
Yes, in 3 to 12 months time ☐2
Yes, in more than 1 year's time ☐3
Have no plans to return to paid work ☐4

Go to L22

L22. ***[Card L 12]*** **What is the occupation of your spouse / partner?**

In all cases describe the occupation fully and precisely giving the full job title.

Use precise terms such as:	Do not use general terms such as:
RETAIL STORE MANAGER	MANAGER
SECONDARY TEACHER	TEACHER
ELECTRICAL ENGINEER	ENGINEER

Civil servants and local government employees should state their grade e.g. SENIOR ADMINISTRATIVE OFFICER.
Members of the Gardai or Army should state their rank. Teachers should state the branch of teaching e.g. PRIMARY TEACHER.
Clergy and religious orders should give full description e.g. NUN, REGISTERED GENERAL NURSE.

Write in main OCCUPATION

_____

If a farmer or a farm worker, write in the SIZE of the farm _____ acres

HOUSEHOLD INCOME

Now I would like you ask you a few questions about household income. Once again I would like to assure you that all information will be treated in the strictest confidence.

L23. Looking at Card L23/L24, which of the following sources of income does the HOUSEHOLD receive? Please consider the income of *ALL* household members, not just your own, your spouse/partner's income. *[INT. Tick 'Yes' or 'No' for each in Col. A]* *[Card L23 / L24]*

L24. And of these sources of income which is the largest source of income at present?*[Int Tick one box only in Col. B]* *[Card L23 / L24]*

	A Receive? Yes	A Receive? No	B Largest Source
A. Wages or Salaries	☐1	☐2	☐3
B. Income from Self-Employment	☐1	☐2	☐3
C. Income from Farming	☐1	☐2	☐3
D. Children's Allowance/ Child Benefit	☐1	☐2	☐3
E. Other Social Welfare Payments	☐1	☐2	☐3
F. Other Income (incl. income from maintenance payments, investments, savings, dividends, private pensions, property)	☐1	☐2	☐3

HOUSEHOLD INCOME FROM ALL HOUSEHOLD MEMBERS

L25. If you added up all the income sources from ALL household members what would be the total HOUSEHOLD NET income, i.e. after deductions for tax and PRSI only? Include income from all sources and from all household members.

Dont Know ..... ☐99 €_____ per Week ..... ☐1 Month ..... ☐2 Year ☐3

[INT: IF RESPONDENT CANNOT GIVE EXACT FIGURE GO TO L26. If exact figure given go to L28]

L26 *[Show Card L26]* **I know that it is difficult to give an exact figure for household income but on Card L26 we have a scale of incomes, and we would like to know into which group your total HOUSEHOLD NET income falls, i.e. after deductions for tax and PRSI only? Include income from all sources and from all members of the household. Looking at the card could you tell me the letter of the group your household falls into, after deductions for tax and PRSI.**

[Int: Tick the letter of the group your household falls into, after deductions for tax and PRSI only]

HOUSEHOLD NET INCOME AFTER DEDUCTIONS OF TAX AND PRSI

Per Week	*Per Month*	*Per Year*	*Category*
Under €230	Under €1,000	Under €12,000	A☐1 → Section A, Card L27
€231 to under €350	€1,001 to under €1,500	€12,001 to under €18,000	B☐2 → Section B, Card L27
€351 to under €460	€1,501 to under €2,000	€18,001 to under €24,000	C☐3 → Section C, Card L27
€461 to under €575	€2,001 to under €2,500	€24,001 to under €30,000	D☐4 → Section D, Card L27
€576 to under €800	€2,501 to under €3,500	€30,001 to under €42,000	E☐5 → Section E, Card L27
€801 to under €925	€3,501 to under €4,000	€42,001 to under €48,000	F☐6 → Section F, Card L27
€926 to under €1,150	€4,001 to under €5,000	€48,001 to under €60,000	G☐7 → Section G, Card L27
€1,151 to under €1,500	€5,001 to under €6,500	€60,001 to under €78,000	H☐8 → Section H, Card L27
€1,501 to under €1,850	€6,501 to under €8,000	€78,001 to under €96,000	I☐9 → Section I, Card L27
€1,851 or more	€8,001 or more	€96,001 or more	J☐10 → Section J, Card L27

Refused ..... ☐77 Don't Know ..... ☐88

L27. Would that be [Int: *Show Card L27* and tick 1, 2 or 3 in appropriate section under per wk; per mth or per yr]

A	**Per week**	under €75	☐1	€75 to €150	☐2	€151 to €230	☐3
	Per Month	€0 to €300	☐1	€301 to €650	☐2	€651 to €1,000	☐3
	Per Year	€0 to €4,000	☐1	€4,001 to €8,000	☐2	€8,001 to €12,000	☐3
B	**Per week**	€231 to €270	☐1	€271 to €310	☐2	€311 to €350	☐3
	Per Month	€1,001 to €1,150	☐1	€1,151 to €1,350	☐2	€1,351 to €1,500	☐3
	Per Year	€12,001 to €14,000	☐1	€14,001 to €16,000	☐2	€16,001 to €18,000	☐3
C	**Per week**	€351 to €390	☐1	€391 to €420	☐2	€421 to €460	☐3
	Per Month	€1,501 to €1,700	☐1	€1,701 to €1,800	☐2	€1,801 to €2,000	☐3
	Per Year	€18,001 to €20,000	☐1	€20,001 to €22,000	☐2	€22,001 to €24,000	☐3
D	**Per week**	€461 to €500	☐1	€501 to €535	☐2	€536 to €575	☐3
	Per Month	€2,001 to €2,150	☐1	€2,151 to €2,300	☐2	€2,301 to €2,500	☐3
	Per Year	€24,001 to €26,000	☐1	€26,001 to €28,000	☐2	€28,001 to €30,000	☐3
E	**Per week**	€576 to €650	☐1	€651 to €750	☐2	€751 to €800	☐3
	Per Month	€2,501 to €2,800	☐1	€2,801 to €3,250	☐2	€3,251 to €3,500	☐3
	Per Year	€30,001 to €34,000	☐1	€34,001 to €38,000	☐2	€38,001 to €42,000	☐3
F	**Per week**	€801 to €850	☐1	€851 to €880	☐2	€881 to €925	☐3
	Per Month	€3,501 to €3,650	☐1	€3,651 to €3,800	☐2	€3,801 to €4,000	☐3
	Per Year	€42,001 to €44,000	☐1	€44,001 to €46,000	☐2	€46,001 to €48,000	☐3
G	**Per week**	€926 to €1,000	☐1	€1,001 to €1,050	☐2	€1,051 to €1,150	☐3
	Per Month	€4,001 to €4,300	☐1	€4,301 to €4,600	☐2	€4,601 to €5,000	☐3
	Per Year	€48,001 to €52,000	☐1	€52,001 to €56,000	☐2	€56,001 to €60,000	☐3
H	**Per week**	€1,151 to €1,250	☐1	€1,251 to €1,375	☐2	€1,376 to €1,500	☐3
	Per Month	€5,001 to €5,500	☐1	€5,501 to €6,000	☐2	€6,001 to €6,500	☐3
	Per Year	€60,001 to €66,000	☐1	€66,001 to €72,000	☐2	€72,001 to €78,000	☐3
I	**Per week**	€1,501 to €1,600	☐1	€1,601 to €1,750	☐2	€1,751 to €1,850	☐3
	Per Month	€6,501 to €7,000	☐1	€7,001 to €7,500	☐2	€7,501 to €8,000	☐3
	Per Year	€78,001 to €84,000	☐1	€84,001 to €90,000	☐2	€90,001 to €96,000	☐3
J	**Per week**	€1,851 to €2,100	☐1	€2,101 to €2,400	☐2	€2,401 or more	☐3
	Per Month	€8,001 to €9,250	☐1	€9,251 to €10,500	☐2	€10,501 or more	☐3
	Per Year	€96,000 to €110,000	☐1	€110,001 to €125,000	☐2	€125,001 or more	☐3

L28a. Do you receive early child care supplement to assist in the cost of raising your children and / or providing childcare?

Yes ☐1 No ☐2

L28b. Does anyone in your household currently receive any other Social Welfare payments?

Yes ☐1 → Go to L29 No ☐2 → Go to L30

L29. *(Card L29)* **Now I'd like to record information on any Social Welfare payments which are received by anyone in the household. Looking at Card L29, could you tell me whether or not anyone in the household currently receives any of these Social Welfare payments?** *[Int Tick payments received by any household member]*

Social Welfare Payment		Social Welfare Payment	
UNEMPLOYMENT PAYMENTS			
Jobseeker's Benefit	☐1	Jobseeker's Allowance or Unemployment Assistance	☐2
EMPLOYMENT SUPPORTS			
Family Income Supplement	☐3	Back to Work Enterprise Allowance	☐6
Farm Assist	☐4	Part-time Job Incentive Scheme	☐7
Back to Work Allowance (Employees)	☐5	Back to Education Allowance	☐8
Supplementary Welfare Allowance (SWA)	☐9		
ONE-PARENT FAMILY / WIDOW(ER) PAYMENTS			
Widow's or Widower's (Contributory) Pension	☐10	Deserted Wife's Allowance	☐14
Deserted Wife's Benefit	☐11	Prisoner's Wife's Allowance	☐15
Widowed Parent Grant	☐12	One-Parent Family Payment	☐16
Widow's or Widower's (Non-Contrib) Pension	☐13		
CHILD RELATED PAYMENTS			
Maternity Benefit	☐17	Health & Safety Benefit	☐19
Adoptive Benefit	☐18	Guardian's Payment (Contributory)	☐20
		Guardian's Payment (Non-Contributory)	☐21
DISABILITY AND CARING PAYMENTS			
Illness Benefit	☐22	Injury Benefit	☐28
Invalidity Pension	☐23	Incapacity Supplement	☐29
Disability Allowance	☐24	Disablement Benefit	☐30
Blind Pension	☐25	Medical Care Scheme	☐31
Carer's Benefit	☐26	Constant Attendance Allowance	☐32
Domiciliary Care Allowance	☐27	Death Benefits (Survivor's Benefits)	☐33
RETIREMENT PAYMENTS			
State Pension (Transition)	☐34	State Pension Non-Contributory	☐36
State Pension (Contributory)	☐35	Pre-Retirement Allowance	☐37

L30. Does anyone in your household currently receive rent or mortgage supplement? Yes ☐1 No ☐2

L31. How much does the household receive PER WEEK in rent or mortgage supplement? €_____

L32. *[Card L32]* **Looking at Card L32 and thinking of your household's total income from all sources and all household members, approximately what proportion of your total household income would you say comes from social welfare payments of any kind – including Children's Allowance / Child Benefit?**

None	Less than 5 %	5% to less than 20%	20% to less than 50%	50% to less than 75%	75% to less than 100%	100%
☐1	☐2	☐3	☐4	☐5	☐6	☐7

L33a. Does anyone in the household other than yourself and your spouse / partner have an income of any sort – from employment, Social Welfare, a pension etc.

Yes ☐1 No ☐2

L33b. ***[Card L33b]*** **For the following items could you indicate whether or not your household has the item and, if not, if it is because you couldn't afford it or for another reason?**

	Yes	No, Cannot Afford	No, other reason
Does your household eat meals with meat, chicken, fish (or vegetarian equivalent) at least every second day?	☐1	☐2	☐3
Does your household have a roast joint (or its equivalent) at least once a week?	☐1	☐2	☐3
Do household members buy new rather than second-hand clothes?	☐1	☐2	☐3
Does each household member possess a warm waterproof coat?	☐1	☐2	☐3
Does each household member possess two pairs of strong shoes?	☐1	☐2	☐3
Does the household replace any worn out furniture?	☐1	☐2	☐3
Does the household keep the home adequately warm?	☐1	☐2	☐3
Does the household have family or friends for a drink or meal once a month?	☐1	☐2	☐3
Does the household buy presents for family or friends at least once a year?	☐1	☐2	☐3

L33c. ***[Card L33c]*** **A household may have different sources of income and more than one household member may contribute to it. Concerning your household's total monthly or weekly income, with which degree of ease or difficulty is the household able to make ends meet?**

With great difficulty	With difficulty	With some difficulty	Fairly easily	Easily	Very easily
☐1	☐2	☐3	☐4	☐5	☐6

L33d. Have you ever had to go without heating during the last 12 months through lack of money? (I mean have you had to go without a fire on a cold day, or go to bed to keep warm or light the fire late because of lack of coal/fuel?)

Yes ☐1 No ☐2

L33e. Did you have a morning, afternoon or evening out in the last fortnight, for your entertainment (something that cost money)?

Yes ☐1 No ☐2

L33f. Why was that?

Didn't want to ☐1	Couldn't leave the children ☐4
Have a full social life in other ways ☐2	Illness ☐5
Couldn't afford to ☐3	Other _____ ☐6

L33f. Thinking back to when you were 16 years old, can you tell me, with which degree of ease or difficulty was your household able to make ends meet?

With great difficulty	With difficulty	With some difficulty	Fairly easily	Easily	Very easily
☐1	☐2	☐3	☐4	☐5	☐6

L34 ***[Card L34]*****. What is the highest level of education (full-time or part-time) which you have completed to date?**

1. No formal education ☐1
2. Primary education ☐2

Second Level

3. Lower Secondary ☐3
(Junior/Intermediate/Group Certificate, 'O' Levels/GCSEs, NCVA Foundation Certificate, Basic Skills Training Certificate or equivalent).
4. Upper Secondary ☐4
(Leaving Certificate (including Applied and Vocational Programmes), 'A' Levels, NCVA Level 1 Certificate or equivalent
5. Technical or Vocational qualification ☐5
(Completed Apprenticeship, NCVA Level 2/3 Certificate, Teagasc Certificate/Diploma or equivalent).
6. Both Upper Secondary and Technical or Vocational qualification ☐6

Third Level

7. Non Degree ☐7
(National Certificate, Diploma NCEA/Institute of Technology or equivalent, Nursing Diploma.)
8. Primary Degree ☐8
(Third Level Bachelor Degree)
9. Professional qualification (of Degree status at least) ☐9
10. Both a Degree and a Professional qualification ☐10
11. Postgraduate Certificate or Diploma ☐11
12. Postgraduate Degree (Masters) ☐12
13. Doctorate (Ph.D) ☐13

L34x. At what age did you leave full-time education for the first time? _____ years

L35. ***[Card L35]*** **What language or languages do you and your partner speak with <baby> most often at home?**
[Int. Tick all that apply]

English	☐1	Irish	☐2
Arabic	☐3	French	☐4
Polish	☐5	Russian	☐6
Czech	☐7	Latvian	☐8
Portuguese	☐9	Spanish	☐10
Chinese	☐11	Lithuanian	☐12
Romanian	☐13	German	☐14
Other (specify)	☐15		

L35a. Is English your native language? Yes ☐1 →Go to L38 No ☐2

[Int: Ask L36 and L37 only if any language other than Irish or English is usually spoken at home see L35 above]

L36. Many people have problems with reading. Can I just check, can you read aloud to a child from a children's storybook in your own language? Yes ☐1 No ☐2

L37. Can you usually read and fill out forms you might have to deal with in your own language?

Yes ☐1 No ☐2

L38. Many people have problems with reading. Can I just check can you read aloud to a child from a children's story book written in English?

Yes ☐1 No ☐2

L39. Can you usually read and fill out forms you might have to deal with in English?

Yes ☐1 No ☐2

L40. When you buy things in shops with a five or ten euro note, can you usually tell if you have the right change?

Yes ☐1 No ☐2

L41. Are you a citizen of Ireland? Yes ☐1 No ☐2

L42. What citizenship do you hold? _____

L43. Were you born in Ireland? Yes ☐1 No ☐2

L44. In which country were you born? _____

L45. How long ago did you first come to live in Ireland?

Within the last year	1-5 years ago	6-10 years ago	11-20 years ago	More than 20 years ago
☐1	☐2	☐3	☐4	☐5

L46. And what about <baby>. Is he / she a citizen of Ireland? Yes ☐1 No ☐2

L47. What citizenship does he / she hold? _____

L48. Was <baby> born in Ireland? Yes ☐1 No ☐2

L49. In which country was he/she born? _____

L50. How long ago did <baby> first come to live in Ireland?

Within last 3 months	3-6 months	More than 6 months
☐1	☐2	☐3

L51. ***[Card L51]*** **Looking at Card L51, can you tell me what is your ethnic or cultural background?**

Irish	☐1	Any other Black background	☐5
Irish Traveller	☐2	Chinese	☐6
Any other white background	☐3	Any other Asian background	☐7
African	☐4	Other – incl. mixed background (specify)	☐8

L52a. Do you belong to any religion? Yes ☐1 No ☐2

L52b. *[Card L52b]* **Which religion**

- Christian – no denomination ☐1
- Roman Catholic ☐2
- Anglican/Church of Ireland/Episcopalian ☐3
- Other Protestant ☐4
- Jewish ☐5
- Muslim ☐6
- Other (specify) ☐7

L53a. And what about <baby> does he/she belong to any religion?

Yes ☐1 No ☐2

L53b. *[Card L53b]* **Which religion**

- Christian – no denomination ☐1
- Roman Catholic ☐2
- Anglican/Church of Ireland/Episcopalian ☐3
- Other Protestant ☐4
- Jewish ☐5
- Muslim ☐6
- Other (specify) ☐7

L54. Can I just check again, does anyone other than yourself and/ or your spouse / partner provide care to <baby> on a regular basis for 8 or more hours each week? Remember, this could be in your own home, in a child-minder's home, in a crèche an after-school club etc. The person providing the care might be a relative or non-relative.

Yes, regular care 8 hrs per week or more ☐1 No regular care 8 hrs per wk or more ☐2 → Go to M1

L55. Is this care provided in:

- the child's home ☐1
- a relative's home ☐2
- home of carer – non-relative ☐3
- centre – crèche) ☐4

L56. We would like to send a short questionnaire to the person / centre who provides this care to <baby>. We would be happy to show you the content of this questionnaire before we send it. Would you be able to provide us with contact details for the person or centre which provides this care to <baby>?

- Yes ☐1 → **Interviewer: record contact details of regular carer on the Work Assignment Sheet**
- No, does not wish regular carer to be contacted ☐2
- No, does not have contact details for regular carer ☐3

M. Neighbourhood / Community

☐☐☐☐

Time Section Started **(24 hour clock)**

Finally, we would like to ask you some questions about your local area.

M1. How long have you lived in your local area? _____ years OR _____ months

M2. How common would you say that each of the things listed below is in your area? For each item listed please say whether or not you think it is very common; fairly common; not very common; or not at all common.

	Very Common	Fairly common	Not very common	Not at all common
Rubbish and litter lying about	☐1	☐2	☐3	☐4
Homes and -gardens in bad condition	☐1	☐2	☐3	☐4
Vandalism and deliberate damage to property	☐1	☐2	☐3	☐4
People being drunk or taking drugs in public	☐1	☐2	☐3	☐4

M3. To what extent do you agree or disagree with these statements about your local area?

	Strongly Agree	Agree	Disagree	Strongly Disagree
It is safe to walk alone in this area after dark	☐1	☐2	☐3	☐4
It is safe for children to play outside during the day in this area	☐1	☐2	☐3	☐4
There are safe parks, playgrounds and play spaces in this area	☐1	☐2	☐3	☐4
We as a family intend to continue living in this area	☐1	☐2	☐3	☐4
As a family we are settled in and part of this community	☐1	☐2	☐3	☐4

M4. I am going to read out a range of services. Could you tell me whether these services are available in or within relatively easy access of YOUR LOCAL AREA?

	Available? Yes	No		Available? Yes	No
1. Regular public transport	☐1	☐2	5. Social Welfare Office	☐1	☐2
2. GP or health clinic	☐1	☐2	6. Banking/ Credit Union	☐1	☐2
3. Schools (primary or secondary)	☐1	☐2	7. Essential grocery shopping	☐1	☐2
4. Library	☐1	☐2	8. Crèche, day-care, mother and toddler groups etc	☐1	☐2

M5. Do you have any family living in this area, including your partner's family (if relevant)?

Yes ☐1 No ☐2

M6. Would you describe the place where the household is situated as being.....?

In open country	☐1	Waterford city	☐7
In a village (200-1,499)	☐2	Galway city	☐8
In a town (1,500-2,999)	☐3	Limerick city	☐9
In a town (3,000-4,999)	☐4	Cork city	☐10
In a town (5,000-9,999)	☐5	Dublin city (incl. Dun Laoghaire)	☐11
In a town (10,000 or more)	☐6	Dublin county (outside Dublin city) urban	☐12
		Dublin county (outside Dublin city) rural	☐13

Time Section Ended ☐☐☐☐ **(24 hour clock)**

Appendix B

The Economic and Social Research Institute
Whitaker Square
Sir John Rogerson's Quay
Dublin 2
Ph: 01-8632000 fax: 01-8632100

ESRI

Office of the Minister for Children and Youth Affairs

University of Dublin
Trinity College
College Green
Dublin 2

NATIONAL LONGITUDINAL STUDY OF CHILDREN IN IRELAND (NLSCI)
3-YEAR QUESTIONNAIRE

STRICTLY CONFIDENTIAL

PRIMARY CAREGIVER QUESTIONNAIRE

GROUP ☐☐ HHOLD ☐☐☐☐ RESPONDENT ☐☐

INTERVIEWER NAME _____ INTERVIEWER NO: ☐☐☐☐☐☐

Time Section Started ☐☐☐☐ (24 hour clock) DATE: dd mm yy

We are seeking to interview the parents/guardians of <child>. The whole interview with the parents/guardians and child will take about 120 minutes to complete [INTERVIEWER: Adjust as appropriate for you in the field]. All the information you and your family provide will be treated in the strictest confidence and will not be released in any way which would allow the information you provide to be identified with you or your family. If however, we are told something which might suggest that a child or other vulnerable person is at risk we may have to act on it.

The Department of Health and Children is funding the study through the Office of the Minister for Children and Youth Affairs (OMCYA), in association with the Department of Social Protection and the Central Statistics Office. The Department of Education and Science is represented on the Steering Group which oversees the Study. A group of researchers led by the Economic and Social Research Institute (ESRI) and The Children's Research Centre at Trinity College Dublin is carrying out the study

Section A – Household Composition

A1a. [INTERVIEWER: Is <primary caregiver at time 1> still resident in the household?

Yes ..... ☐1 No ..... ☐2 → Go to A7a

A1b. Do you have a spouse/partner who lives here with you in the household?

Yes ..... ☐1 No ..... ☐2

A1c. At the time of the last interview in [MM/YYYY] you told us that [number of people resident at time 1] lived here in the household. I'd like to begin by asking you to check the information we collected the last time we visited.

A2. ***The name, sex, date of birth, and relationship of each person to the <primary respondent at time 1> and <child> will be checked and edited where necessary and their residency in the household at time 2 confirmed.***

								(E) Show Card A2F						
No.	First name	Sex	Date of Birth	If DOB not available	Still resident?	Relationship of each member to mother and child.		Not yet at school	School/Education	At work/Training	Unemployed	Retired	Home Duties	Other
		M F			Y N	R'SHIP TO: CARD A2E1 Mother	R'SHIP TO: CARD A2E2 Study Child							
1		☐ ☐	— — —		☐ ☐	////								
2		☐ ☐	— — —		☐ ☐		////							
3		☐ ☐	— — —		☐ ☐			☐	☐	☐	☐	☐	☐	☐
4		☐ ☐	— — —		☐ ☐			☐	☐	☐	☐	☐	☐	☐
5		☐ ☐	— — —		☐ ☐			☐	☐	☐	☐	☐	☐	☐
6		☐ ☐	— — —		☐ ☐			☐	☐	☐	☐	☐	☐	☐
7		☐ ☐	— — —		☐ ☐			☐	☐	☐	☐	☐	☐	☐
8		☐ ☐	— — —		☐ ☐			☐	☐	☐	☐	☐	☐	☐

Interviewer: Mother or lone father should be on line 1. Study Child should be on line 2. Father / Partner on line 3 (if relevant).

[BLAISE CONDITION: IF ANY PERSON RESIDENT AT TIME 1 IS NO LONGER RESIDENT IN THE HOUSEHOLD AT TIME 2: ASK QUESTIONS AS1 – AS3 ON THE SENSITIVE QUESTIONNAIRE]

[INTERVIEWER: IF THE RESPONDENT INDICATES THAT A RESIDENT MEMBER OF THE HOUSEHOLD WAS ACCIDENTALLY OMITTED FROM THE HOUSEHOLD GRID AT TIME 1 - ADD THEM TO THE NEW GRID BELOW]

A3a. Has anyone else joined the household since we last spoke and is currently living with you?

Yes ..... ☐1 No ..... ☐2 Go to A4

A3b. How many people have joined the household since we last spoke?

No	First Name	Sex	Date of Birth	If DOB not available	Relationship of each member to mother and child		Since when have they been living with you		Resident	Show Card A2F						
		M F			Mother (Card A2E1)	Child (Card A2E2)	Month	Year	Y/N	Not yet at school	School/Education	At work/Training	Unemployed	Retired	Home Duties	Other
21		☐ ☐	— — —							☐	☐	☐	☐	☐	☐	☐
22		☐ ☐	— — —							☐	☐	☐	☐	☐	☐	☐
23		☐ ☐	— — —							☐	☐	☐	☐	☐	☐	☐
24		☐ ☐	— — —							☐	☐	☐	☐	☐	☐	☐
25		☐ ☐	— — —							☐	☐	☐	☐	☐	☐	☐
		☐ ☐	— — —							☐	☐	☐	☐	☐	☐	☐

2

[INT: RECORD DETAILS OF NEW PERSONS ON HOUSEHOLD GRID AT A3 ABOVE INCLUDING WHEN THEY STARTED LIVING WITH RESPONDENT]

A4. So that's a total of _____ people who live here in the household at present. Is that correct?

Yes ..... ☐1 No ..... ☐2 → [INT: Check Household Grid]

[ASK ONLY IF <TIME 1 PRIMARY CARER> IS STILL RESIDENT IN THE HOUSEHOLD AT TIME 2.

A5. When we last spoke in [MM/YY], we interviewed you as the primary caregiver of <child>. We would like you to complete the primary carer questionnaire with us on this occasion as well. Can I just check, are you still the primary caregiver of <child>?

Yes ..... ☐1 Go to A9a No ..... ☐2

A6a. Why is that? _____

_____

IF PRIMARY CAREGIVER FROM TIME 1 HAS A RESIDENT SPOUSE PARTNER [IDENTIFIED AT A2 ABOVE] THEN:

A6b. You mentioned that <spouse/partner> [identified at A1b above] lives here with you as part of the household. This means that we should interview him/her as the primary caregiver of <child> on this occasion. Is that correct?

Yes ..... ☐1 No ..... ☐2 [Int: please establish who is the Primary Caregiver of <child> at this time]

Go to A9a

IF PRIMARY CAREGIVER AT TIME 1 IS NO LONGER RESIDENT IN THE HOUSEHOLD AT TIME 2 ASK A7a – A9.

A7a. Are you the legal parent / guardian of <child> who usually provides the most care to him/her?

Yes ..... ☐1 No ..... ☐2 → [INT: Ask to speak to PCG]

A7b. [Card A7b] Can you please tell me which of the following best describes your relationship to <child>?
[Interviewer use codes only]

Biological mother/ father	☐1	Grand parent	☐5
Adoptive mother/ father	☐2	Aunt/uncle	☐6
Step-mother / Step-father / Partner of child's parent	☐3	Other relative/ in law	☐7
Foster mother / father	☐4	Unrelated guardian	☐8

A7c. Do you have a spouse/partner who lives here with you in the household?

Yes ..... ☐1 No ..... ☐2

A8a. How many people in total (including yourself and <child>) live here regularly as members of the household? _____ persons

								(E) Show Card A2F						
No.	First name/Initial	Sex	Date of Birth	If DOB not available	Was this Person Resident at time 1?	Relationship of each member to mother and child.		Not yet at school	School/Education	At work/Training	Unemployed	Retired	Home Duties	Other
		M F			Y N	R'SHIP TO: CARD A2E1 Mother	R'SHIP TO: CARD A2E2 Study Child							
51		☐☐	— — —		☐	////		☐1	☐2	☐3	☐4	☐5	☐6	☐7

52		☐☐	___		☐			////	☐	☐	☐	☐	☐	☐	☐
53		☐☐	___		☐				☐	☐	☐	☐	☐	☐	☐
54		☐☐	___		☐				☐	☐	☐	☐	☐	☐	☐
55		☐☐	___		☐				☐	☐	☐	☐	☐	☐	☐

A8b. Was that person born into the household or did they join for another reason?

Born into the household ..... ☐1
Joined for another reason (specify) _____ ☐2

A8c. Since when has this person being living here in the household? ____ month ____ year

Go to A9a

A9a. Does <child> have any brother(s) or sister(s) who live outside the household? Please include full, half or step brothers or sisters?

Yes ..... ☐1 No ..... ☐2

A9b. How many full/half/step brother(s)/sister(s) does <child> have who live outside the household? ____ n

A9c. For each full/half/step brother/sister who lives outside the household, can you tell me:

1) their gender
2) their Date of Birth (DOB)
3) their relationship to <child>

	Male	Female	Date of Birth	Relationship to <child>
1.	☐1	☐2	__ __ / __ __ / __ __ __ __	*SHOW CARD A9c*
2.	☐1	☐2	__ __ / __ __ / __ __ __ __	*SHOW CARD A9c*
3.	☐1	☐2	__ __ / __ __ / __ __ __ __	*SHOW CARD A9c*

Section B - Child's Habits and Routines

I'd now like to ask you a few questions about <child's> habits and routines.

B1. On a normal day, what time in the evening does <child> usually go to sleep? _____ (24 hour clock)

B2. On a normal day, what time does <child> wake up at in the morning? _____ (24 hour clock)

B3. On a normal day how many hours would the <child> sleep *during* the day _____ hours _____ mins
[INT: IF NONE THEN ENTER '0' FOR BOTH HOURS AND MINUTES]

B4. How much is <child's> sleeping pattern or habits a problem for you? Would you say... [INT: READ OUT]

A large problem	A moderate problem	A small problem	No problem at all
☐1	☐2	☐3	☐4

B5. [CARD B5] Does <child> wear nappies / training pants / pull-ups?

Always	Sometimes	Never

(a) during the day	☐1	☐2	☐3
(b) at night	☐1	☐2	☐3

B6. [CARD B6] How often does he/she suck a soother or his/her thumb or finger(s)?

	Most of the time	Sometimes	Never
(a) Soother	☐1	☐2	☐3
(b) Thumb/finger(s)	☐1	☐2	☐3

B7. [CARD B7] I am going to read out some statements about the relationship between you and <child>. Please listen to each statement and describe the degree to which each of the following statements currently applies.

	Definitely does not apply	Not really	Neutral not sure	Applies somewhat	Definitely applies
a. I share an affectionate, warm relationship with my child.	☐1	☐2	☐3	☐4	☐5
b. My child and I always seem to be struggling with each other	☐1	☐2	☐3	☐4	☐5
c. If upset, my child will seek comfort from me	☐1	☐2	☐3	☐4	☐5
d. My child is uncomfortable with physical affection or touch from me	☐1	☐2	☐3	☐4	☐5
e. My child values his/her relationship with me	☐1	☐2	☐3	☐4	☐5
f. When I praise my child he/she beams with pride	☐1	☐2	☐3	☐4	☐5
g. My child spontaneously shares information about his/herself	☐1	☐2	☐3	☐4	☐5
h. My child easily becomes angry at me	☐1	☐2	☐3	☐4	☐5
i. It is easy to be in tune with what my child is feeling	☐1	☐2	☐3	☐4	☐5
j. My child remains angry or resistant after being disciplined	☐1	☐2	☐3	☐4	☐5
k. Dealing with my child drains my energy	☐1	☐2	☐3	☐4	☐5
l. When my child is in a bad mood I know we're in for a long and difficult day	☐1	☐2	☐3	☐4	☐5
m. My child's feelings toward me can be unpredictable or change suddenly	☐1	☐2	☐3	☐4	☐5
n. My child is sneaky or manipulative with me	☐1	☐2	☐3	☐4	☐5
o. My child openly shares his/her feelings and experiences with me	☐1	☐2	☐3	☐4	☐5

B8. [Card B8] How often do you do the following when <child> misbehaves?

	Never	Rarely	Now and Again	Regularly	Always	Can't say
A. Discuss/Explain why behaviour was wrong	☐1	☐2	☐3	☐4	☐1	☐8
B. Ignore him/her	☐1	☐2	☐3	☐4	☐5	☐8
C. Smack him/her	☐1	☐2	☐3	☐4	☐5	☐8
D. Shout or yell at him/her	☐1	☐2	☐3	☐4	☐5	☐8
E. Send him/her out of the room or to his/her bedroom or Naughty step	☐1	☐2	☐3	☐4	☐5	☐8
F. Take away treats	☐1	☐2	☐3	☐4	☐5	☐8
G. Tell him/her off	☐1	☐2	☐3	☐4	☐5	☐8
H. Bribe him/her	☐1	☐2	☐3	☐4	☐5	☐8

Section C - Child's physical health and development

Now I'd like to ask you a few questions about <child's> health

C1. [Card C1] In general, how would you describe <child's> current health?

Very healthy, no problems ☐1
Healthy, but a few minor problems ☐2
Sometimes quite ill ☐3
Almost always unwell ☐4

C2. Does <child> have any longstanding illness, condition or disability? By longstanding I mean anything that has troubled him/her over a period of time or that is likely to affect him/her over a period of time?

Yes ☐1 No ☐2 → **Go to C6z_1**

C3. [Card C3] What longstanding illness, condition or disability does <child> have?
[INT – code for up to 3 illnesses]

a. Asthma	☐1
b. Cystic Fibrosis	☐2
c. Heart abnormalities	☐3
d. Eczema or any kind of skin allergy	☐4
e. Any kind of respiratory allergy (including hayfever)	☐5
f. Any kind of food or digestive allergy	☐6
g. Problem with non-food allergies, such as to dust, animals or medicine	☐7
h. Bone, joint or muscle problems	☐8
i. A problem using his/her arms or legs	☐9
j. A problem using his/her hands or fingers	☐10
k. Hyperactivity/Problems with attention	☐11
l. Severe behavioural problems	☐12
m. Diabetes	☐13
n. Kidney disease	☐14
o. Migrainous headaches	☐15
p. Epilepsy or seizures	☐16
q. Down syndrome	☐17
r. Spina bifida/hydrocephalis	☐18
s. Cerebral palsy	☐19
t. Autism Spectrum Disorder	☐20
u. Other (please specify)	☐21

[INT – CODE FOR UP TO 3 ILLNESSES]

C4. Has this illness, condition or disability been diagnosed by a medical professional?

Yes ☐1 No ☐2

C5. Since when has <child> had this illness, condition or disability? ____month ____year

C6. Do any of these illnesses hamper <child> in his/her daily activities?

Yes, severely ☐1 Yes, to some extent ☐2 No ☐3

C6z_1. In the past 12 months has <child> had any periods when there was wheezing with whistling on his/her chest when he/she breathed?

Yes ☐1 No ☐2

C6z_2. How many separate episodes/bouts of wheezing with whistling on his/her chest has <child> had in the past 12 months? _____ N

C6z_3. Has <child> been prescribed medication for this condition (including inhaler, antibiotics, nebuliser) in the past 12 months?

Yes ☐1 No ☐2

C7. Has <child> had the Measles/Mumps/Rubella (MMR) vaccination?

Yes ☐1 No ☐2

C8. In the past 12 months, how many times have you seen or talked on the telephone with any of the following about <child's> physical or emotional health? [INT: IF NONE THEN ENTER 0 – DO NOT LEAVE BLANK]

a) A general practitioner (GP) _____N
b) A paediatrician / consultant / hospital doctor _____N
c) A public health nurse _____N
d) A practice nurse (i.e. a nurse in a GP's surgery/clinic) _____N
e) A psychiatrist/psychologist _____N
f) Accident and Emergency _____N
g) A social worker _____N

C9a. Has <child> received a course of antibiotics in the past 12 months?

Yes ☐1 No ☐2

C9b. In total, how many courses of antibiotics has <child> received in the past 12 months? _____ N

C10. Since the time of the last interview in MM/YY, approximately how many nights has <child> spent in hospital? _____ nights
[INT: NOT HOSPITAL OUTPATIENT OR EMERGENCY DEPARTMENT VISITS – IF NONE THEN CODE AS '0']

C11. Most children have accidents at some time. Has <child> ever had an accident or injury that required hospital treatment or admission?

Yes ☐1 No ☐2

C12. How many separate accidents has <child> ever had that required hospital treatment or admission?
_____ accidents

C13. How many of these accidents involved bone fractures or breaks? _____

C14. Does <child> currently have, or at any time in the past had, any sort of sight problem requiring correction? [INTERVIEWER: Explain that 'correction' includes being prescribed glasses]

Yes, currently ☐1 Yes, in the past ☐2 No ☐3

C15. Does <child> currently have, or at any time in the past had, any sort of hearing problem requiring correction?

Yes, currently ☐1 Yes, in the past ☐2 No ☐3

C16. [Card C16] Was there any time in the last 12 months when, in your opinion, <child> needed medical care or treatment for a health problem but he/she did not receive it because: [INT: READ OUT]

	Yes	No
a) You couldn't afford to pay	☐1	☐2
b) The necessary medical care wasn't available or accessible to you	☐1	☐2
c) You could not take time off work to visit the doctor with <child>	☐1	☐2
d) You wanted to wait and see if the problem got better	☐1	☐2
e) Child refused / fear of doctor	☐1	☐2
f) Child is still on the waiting list	☐1	☐2
g) Other (specify)	☐1	☐2

C17. Do you have any concerns about how <child> talks and makes speech sounds? Would you say no, yes a little or yes a lot?

No ☐1 Yes, a little ☐2 Yes, a lot ☐3 Don't know ☐4

C18. [Card C18] In which areas does child have difficulties? What speech problems does <child> have?
[TICK ALL THAT APPLY]

A. Reluctant to speak ☐1
B. Speech not clear to the family ☐2
C. Speech not clear to others ☐3
D. Speech is developing slowly ☐4
E. Difficulty finding words ☐5
F. Difficulty putting words together ☐6
G. Voice sounds unusual ☐7
H. Stutters, stammers ☐8
I. Lisp or difficulty pronouncing certain letter combinations ☐9
J. Other (please specify) ☐10
K. Don't know ☐99

C19. Has <child> received any treatment for his/her speech or language problem?

Yes ☐1 No ☐2

C20. How old was <child> [in months] when he/she took his/her first steps unsupported?
Interviewer: By unsupported I mean that he/she walked on his/her own without holding onto someone else or something else for support.

_____ months ☐99 child cannot walk

C21. [Card C21] Getting children to brush their teeth is a challenge faced by many parents. I'd like to ask you a few questions about <child's> teeth. How often is a toothbrush used to clean < child's > teeth?

More than twice a day ☐1
Twice a day ☐2
Once a day ☐3
Less often than once a day ☐4
Rarely ☐5
Not at all ☐6

C22. Has <child> been to visit the dentist because of a problem with his/her teeth?

Yes ☐1 No ☐2

[BLAISE CONDITION: ASK C23 – C24 ONLY OF THOSE WHO WERE STILL BREASTFEEDING AT 9 MONTHS OF AGE]
C23. When we last interviewed you in _____, you told us that you were still breastfeeding <child>. Can I just check, are you still breastfeeding <child>? [Include expressed milk]

Yes ☐1 No ☐2

C24. How old was <child> [in months] when he/she completely stopped being breastfed? ____Months
[Int: Only Accept answer in Months]

C25. [Card C25] In the last 24 hours has <child> had the following foods and drinks once, more than once, or not at all?

	Not At all	Once	More than Once
A. Fresh fruit	☐0	☐1	☐2
B. Cooked vegetables	☐0	☐1	☐2
C. Raw vegetables or salad	☐0	☐1	☐2
D. Hamburger, hot dog, sausage or sausage roll, meat pie,	☐0	☐1	☐2
E. Hot chips or French fries	☐0	☐1	☐2
F. Crisps or savoury snacks	☐0	☐1	☐2
G. Biscuits, doughnuts, cake, pie or chocolate	☐0	☐1	☐2
H. Sweets	☐0	☐1	☐2
I. Full fat cheese/yoghurt/ fromage frais	☐0	☐1	☐2
J. Low fat Cheese/ low fat yoghurt	☐0	☐1	☐2
K. Water (tap water / still water/ sparkling water)	☐0	☐1	☐2
L. Fizzy drinks / minerals / cordial / squash (diet)	☐0	☐1	☐2
M. Fizzy drinks / minerals / cordial / squash (not diet)	☐0	☐1	☐2
N. Full cream milk or full cream milk products	☐0	☐1	☐2
O. Skimmed/Semi-skimmed milk or Skimmed/Semi skimmed milk products	☐0	☐1	☐2

C26. [Card C26] Please read the following statements and indicate the answer which best describes how you deal with feeding <child>. It is important to remember that there are no right or wrong answers to these questions, we are interested in what parents really feel and do.

	Never	Rarely	Sometimes	Often	Always
1. I decide how many snacks <child> should have	☐1	☐2	☐3	☐4	☐5
2. I give <child> something to eat to make him/her feel better when s/he is feeling upset	☐1	☐2	☐3	☐4	☐5
3. I let <child> decide when s/he would like to have her meal	☐1	☐2	☐3	☐4	☐5
4. I give <child> something to eat if s/he is feeling bored	☐1	☐2	☐3	☐4	☐5
5. I insist <child> eats meals at the table	☐1	☐2	☐3	☐4	☐5
6. I let <child> eat between meals whenever s/he wants	☐1	☐2	☐3	☐4	☐5

C27. [Card C27] Which of these best describes <child's> weight?

Underweight ..... ☐1
Normal weight ..... ☐2
Somewhat overweight ..... ☐3
Very Overweight ..... ☐4

Section D - Parental Health

Now I'd like to ask you a few questions about your own health.

D1. [Card D1] In general, how would you say your current health is?

Excellent ..... ☐1 Very good ..... ☐2 Good ..... ☐3 Fair ..... ☐4 Poor ..... ☐5

D2. Do you have any on-going chronic physical or mental health problem, illness or disability?

Yes ..... ☐1 No ..... ☐2

D3. What is the nature of this problem, illness or disability? Please describe as fully as possible.
[Int. please record diagnosis – not symptoms of the problem.]

_____

_____

D4. Since when have you had this problem, illness or disability? _____(mth) _____(year)

D5. Are you hampered in your daily activities by this problem, illness or disability?

Yes, severely ..... ☐1 Yes, to some extent ..... ☐2 No ..... ☐3

D6. Is the family (you, your spouse/partner and child(ren)) covered by a medical card?

Yes, full card ..... ☐1 Yes, GP only ..... ☐2 Not covered ..... ☐3

D7. Is <child> covered by private medical insurance?

Yes ..... ☐1 No ..... ☐2

D8. Does that insurance include the cost of GP visits?

Yes, in full ..... ☐1 Yes, partially ..... ☐2 No ..... ☐3

Section E - Child's play and activities

E1. [CARD E1] Look at the card, for each statement, please indicate the answer that best describes the <child's> behaviour <u>at the present time</u>.

	Almost Never	Not Often	Variable usually does not	Variable usually does	Frequently	Almost always
A. This child is pleasant (smiles, laughs) when first arriving in unfamiliar places	☐1	☐2	☐3	☐4	☐5	☐6
B. This child plays continuously for more than 10 minutes at a time with a favourite toy	☐1	☐2	☐3	☐4	☐5	☐6
C. This child responds to frustration intensely (screams, yells)	☐1	☐2	☐3	☐4	☐5	☐6
D. This child smiles when an unfamiliar adult plays with him/her	☐1	☐2	☐3	☐4	☐5	☐6
E. This child goes back to the same activity after a brief interruption (snack, trip to toilet)	☐1	☐2	☐3	☐4	☐5	☐6
F. This child has moody "off" days when he/she is irritable all day	☐1	☐2	☐3	☐4	☐5	☐6
G. This child is outgoing with adult strangers outside the home	☐1	☐2	☐3	☐4	☐5	☐6
H. This child stays with a routine task (dressing, picking up toys) for 5 minutes or more	☐1	☐2	☐3	☐4	☐5	☐6
I. This child shows much bodily movement (stomps, writhes, swings arms) when upset or crying	☐1	☐2	☐3	☐4	☐5	☐6
J. This child is still wary of strangers after 15 minutes	☐1	☐2	☐3	☐4	☐5	☐6
K. This child stops to examine objects thoroughly (5 minutes or more)	☐1	☐2	☐3	☐4	☐5	☐6
L. This child reacts strongly (cries, screams) when unable to complete a play activity	☐1	☐2	☐3	☐4	☐5	☐6
M. This child practices a new skill (throwing, building, drawing for 10 or more minutes)	☐1	☐2	☐3	☐4	☐5	☐6

E2. Overall, compared to other children of the same age, do you think <child> is... [INT: READ OUT]

Easier than average ☐1
About average ☐2
More difficult than average ☐3

We are interested in the various kinds of activities that children do with their families. I would like you to think about activities which <child> may do at home. Please think about the usual pattern for <child> at the moment.

E3. [Card E3] Now I'd like to ask you about activities which <child> may do at home.

a) On how many days in an average week does anyone at home read to <child>

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
☐0	☐1	☐2	☐3	☐4	☐5	☐6	☐7

b) On how many days in an average week does anyone at home help <child> learn the ABC or alphabet

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
☐0	☐1	☐2	☐3	☐4	☐5	☐6	☐7

c) On how many days in an average week does anyone at home help <child> learn numbers or counting

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
☐0	☐1	☐2	☐3	☐4	☐5	☐6	☐7

d) On how many days in an average week does anyone at home help <child> learn songs, poems or nursery rhymes

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
☐0	☐1	☐2	☐3	☐4	☐5	☐6	☐7

e) On how many days in an average week does anyone play games [board games, jigsaws, card games etc] with child

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
☐0	☐1	☐2	☐3	☐4	☐5	☐6	☐7

f) On how many days in an average week does <child> paint, draw, colour, or play with play-doh at home

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
☐0	☐1	☐2	☐3	☐4	☐5	☐6	☐7

g On how many days in an average week does anyone at home play active games with <child> (e.g. football)?

0 days	1 day	2 days	3 days	4 days	5 days	6 days	7 days
☐0	☐1	☐2	☐3	☐4	☐5	☐6	☐7

E4. About how many *children's books* does <child> have access to in your home now, including any library books? Would you estimate... [INT: READ OUT]

None ☐1
Less than 10 ☐2
10 to 20 ☐3
21 to 30 ☐4
More than 30 ☐5

E5. Typically, how many hours a day does <child> sit and watch television or videos/dvds?
_____hours _____minutes [If none, enter 0 for hours and minutes]

E6. And are there rules in your family about what <child> may watch on television?

Yes ☐1 No ☐2

E7. Is there a television or computer (including games console) in <child's> bedroom?

Yes ☐1 No ☐2

E8. [Card E8] What does <child> prefer to do when he/she has a choice about how to spend free time?

Usually chooses inactive pastimes like TV, drawing or playing with toys in one place ☐1
Usually chooses active pastimes like running around, riding push-cars, kicking balls ☐2
Just as likely to choose active as inactive ☐3

E9. Can your child ride a tricycle or other similar toy vehicle with pedals?

Yes, can use pedals to cycle ☐1
Can sit on tricycle and push it along with his/her feet but does not pedal properly yet ☐2
No ☐3
Not sure/doesn't have tricycle ☐4

E10. Can your child assemble simple jigsaw puzzles OR assemble and break-up lego/duplo pieces? (He/she can manipulate the pieces even if he/she does not solve the puzzle correctly)

Yes ☐1 No ☐2 Not sure ☐3

Section F - Child's Functioning and relationships

Now I'd like to ask you some questions about <child's> emotional health and wellbeing.

F1. [CARD F1] Listed below is a set of statements which could be used to describe the Study Child's behaviour. For each item, please indicate whether it is Not True, Somewhat True or Certainly True. It would help us if you answered all items as best you can even if you are not absolutely certain. Please give answers on the basis of the Study Child's behaviour over the last six months. Use answers 1, 2 or 3 as on the card if you like.

	Not True	Somewhat True	Certainly True
A. Considerate of other people's feelings	☐1	☐2	☐3
B. Restless, overactive, cannot stay still for long	☐1	☐2	☐3
C. Often complains of headaches, stomach-aches or sickness	☐1	☐2	☐3
D. Shares readily with other children (treats, toys, pencils etc.)	☐1	☐2	☐3
E. Often has temper tantrums or hot tempers	☐1	☐2	☐3
F. Rather solitary, tends to play alone	☐1	☐2	☐3
G. Generally obedient, usually does what adults request	☐1	☐2	☐3
H. Many worries, often seems worried	☐1	☐2	☐3
I. Helpful if someone is hurt, upset or feeling ill	☐1	☐2	☐3
J. Constantly fidgeting or squirming	☐1	☐2	☐3
K. Has at least one good friend	☐1	☐2	☐3
L. Often fights with other children or bullies them	☐1	☐2	☐3
M. Often unhappy, down-hearted or tearful	☐1	☐2	☐3
N. Generally liked by other children	☐1	☐2	☐3
O. Easily distracted, concentration wanders	☐1	☐2	☐3
P. Nervous or clingy in new situations, easily loses confidence	☐1	☐2	☐3
Q. Kind to younger children	☐1	☐2	☐3
R. Often argumentative with adults	☐1	☐2	☐3
S. Picked on or bullied by other children	☐1	☐2	☐3
T. Often volunteers to help others (parents, teachers, other children)	☐1	☐2	☐3
U. Can stop and think things out before acting	☐1	☐2	☐3
V. Can be spiteful to others	☐1	☐2	☐3
W. Gets on better with adults than with other children	☐1	☐2	☐3
X. Many fears, easily scared	☐1	☐2	☐3
Y. Sees tasks through to the end, good attention span	☐1	☐2	☐3

F2. Does <child> have any brothers or sisters?

Yes ☐1 No ☐2

F3. [Card F3] In general, how well does <child> get on with his/her siblings?

Gets on well with his/her siblings ☐1
Mixed ☐2
Does not get on well with his/her siblings ☐3
Does not see them ☐4

Section G – Childcare Arrangements

Now I'd like to ask you some questions about childcare arrangements.

G1. Is <child> currently being minded by someone other than you or your resident spouse / partner for 8 hours or more per week during the day?

Yes ☐1 No ☐2 If no go to G8a

G2. (a) Who minds <child> on a regular basis each week? [Int: Show Card G2]
(b) number of days per week <child> spends in each type of childcare
(c) number of hours per week <child> spends in each type of childcare
(d) how much you pay for this childcare for <child> per week
(e) whether this is your main type of childcare

	[Tick all that apply]	Number of days	Number of hours	Cost per week	Main type of care
a. A relative in your home	☐1 Go to G3a	____N	____N	€____	☐4
b. A non-relative in your home	☐2 Go to G4a	____N	____N	€____	☐4
c. A relative in their home	☐3 Go to G3b	____N	____N	€____	☐4
d. A non-relative in their home	☐4 Go to G4b	____N	____N	€____	☐4
e. Creche, Montessori, pre-school, naíonra or other centre-based care setting	☐5 Go to G6	____N	____N	€____	☐4
f. Other (please specify)	☐6 Go to G6	____N	____N	€____	☐4

If more than one child in childcare arrangement, take the average cost of childcare

G3a. [Card G3] Please specify how this person is related to <child>

a. Grandmother of <baby> ☐1
b. Grandfather of <baby> ☐2
c. Aunt /Uncle of <baby> ☐3
d. Brother / Sister of <baby> ☐4
e. Non-resident Parent ☐5
f. Cousin of <baby> ☐6
g. Other relative ☐7

G3b. [Card G3] Please specify how this person is related to <child>

a. Grandmother of <baby> ☐1
b. Grandfather of <baby> ☐2
c. Aunt /Uncle of <baby> ☐3
d. Brother / Sister of <baby> ☐4
e. Non-resident Parent ☐5
f. Cousin of <baby> ☐6
g. Other relative ☐7

G4a. [Card G4a] Which of the following best describes that person?

a. Au pair / Nanny (live in) ☐1
b. Friend / Neighbour ☐2
c. Childminder ☐3
d. Other ☐6

G4b. [Card G4b] Which of the following best describes that person?

a. Friend / Neighbour ☐1
b. Childminder ☐2
c. Other ☐3

G6a. Thinking now of the main type of childcare, in total, how many children (including <child>) are looked after in the room where <child> is cared for?

_____ **number of children**

G6b. Thinking now of the main type of childcare, in total, how many adults supervise the children in the room where <child> is cared for?

_____ **number of adults**

G7. [Card G7] The next questions are about the place where <child> is cared for. Please read each statement and indicate how characteristic each statement is of the MAIN place where <child> is cared for.

	Strongly Agree	Agree	Neither agree or disagree	Disagree	Strongly disagree
a. There are plenty of toys, books, pictures and music for my child	☐1	☐2	☐3	☐4	☐5
b. My caregiver knows a lot about children and their needs	☐1	☐2	☐3	☐4	☐5
c. My child is happy in this arrangement	☐1	☐2	☐3	☐4	☐5
d. The place where my child is cared for is kept clean	☐1	☐2	☐3	☐4	☐5
e. My child spends time learning letters and numbers	☐1	☐2	☐3	☐4	☐5
f. There are different play activities, e.g. water based, sand based, outdoor play, construction, painting etc. available to <child>	☐1	☐2	☐3	☐4	☐5

G8a. [Card G8a] Have you heard of and do you intend to avail of the free preschool year scheme?
["All children aged between 3 years 3 months and 4 years 6 months at September 1st each year are eligible for the free pre-school year scheme which entitles them to receive free pre-school provision of between 2 and 3 hours per day."]

1. Currently availing of the preschool scheme ☐1
2. Have heard of and plan to avail of the preschool scheme ☐2
3. Have heard of but unsure if I will avail of the preschool scheme ☐3
4. Have heard of but don't plan to avail of ☐4
5. Have never heard of the preschool scheme ☐5

G8b. Why not? _____

Note: 3 hours per day over 38 weeks per year (or 2 hours and 15 minutes per day over 50 weeks)

G9. [Card G9] Have you registered or enrolled <child> with a primary school?

No ☐1
Yes, with one school ☐2
Yes, with more than one school ☐3
Not registered, <child> will definitely attend local school ☐4

[If <child> is in receipt of childcare for 8 or more hours per week, ask of the person identified as the main childcare provider at G2]

G10. We would like to send a short questionnaire to the person/centre who provides this care to <child>. Would you be able to provide us with the contact details for the person or centre who provides this care to <child>?

Yes ☐1
No, does not wish regular carer to be contacted ☐2 → **Interviewer: Record contact details of regular carer on the Work Assignment Sheet**
No, does not have contact details for regular carer ☐3

Section H – Parenting and Family Context

I'd now like to ask you some general questions about parenting.

H1. How many times in the past week has the family sat down to eat an evening meal together? ____ (range 0 – 7)

H2. [Card H2] The next questions are about being a parent. There are no right or wrong answers, we are just asking about what happens in your family.

Thinking about <child> over the last six months, how often did you...? (Tick one box per row only)

	Never / Almost never	Rarely	Sometimes	Often	Always / Almost always
(a) Hug or hold this child for no particular reason	☐1	☐2	☐3	☐4	☐5
(b) Tell this child how happy he/she makes you	☐1	☐2	☐3	☐4	☐5
(c) Have warm, close times together with this child	☐1	☐2	☐3	☐4	☐5
(d) Enjoy listening to this child and doing things with him/her	☐1	☐2	☐3	☐4	☐5
(e) Feel close to this child both when he/she was happy and when he/she was upset	☐1	☐2	☐3	☐4	☐5
(f) Express affection by hugging, kissing and holding this child	☐1	☐2	☐3	☐4	☐5

H3. [Card H3] When parents spend time with their children, sometimes things go well and sometimes they don't. How often does the following happen...? (Tick one box per row only)

	Never / Almost never	Less than half the time	About half the time	More than half the time	All the time
(a) Of all the times you talk to this child about his/her behaviour, how often is this praise	☐1	☐2	☐3	☐4	☐5
(b) Of all the times you talk to this child about his/her behaviour, how often is this disapproval	☐1	☐2	☐3	☐4	☐5
(c) When you give this child an instruction or request to do something, how often do you make sure that he/she does it	☐1	☐2	☐3	☐4	☐5
(d) If you tell this child he/she will get punished if he/she doesn't stop doing something, but he/she keeps doing it, how often will you punish him/her	☐1	☐2	☐3	☐4	☐5
(e) How often does this child get away with things that you feel should have been punished	☐1	☐2	☐3	☐4	☐5
(f) How often are you angry when you punish this child	☐1	☐2	☐3	☐4	☐5
(g) How often do you feel you are having problems managing this child in general	☐1	☐2	☐3	☐4	☐5
(h) How often is this child able to get out of punishment when he/she really sets his/her mind to it	☐1	☐2	☐3	☐4	☐5
(i) When you discipline this child, how often does he/she ignore the punishment	☐1	☐2	☐3	☐4	☐5
(j) How often do you tell this child that he/she is bad or not as good as others	☐1	☐2	☐3	☐4	☐5
(k) How often do you think that the level of punishment you give this child depends on your mood	☐1	☐2	☐3	☐4	☐5

H4. [Card H4] If you are currently working outside the home, can I ask you the extent to which you agree or disagree with the following statements?

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	N/A
Because of your work responsibilities:						
A. You have missed out on home or family activities that you would have liked to have taken part in	☐1	☐2	☐3	☐4	☐5	☐6
B. Your family time is less enjoyable and more pressured	☐1	☐2	☐3	☐4	☐5	☐6
Because of your family responsibilities:						
C. You have to turn down work activities or opportunities that you would prefer to take on	☐1	☐2	☐3	☐4	☐5	☐6
D. The time you spend working is less enjoyable and more pressured	☐1	☐2	☐3	☐4	☐5	☐6

H5. [Card H5] Overall, how do you feel about the amount of support or help you get from family or friends living outside your household?

I get enough help ☐1 | I don't get enough help ☐2 | I don't get any help at all ☐3 | I don't need any help ☐4

H6. Are you in regular contact with <child's> grandparents?

Yes ☐1 | No ☐2 | All Grandparents are deceased ☐3 | All Grandparents live abroad ☐4

H7. How many of <child's> grandparents are still alive? _____ N

H8. With how many *his/her* grandparents would you say (child) has a close or very close |relationship? ____N

15

H9. [Card H9] Here are some questions about how much support you receive from <child's> grandparents

	Never	Less often than once every 3 months	At least once every 3 months	At least once a month	At least once a week	Every day or almost every day
(a) How often do <child's> grandparents babysit?	☐1	☐2	☐3	☐4	☐5	☐6
(b) How often do <child's> grandparents have <baby> to stay over night?	☐1	☐2	☐3	☐4	☐5	☐6
(c) How often do <child's> grandparents take <child> out?	☐1	☐2	☐3	☐4	☐5	☐6
(d) How often do <child's> grandparents buy toys or clothes for <child>?	☐1	☐2	☐3	☐4	☐5	☐6
(e) How often do <child's> grandparents help <child> learn the ABC/Alphabet or Numbers/Counting?	☐1	☐2	☐3	☐4	☐5	☐6
(f) How often do <child's> grandparents help you out financially?	☐1	☐2	☐3	☐4	☐5	☐6

J: SOCIO-DEMOGRAPHICS

Time Section Started ☐☐☐☐ **(24 hour clock)**

Now some questions about the circumstances of your household.

J1. I would now like to ask you some questions about your accommodation: Is this accommodation a:

House ☐1
Apartment / Flat/ Bedsit ☐2
Other (specify)_____ ☐3

J2. Does your accommodation have access to a garden or common space (either private or shared) where you can let <child> out to play?

Yes ☐1 No ☐2

J3. [Card J3] From this card, please tell me which best describes your (and your partner's) occupancy of the accommodation?

1. Owner occupied (with or without a mortgage) ☐1
2. Being purchased from a Local Authority under a Tenant Purchase Scheme ☐2
3. Rented from a Local Authority ☐3
4. Rented from a Voluntary Body ☐4
5. Rented from a Private Landlord ☐5
6. Living with and paying rent to your (or your partner's) parent(s) ☐6
7. Occupied free of rent with your (or your partner's) parent(s) ☐7
8. Occupied free of rent from your (or your partner's) job ☐8

J4a.Do you feel that your current accommodation (excluding location) is suitable for your family's needs?

Yes ☐1 No ☐2

J4b. [CARD J4b] Why is that? [Int: tick all that apply]

a. Too small ☐1
b. Not a child-friendly layout ☐2
c. Too many steps ☐3
d. Poor conditions in the home (damp, drafts, leaks etc) ☐4
e. Problems with rats, mice, cockroaches etc ☐5
f. Too noisy ☐6
g. Problems with neighbours ☐7
h. Other (specify) _____ ☐8

J5. [Card J5] Which of these descriptions BEST describes your usual situation in regard to work?
[Int: If respondent is on maternity leave and she has a job which she intends to return to, she should be coded as 0]

0. Currently on maternity leave, but have a job to return to ☐0
1. Employee (incl. apprenticeship or Community Employment) ☐1
2. Self employed outside farming ☐2
3. Farmer ☐3
4. Student full-time ☐4
5. On State training scheme (FAS, Fáilte Ireland etc) ☐5
6. Unemployed, actively looking for a job ☐6
7. Long-term sickness or disability ☐7
8. Home duties / looking after home or family ☐8
9. Retired ☐9
10. Other (please specify) _____ ☐10

[BLAISE CONDITION: IF RESPONDENT NOT WORKING AT TIME 1 BUT IS WORKING AT TIME 2 OR ON MATERNITY LEAVE AT TIME 1 BUT IS WORKING AT TIME 2 ASK J6a]

J6a. When did you return to work? _____ mth _____ year

[BLAISE CONDITION: IF RESPONDENT IS CURRENTLY ON MATERNITY LEAVE AND PLANS TO RETURN TO WORK ASK J6b]

J6b. When will you return to work? _____ mth _____ year

J7. How many hours do you normally work per week, including any regular overtime work? If you work at more than one job, please include the hours in all jobs.

_____ hours

J8. On a typical work day, how much time in minutes do you spend commuting to and from work (outward and return journey combined)?

_____ **minutes** [Int. if respondent works at home enter '0' for minutes]

J9. [Card J9] What is your occupation in your main job?

In all cases please describe the occupation fully and precisely giving the full job title.

Use precise terms such as:	Do not use general terms such as:
RETAIL STORE MANAGER	MANAGER
SECONDARY TEACHER	TEACHER
ELECTRICAL ENGINEER	ENGINEER

Civil servants and local government employees should state their grade e.g. SENIOR ADMINISTRATIVE OFFICER. Members of the Gardaí or Army should state their rank. Teachers should state the branch of teaching e.g. PRIMARY TEACHER. Clergy and religious orders should give full description e.g. NUN, REGISTERED GENERAL NURSE.

Write in your main OCCUPATION

_____

J10. Do you supervise or manage any personnel in your job?

Yes ☐1 No ☐2

J11. How many? _____

J12. How many employees (if any) do you have?_____ employees N A .... ☐99

J13. [Ask only if Farmer at J5.] How many acres do you farm? _____ acres _____ hectares

Go to J23

J14. Apart from holiday or casual work, have you ever had a full-time job? Yes ☐1 No ☐2 **Go to J19**

J15. In what year did you last work in that full-time job? _____ **year**

J16. When you last worked in that full-time job were you?

Employee (incl. apprenticeship or Community Employment) ☐1 Self-employed outside farming ☐2 Farmer ☐3

J17. [Card J17] What (was) your occupation in your main job?

In all cases describe the occupation fully and precisely giving the full job title.

Use precise terms such as:	Do not use general terms such as:
RETAIL STORE MANAGER	MANAGER
SECONDARY TEACHER	TEACHER
ELECTRICAL ENGINEER	ENGINEER

Civil servants and local government employees should state their grade e.g. SENIOR ADMINISTRATIVE OFFICER.
Members of the Gardaí or Army should state their rank. Teachers should state the branch of teaching e.g. PRIMARY TEACHER.
Clergy and religious orders should give full description e.g. NUN, REGISTERED GENERAL NURSE.

Write in your main OCCUPATION

_____

J18. [Ask only if Farmer at J16] How many acres did you farm? _____ acres _____ hectares

J19. Do you currently have a part time job outside the home? Yes ..... ☐1 No ..... ☐2 **Go to J22**

J20. On average, how many hours per week do you work in that part-time job? _____ **hours**

J21. [Card J21] What is your occupation in your main job?

In all cases describe the occupation fully and precisely giving the full job title.

Use precise terms such as:	Do not use general terms such as:
RETAIL STORE MANAGER	MANAGER
SECONDARY TEACHER	TEACHER
ELECTRICAL ENGINEER	ENGINEER

Civil servants and local government employees should state their grade e.g. SENIOR ADMINISTRATIVE OFFICER.
Members of the Gardaí or Army should state their rank. Teachers should state the branch of teaching e.g. PRIMARY TEACHER.
Clergy and religious orders should give full description e.g. NUN, REGISTERED GENERAL NURSE.

Write in your main OCCUPATION

_____

If a farmer or a farm worker, write in the SIZE of the farm _____**acres**

Go to J23

J22. [Card J22] From the reasons listed on this card could you tell me the most important reasons for you not working in a paid job outside the home? If more than one reason, please rank them in order of importance, where 1 is the most important reason, up to a maximum of 3.

A. I can't find a job ..... ___
B. I chose not to work ..... ___
C. I am caring for an elderly or ill relative or friend .. ___
D. I prefer be at home to look after my children myself
E. I cannot earn enough to pay for childcare ..... ___
F. I cannot find suitable childcare ..... ___
G. There are no suitable jobs available for me .. ___
H. My family would lose Social Welfare or medical benefits if I was earning ..... ___
I. Other reason (please specify)_____ ___

Go to J23

J23. [Card J23] What is the occupation of your spouse / partner?

In all cases describe the occupation fully and precisely giving the full job title.

Use precise terms such as:	Do not use general terms such as:
RETAIL STORE MANAGER	MANAGER
SECONDARY TEACHER	TEACHER
ELECTRICAL ENGINEER	ENGINEER

Civil servants and local government employees should state their grade e.g. SENIOR ADMINISTRATIVE OFFICER.
Members of the Gardaí or Army should state their rank. Teachers should state the branch of teaching e.g. PRIMARY TEACHER.
Clergy and religious orders should give full description e.g. NUN, REGISTERED GENERAL NURSE.

Write in main OCCUPATION

_____

If a farmer or a farm worker, how many acres do you farm? _____ **acres**

J24. Looking at Card J24, which of the following sources of income does the HOUSEHOLD receive? Please consider the income of *ALL* household members, not just your own, your spouse/partner's income. *[INT. Tick 'Yes' or 'No' for each in Col. A]* **[Card J24]**

J25. And of these sources of income which is the largest source of income at present? *[Int Tick one box only in Col. B]* **[Card J24]**

	A Receive? Yes	A Receive? No	B Largest Source
A. Wages or Salaries	☐1	☐2	☐3
B. Income from Self-Employment	☐1	☐2	☐3
C. Income from Farming	☐1	☐2	☐3
D. Children's Allowance/ Child Benefit	☐1	☐2	☐3
E. Other Social Welfare Payments	☐1	☐2	☐3
F. Other Income (incl. income from maintenance payments, investments, savings, dividends, private pensions, property)	☐1	☐2	☐3
G. Student Maintenance Grants	☐1	☐2	☐3

J26. [Card J26] If you added up all the income sources from ALL household members what would be the total HOUSEHOLD NET income, i.e. after deductions for tax and PRSI as well as the income levy and public sector pension levy [if applicable]? Include income from all sources and from all household members. *[INT: IF RESPONDENT CANNOT GIVE EXACT FIGURE GO TO J27.IF EXACT FIGURE GIVEN GO TO J29]*

Dont Know..... ☐99 €_____ per Week..... ☐1 Month..... ☐2 Year ☐3

J27. [Card J27] I know that it is difficult to give an exact figure for household income but on Card J27 we have a scale of incomes, and we would like to know into which group your total HOUSEHOLD NET income falls, i.e. after deductions for tax and PRSI, the income levy and public sector pension levy [if applicable]. Include income from all sources and from all members of the household. Looking at the card could you tell me the letter of the group your household falls into, after these deductions have been applied.

[Int: Tick the letter of the group your household falls into]

HOUSEHOLD NET INCOME AFTER DEDUCTIONS OF TAX AND PRSI

Per Week	Per Month	Per Year	Category
Under €230	Under €1,000	Under €12,000	A☐1 → Section A, Card J28
€231 to under €350	€1,001 to under €1,500	€12,001 to under €18,000	B☐2 → Section B, Card J28
€351 to under €460	€1,501 to under €2,000	€18,001 to under €24,000	C☐3 → Section C, Card J28
€461 to under €575	€2,001 to under €2,500	€24,001 to under €30,000	D☐4 → Section D, Card J28
€576 to under €800	€2,501 to under €3,500	€30,001 to under €42,000	E☐5 → Section E, Card J28
€801 to under €925	€3,501 to under €4,000	€42,001 to under €48,000	F☐6 → Section F, Card J28
€926 to under €1,150	€4,001 to under €5,000	€48,001 to under €60,000	G☐7 → Section G, Card J28
€1,151 to under €1,500	€5,001 to under €6,500	€60,001 to under €78,000	H☐8 → Section H, Card J28
€1,501 to under €1,850	€6,501 to under €8,000	€78,001 to under €96,000	I☐9 → Section I, Card J28
€1,851 or more	€8,001 or more	€96,001 or more	J☐10 → Section J, Card J28

Refused..... ☐77 GO TO J29 Don't' Know..... ☐88 GO TO J28

J28. Would that be [Int: Show Card J28 and tick 1, 2 or 3 in appropriate section under per wk; per mth or per yr]

A	Per week	under €75 ☐1	€75 to €150 ☐2	€151 to €230 ☐3
	Per Month	€0 to €300 ☐1	€301 to €650 ☐2	€651 to €1,000 ☐3
	Per Year	€0 to €4,000 ☐1	€4,001 to €8,000 ☐2	€8,001 to €12,000 ☐3
B	Per week	€231 to €270 ☐1	€271 to €310 ☐2	€311 to €350 ☐3
	Per Month	€1,001 to €1,150 ☐1	€1,151 to €1,350 ☐2	€1,351 to €1,500 ☐3
	Per Year	€12,001 to €14,000 ☐1	€14,001 to €16,000 ☐2	€16,001 to €18,000 ☐3
C	Per week	€351 to €390 ☐1	€391 to €420 ☐2	€421 to €460 ☐3
	Per Month	€1,501 to €1,700 ☐1	€1,701 to €1,800 ☐2	€1,801 to €2,000 ☐3
	Per Year	€18,001 to €20,000 ☐1	€20,001 to €22,000 ☐2	€22,001 to €24,000 ☐3
D	Per week	€461 to €500 ☐1	€501 to €535 ☐2	€536 to €575 ☐3
	Per Month	€2,001 to €2,150 ☐1	€2,151 to €2,300 ☐2	€2,301 to €2,500 ☐3
	Per Year	€24,001 to €26,000 ☐1	€26,001 to €28,000 ☐2	€28,001 to €30,000 ☐3
E	Per week	€576 to €650 ☐1	€651 to €750 ☐2	€751 to €800 ☐3
	Per Month	€2,501 to €2,800 ☐1	€2,801 to €3,250 ☐2	€3,251 to €3,500 ☐3
	Per Year	€30,001 to €34,000 ☐1	€34,001 to €38,000 ☐2	€38,001 to €42,000 ☐3

F	Per week	€801 to €850	1	€851 to €880	2	€881 to €925	3
	Per Month	€3,501 to €3,650	1	€3,651 to €3,800	2	€3,801 to €4,000	3
	Per Year	€42,001 to €44,000	1	€44,001 to €46,000	2	€46,001 to €48,000	3
G	Per week	€926 to €1,000	1	€1,001 to €1,050	2	€1,051 to €1,150	3
	Per Month	€4,001 to €4,300	1	€4,301 to €4,600	2	€4,601 to €5,000	3
	Per Year	€48,001 to €52,000	1	€52,001 to €56,000	2	€56,001 to €60,000	3
H	Per week	€1,151 to €1,250	1	€1,251 to €1,375	2	€1,376 to €1,500	3
	Per Month	€5,001 to €5,500	1	€5,501 to €6,000	2	€6,001 to €6,500	3
	Per Year	€60,001 to €66,000	1	€66,001 to €72,000	2	€72,001 to €78,000	3
I	Per week	€1,501 to €1,600	1	€1,601 to €1,750	2	€1,751 to €1,850	3
	Per Month	€6,501 to €7,000	1	€7,001 to €7,500	2	€7,501 to €8,000	3
	Per Year	€78,001 to €84,000	1	€84,001 to €90,000	2	€90,001 to €96,000	3
J	Per week	€1,851 to €2,100	1	€2,101 to €2,400	2	€2,401 or more	3
	Per Month	€8,001 to €9,250	1	€9,251 to €10,500	2	€10,501 or more	3
	Per Year	€96,000 to €110,000	1	€110,001 to €125,000	2	€125,001 or more	3

J29. Does anyone in your household currently receive any Social Welfare payments?

Yes ..... 1 No 2

J30. [Card J30] Now I'd like to record information on any Social Welfare payments which are received by anyone in the household. Looking at Card J30, could you tell me whether or not anyone in the household currently receives any of these Social Welfare payments? *[Int Tick payments received by any household member]*

Social Welfare Payment		Social Welfare Payment	
UNEMPLOYMENT PAYMENTS			
Jobseeker's Benefit	1	Jobseeker's Allowance or Unemployment Assistance	2
EMPLOYMENT SUPPORTS			
Family Income Supplement	3	Back to Work Enterprise Allowance	6
Farm Assist	4	Part-time Job Incentive Scheme	7
Back to Work Allowance (Employees)	5	Back to Education Allowance	8
Supplementary Welfare Allowance (SWA)	9	Rural Social Scheme	10
ONE-PARENT FAMILY / WIDOW(ER) PAYMENTS			
Widow's or Widower's (Contributory) Pension	11	Deserted Wife's Allowance	15
Deserted Wife's Benefit	12	Prisoner's Wife's Allowance	16
Widowed Parent Grant	13	One-Parent Family Payment	17
Widow's or Widower's (Non-Contrib) Pension	14		
CHILD RELATED PAYMENTS			
Maternity Benefit	18	Guardian's Payment (Contributory)	21
Adoptive Benefit	19	Guardian's Payment (Non-Contributory)	22
Health & Safety Benefit	20	Guardian/Orphan's pension	23
DISABILITY AND CARING PAYMENTS			
Illness Benefit	24	Prescribed Relative's Allowance	32
Invalidity Pension	25	Injury Benefit	33
Disability Allowance	26	Incapacity Supplement	34
Blind Pension	27	Disablement Benefit	35
Carer's Benefit	28	Medical Care Scheme	36
Domiciliary Care Allowance	29	Constant Attendance Allowance	37
Carer's Allowance	30	Death Benefits (Survivor's Benefits)	38
Half-rate Carer's Allowance	31		
RETIREMENT PAYMENTS			
State Pension (Transition)	39	State Pension Non-Contributory	41
State Pension (Contributory)	40	Pre-Retirement Allowance	42
OTHER PAYMENTS			
Fuel/Smokeless Fuel Allowance	43	Diet/heating supplements	45
Household Benefits Package (electricity/gas/phone)	44		

J31a. Does anyone in your household currently receive rent or mortgage supplement? Yes ☐1 No ☐2

J31b. How much does the household receive PER WEEK in rent or mortgage supplement? €_____

J31c. Do you receive or have you received in the last 12 months, any of the following payments? [Tick all that apply]

(a) Back to school clothing and footwear allowance ☐1
(b) Exceptional and urgent needs payments (from Community Welfare Officer) ☐2
(c) Foster Care Allowance ☐3

J32. [Card J32] For the following items could you indicate whether or not your household has the item and, if not, if it is because you couldn't afford it or for another reason?

	Yes	No, Cannot Afford	No, other reason
a. Does your household eat meals with meat, chicken, fish (or vegetarian equivalent) at least every second day?	☐1	☐2	☐3
b. Does your household have a roast joint (or its equivalent) at least once a week?	☐1	☐2	☐3
c. Do household members buy new rather than second-hand clothes?	☐1	☐2	☐3
d. Does each household member possess a warm waterproof coat?	☐1	☐2	☐3
e. Does each household member possess two pairs of strong shoes?	☐1	☐2	☐3
f. Does the household replace any worn out furniture?	☐1	☐2	☐3
g. Does the household keep the home adequately warm?	☐1	☐2	☐3
h. Does the household have family or friends for a drink or meal once a month?	☐1	☐2	☐3
i. Does the household buy presents for family or friends at least once a year?	☐1	☐2	☐3

J33. [Card J33] A household may have different sources of income and more than one household member may contribute to it. Concerning your household's total monthly or weekly income, with which degree of ease or difficulty is the household able to make ends meet?

With great difficulty ☐1 | With difficulty ☐2 | With some difficulty ☐3 | Fairly easily ☐4 | Easily ☐5 | Very easily ☐6

J34. Have you ever had to go without heating during the last 12 months through lack of money? (I mean have you had to go without a fire on a cold day, or go to bed to keep warm or light the fire late because of lack of coal/fuel?)

Yes ☐1 No ☐2

J35a. Did you have a morning, afternoon or evening out in the last fortnight, for your entertainment (something that cost money)?

Yes ☐1 No ☐2

J35b. [CARD J35b] Why was that?

Didn't want to ☐1
Have a full social life in other ways ☐2
Couldn't afford to ☐3
Couldn't leave the children ☐4
Illness ☐5
Other (specify) _____ ☐6

J36a. Does your family have a car?

Yes ☐1 No ☐2

J36b. Would your family like to have a car but you cannot afford it?

Yes ☐1 No ☐2

J37. Since our last interview when <child> was 9 months old we have had major changes in the economy with the recession, cutbacks and unemployment. Would you say that the recession has had... ...[INT: READ OUT]

A very significant effect on your family	A significant effect on your family	A small effect on your family	No effect at all on your family
☐1	☐2	☐3	☐4

J38. [Card J38] How has it affected your family? [Int: tick all that apply]

a. You were made redundant / lost your job ☐1
b. Your spouse/partner was made redundant / lost their job ☐2
c. Your or your spouse/partner's working hours were reduced ☐3
d. Your or your spouse/partner's wages were reduced ☐4
e. Your or your spouse/partner's social welfare benefits were reduced ☐5
f. Your family can't afford luxuries (holidays, meals out etc) ☐6
g. Your family can't afford / had to cut back on basics (food, clothes etc.) ☐7
h. You are behind with rent / mortgage payments ☐8
i. You are behind with utility bills (e.g. electricity, gas bills etc) ☐9
j. Other (please specify) ☐10

Section K – About You

Now some more questions about yourself

K1. [Card K1] What is the highest level of education (full-time or part-time) which you have completed to date?

1. No formal education ☐1
2. Primary education ☐2

Second Level

3. Lower Secondary ☐3
(Junior/Intermediate/Group Certificate. 'O' Levels/GCSEs, NCVA Foundation Certificate, Basic Skills Training Certificate or equivalent).
4. Upper Secondary ☐4
(Leaving Certificate (including Applied and Vocational Programmes). 'A' Levels, NCVA Level 1 Certificate or equivalent
5. Technical or Vocational qualification ☐5
(Completed Apprenticeship, NCVA Level 2/3 Certificate, Post-Leaving Certificate Course/FETAC Level 5, Teagasc Certificate/Diploma or equivalent).
6. Both Upper Secondary and Technical or Vocational qualification ☐6

Third Level

7. Non Degree ☐7
(National Certificate, Diploma NCEA/Institute of Technology or equivalent, Nursing Diploma.)
8. Primary Degree ☐8
(Third Level Bachelor Degree)
9. Professional qualification (of Degree status at least) ☐9
10. Both a Degree and a Professional qualification ☐10
11. Postgraduate Certificate or Diploma ☐11
12. Postgraduate Degree (Masters) ☐12
13. Doctorate (Ph.D) ☐13

K2. At what age did you leave full-time education for the first time? _____ years
[INTERVIEWER: Code as '0' if respondent never undertook full-time education]

K3. What is <child's> first language?
English ☐1 Irish ☐2 Other (please specify) ☐3

[BLAISE CONDITION: ASK K4 –K6 OF THOSE WHO INDICATED LITERACY WAS A PROBLEM AT TIME 1, NON-RESPONDENT AT TIME 1 OR NEW RESPONDENT AT TIME 2]

K4. Many people have problems with reading. Can I just check, can you read aloud to a child from a children's story book written in your native language?

Yes ☐1 No ☐2

K5. Can I just check, can you read aloud to a child from a children's story book written in English?

Yes ☐1 No ☐2

K6. Can you usually read and fill out forms you might have to deal with in English?

Yes ☐1 No ☐2

[BLAISE CONDITION: ASK K7 OF THOSE WHO INDICATED NUMERACY WAS A PROBLEM AT TIME 1, NON-RESPONDENT AT TIME 1 OR NEW RESPONDENT AT TIME 2]

K7. When you buy things in shops with a five or ten euro note, can you usually tell if you have the right change?

Yes ☐1 No ☐2

K8. Do you belong to any religion?

Yes ☐1 No ☐2

K9. [Card K9] Which religion?

1. Christian – no denomination ☐1
2. Roman Catholic ☐2
3. Anglican/Church of Ireland/Episcopalian ☐3
4. Other Protestant ☐4
5. Jewish ☐5
6. Muslim ☐6
7. Other (please specify) ☐7

[ASK K10 – K11 IF NOT AN IRISH CITIZEN AT TIME 1, NON RESPONDENT AT TIME 1 OR NEW RESPONDENT AT TIME 2]

K10. Are you a citizen of Ireland? Yes ☐1 No ☐2

K11. What citizenship do you hold? _____

[ASK K12 – K14 IF NON RESPONDENT AT TIME 1 OR NEW RESPONDENT AT TIME 2]

K12. Were you born in Ireland? Yes ☐1 No ☐2

K13. In which country were you born? _____

K14. How long ago did you first come to live in Ireland?

Within the last year	1-5 years ago	6-10 years ago	11-20 years ago	More than 20 years ago	Don't Know
☐1	☐2	☐3	☐4	☐5	☐88

K15. [Card K15] Looking at card K15, can you tell me, what is your ethnic or cultural background?
Please choose ONE section from 1 to 4 then tick the appropriate box.

1. White
   - Irish ☐1
   - Irish Traveller ☐2
   - Any other White background ☐3
2. Black or Black Irish
   - African ☐4
   - Any other Black background ☐5
3. Asian or Asian Irish
   - Chinese ☐6
   - Any other Asian background ☐7
4. Other, including mixed background ☐8

L. Neighbourhood / Community

Time Section Started ☐☐☐☐ **(24 hour clock)**

Finally, we would like to ask you some questions about your local area.

L1. How long have you lived in your local area? _____ **years OR** _____ **months**

L2. [Card L2] To what extent do you agree or disagree with these statements?

	Strongly Agree	Agree	Disagree	Strongly Disagree
It is safe to walk alone in this area after dark	☐1	☐2	☐3	☐4
It is safe for children to play outside during the day in this area	☐1	☐2	☐3	☐4
There are safe parks, playgrounds and play spaces in this area	☐1	☐2	☐3	☐4
As a family we are happy living in this area	☐1	☐2	☐3	☐4
We as a family intend to continue living in this area	☐1	☐2	☐3	☐4

L3. Do you intend to continue living in Ireland?

Yes ☐1 No ☐2

OBSERVATIONS

Interviewer: ask the parent to get the child to do the following activities so that you can observe the child.

Now I would like to ask you some questions about how <child> uses his/her hands and legs.

3. Please ask your child to stand on one leg. Interviewer: Have you observed the child to stand on one leg?

Yes ☐1 No ☐2

4. Please ask your child throw a ball overhand. Interviewer: have you observed the child throwing a ball overhand? (letting it fall to the ground does not count)

Yes ☐1 No ☐2

5. Using this pencil and piece of paper, please draw a vertical line from the top to the bottom of the page. Now ask your child to copy your line, but do not let him/her trace it. Interviewer: have you observed the child to draw a vertical line even if it is not perfectly straight. (See pictures)

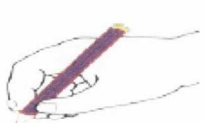
Yes ☐1 No ☐2

Count as yes

Count as no

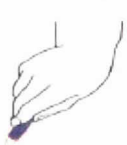
6. Interviewer: When copying the line, does the child hold the crayon like the child in picture A (between thumb and forefinger)?

Yes ☐1 No ☐2



Picture A (correct)

B. Incorrect



C. Incorrect