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Childhood Circumstances and Mid-Life Functional Mobility

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Abstract

Objectives: We examine the cumulative long-term role of childhood health and socioeconomic status in affecting functional health at ages 50 to 59. **Method:** Data on 2,233 respondents to The Irish Longitudinal Study of Aging (TILDA) are used to examine functional health measured by the timed-up-and-go (TUG) test of lower-body mobility. We examine the association of father's education, childhood rural residence, and childhood self-evaluated health with TUG and examine respondent's education, adult health behaviors, measured health, and cognition as mediators of the association of childhood characteristics and TUG. **Results:** Father's education, rural residence, childhood health, and education are associated with TUG times at ages 50 to 59. While health behaviors mediate most of the rural residence and education associations, the association with childhood self-evaluated health is direct. **Discussion:** Early life circumstances play substantial direct and indirect roles in molding functional level in late mid-life.

Keywords

disability, health behaviors, social factors, physical function, rural aging

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Introduction

This article examines the cumulative long-term relationship of childhood socioeconomic position (SEP), rural childhood, and childhood health to late mid-life functional mobility. Substantial numbers of persons in late mid-life already have lower-body mobility limitations. Among persons aged 55 to 64 in the United States, 17.3% find walking one-quarter mile (402 m) at least "somewhat" difficult (Schoenborn & Heyman, 2009). In an English sample aged 50 to 64, 8% of men and 9% of women reported a more stringent "much" difficulty or were unable to walk the same distance (Melzer, Gardener, & Guralnik, 2005). These mid-life limitations predict more severe disability and extensive health care use over time (Penninx et al., 2000; Stenholm, Guralnik, Bandinelli, & Ferrucci, 2014) and may reflect social inequality because the onset of poor health occurs earlier among those with less education (Crimmins, 2005).

Survey assessments of functional health, such as questions about difficulties with common activities, involve a significant subjective element. Recent research (e.g., Birnie et al., 2011) has increasingly focused on measured functioning to avoid this subjectivity. Use of the timed-up-and-go (TUG) test provides an objective functional-health measure allowing comparison across individuals and focusing on an aspect of lower-body functional health with a clear empirical referent as the TUG measures movements of rising, pivoting, and walking that are required for many common daily activities.

Childhood Characteristics, Education, and Later Health

The demographic and epidemiological literature has demonstrated that early SEP and health are associated with later health and mortality (Ben-Shlomo & Kuh, 2002; Birnie et al., 2011; Elo & Preston, 1992; Haas, Krueger, & Rohlfsen, 2012). The critical events model for this process focuses on key events with latent effects, whereas the accumulation model focuses on the accretion of effects over time (Ben-Shlomo & Kuh, 2002; Power & Hertzman, 1997) either through time spent in a status, or through a pathway model in which one status leads to another. Evidence suggests that some processes, such as fetal development and birth weight, fit the critical events model (Gluckman & Hanson, 2004), while different aspects of early SEP may be consistent with either the accumulation model (Galobardes, Lynch, & Smith, 2004) or the critical events model. Unambiguous attribution to either model is complicated by the fact that they are not mutually exclusive. Indeed, Hallqvist, Lynch, Bartley, Lang, and Blane (2004) have cautioned that it is difficult to conceive of a critical test of different life-course models that completely eliminates confounding between them.

Childhood SEP appears to affect adult health indirectly through educational attainment and its sequelae. Childhood SEP is mediated by later education (Hayward & Gorman, 2004; Marmot, Shipley, Brunner, & Hemingway, 2001), indirectly affecting behaviors that influence health such as smoking and body mass index (BMI; Hayward & Gorman, 2004; Huurre, Aro, & Rahkonen, 2003). Cognition is also a factor affecting adult health behaviors through a large number of decisions made throughout life, as well as adult SEP (Cutler & Lleras-Muney, 2010). Education is often favored as a measure of adult SEP over current income in studies of health because it is typically completed at a relatively early age, before the onset of many chronic diseases (Elo, 2009) that might affect the level of earnings, thereby reducing the chances of reverse causation.

Separate from SEP, childhood in a rural area is likely to be important in Ireland in the particular historical period when today's older population was growing up. In this period, rural childhood appears to be an indicator of a number of environmental factors that may affect early and later health, such as physical environment and nutrition, particularly among pre-1955 birth cohorts. These may not be fully reflected in childhood reports of illness and are likely to be separate from SEP, differentiating between urban and rural residents while holding SEP constant. Urban infant mortality rates were higher than rural ones in Ireland until the mid-1950s (Delaney, McGovern, & Smith, 2011), and the higher urban rates would have affected the older half of the cohort examined here. Delaney et al. (2011) also find that adult disability rates are higher among those with urban birth for cohorts born before 1955. Moreover, there is evidence of poorer urban health in later childhood. A 1961 study found much higher rates of positive tuberculin tests among 13-year-olds in Dublin than in rural areas (Mac Lellan, 2013). Finally, there is suggestive evidence from the Irish Nutrition Survey of 1948-1949 of poorer nutrition in urban areas. The survey (Department of Health, 1950: Part VI, Table 11) showed per-capita levels of calcium consumption in Dublin, small towns, and large towns for all ages combined to be below the 1999 Irish-recommended daily allowance of calcium of 1,200 mg for children aged 11 to 18 (Food Safety Authority of Ireland, 1999). Among farming families and in the poor areas along the west coast (though not among farm laborers), per-capita consumption was well above these amounts. This is important as Birnie et al. (2012) have shown that childhood calcium consumption affects later-life lower-body mobility.

Many of the studies that have prospective data on health and socioeconomic exposures in early childhood and good objective measures of physical functioning in later life come from the United Kingdom (Birnie et al., 2012; Birnie et al., 2011; Guralnik, Butterworth, Wadsworth, & Kuh, 2006; Kuh, Bassey, Butterworth, Hardy, & Wadsworth, 2005; Strand, Cooper, Hardy, Kuh, & Guralnik, 2011). One of the richest sources of information is the 1946 British National Birth Cohort; yet, this cohort was born at a unique juncture in British history, at the end of the Second World War and at the conception of the welfare state (Wadsworth, Kuh, Richards, & Hardy, 2006). It would be useful therefore to determine whether these findings have ecological validity in Ireland's cultural contexts with different health care and welfare systems. Birnie et al. (2011) examine the relationship between childhood conditions and the TUG using the Boyd-Orr and Caerphilly cohorts. This study is limited by the fact that less than 15% of the original Boyd-Orr cohort were still alive in 2002, and only 55% (n = 406) of those still alive agreed to take part in the clinical assessment. Similarly, the Caerphilly cohort is limited to the extent that it comprises an all-male sample. In short, we believe that further investigation is therefore required to examine the life-course impact of early life exposures on objectively measured physical functioning in later life using other population representative data.

Our analysis examines a different range of childhood influences on mobility by considering the role of childhood health and rural residence, in addition to SEP, as potential life-course influences on mid-life locomotion. The Irish Longitudinal Study of Aging (TILDA) also collects detailed information on a number of variables that are known to influence ambulation in older people, including blood pressure (Rosano et al., 2011), medication (Donoghue, O'Hare, King-Kallimanis, & Kenny, 2014; Draganich, Zacny, Klafta, & Karrison, 2001), and cognition (Donoghue et al., 2012), allowing examination of their mediating role.

Our analysis is also distinguished by its focus on a younger age group and a more recent birth cohort than Birnie et al. (2011)—ages 50 to 59 born in the 1950s compared with ages 63 to 86 born in the 1920s and 1930s. Cohorts currently on the edge of their retirement years have experienced different physical activity patterns and higher incomes than preceding cohorts, making it important to examine the cumulative outcome of early and mid-life events on health for the cohort born in the 1950s.

Method

Sample

Data come from the first wave of TILDA collected between late 2009 and mid-2011. TILDA is a nationally representative sample of persons aged 50 and above in the Republic of Ireland. Respondents were interviewed in their homes and were then invited to a clinic in Dublin or Cork for an examination of physical and functional health. The household interview response rate was 62%. Of the 3,271 respondents aged 50 to 59 who completed the household interview, 2,264 (69%) attended a clinic session. Thirty-one respondents are lost to missing data, 14 of whom are missing on the TUG measure and 17 were missing on various other covariates, leaving a final sample of 2,233. We use inverse proportional weighting to adjust for selection (Li, Shen, Li, & Robins, 2011) for both initial response to the household survey and attendance at a clinic session as well as for the complex survey design. All participants provided written informed consent.

Measures

The TUG Measure. The TUG measures the time in seconds required to rise from an arm chair, walk 3 m, turn around, return, and sit down. While used most commonly in studies of the older population, it has also been used as a measure of function and mobility in younger and mid-life adults (Jakobsen, Rask, & Kondrup, 2010; Nolan, Nitz, Choy, & Illing, 2010; Vereeck, Wuyts, Truijen, & Van de Heyning, 2008). The outcome measure for our main analysis is a quantitative measure. While a cutoff score for very slow TUG times is often used for clinical evaluation, Viccaro, Perera, and Studenski (2011) find that a quantitative measure of TUG leads to similar predictions as a categorical one. In addition to our quantitative analysis, Table 4 presents an analysis using a dichotomous variable to differentiate the slowest 10% of TUG times. The standard criterion for a TUG cutoff is typically determined by its relation to falls, but there is no established cutoff for this age group. The choice of 10% is arbitrary, but it is significantly related to fear of falling and actual falls. Those in the slowest 10% are more than twice as likely to fear falling (41.6% vs. 17.6%, $p < .001$), and more of the slowest group have actually fallen in the last year (25.1% vs. 18.6%, $p < .001$). Fear of falling is important even in the absence of an actual fall because it may lead the respondent to limit social activities outside the home and therefore reduce quality of life.

Childhood measures include health, measured by a retrospective global health measure that refers to the period between birth and age 14. Originally collected in five categories, it is recoded into three: excellent, very good, and a third category combining good, fair, and poor. Reporting of childhood health, either as specific diseases (Smith, 2009) or as overall global health (Haas, 2007), exhibits reasonably good reliability and validity. Yet there is concern about the level of anchoring of childhood reports by current perceived health. Smith (2009) and Haas (2007) find that there is a limited amount of anchoring, while Vuolo, Ferraro, Morton, and Yang (2014) suggest including current perceived health as a covariate to adjust for anchoring. In the results section, we present two tests to provide some indication of the extent of anchoring in our data.

For reasons described earlier, we conceptualize childhood rural residence as a measure of a number of environmental factors, such as physical environment and nutrition that affect later health. TILDA does not ask where the respondent lived from birth. To measure rural childhood, we use an item asking whether the respondent lived in a rural area around age 14.

Childhood SEP is measured by father's education coded as less than primary schooling, primary completion, more than primary, and don't know.

Respondent's education is measured as age at completion of full-time schooling. Wave 1 of TILDA collected a categorical variable measuring qualifications attained while age at leaving full-time education was measured in Wave 2. We employed a univariate imputation procedure using the Uvis program in STATA 12.0 to impute school-leaving age for non-respondents to Wave 2; the imputation procedure regressed school-leaving age on the Wave 1 educational qualifications, father's education, age, sex, and rural residence growing up.

We also include three measures from adulthood: age (in years), marital status, contrasting never-married with ever-married respondents, and two health behaviors: smoking history and BMI. Smoking history is a five-category variable with never smoked as the reference category. Smokers are cross-classified by whether they currently smoke and whether they smoked 30 or more years. BMI (weight [kg] / height [m^2]) was measured during the clinic visit. We treat BMI as predetermined but the timing of measurement creates some uncertainty in the causal ordering of BMI and functional health.

Current health status is measured by reported and measured health status. These include four variables measuring whether a doctor ever told the respondent that he or she has had arthritis, diabetes, a stroke, or lung problems. We also include two measures of cardiovascular health from the clinic visit: blood pressure and orthostatic hypotension. Blood pressure is measured in four categories with normal blood pressure without medication as the reference category. Seated blood pressure was measured twice, and normal pressure is defined as a mean pressure less than 140/90. The other categories are normal with medication; high without medication; and high with medication. Orthostatic hypotension, defined as a drop of more than 20 points systolic or 10 points diastolic 1 min after rising from a seated position, is an established risk factor for cardiovascular disease and mortality (Rose et al., 2006; Verwoert et al., 2008).

The Montreal Cognitive Assessment (MoCA) was included because the TUG involves executive function. It was designed as a brief cognitive screening tool to detect mild cognitive impairment among community and clinic-based samples (Nasreddine et al., 2005). The instrument yields a sum score ranging from 0 to 30 with higher scores indicating better cognitive functioning. The variable is measured in its original metric.

Statistical Analysis Plan

In the next section, we estimate several equations that coincide with the typical timing of life-course events beginning with an equation estimating the effects of (a) childhood health, father's education, and a rural childhood. They are entered in one equation because we do not analyze mediation paths among them. In subsequent models, we include (b) respondents' own educational attainment; (c) marital status, smoking history, and BMI; (d) current adult health conditions; and (e) cognition, to allow examination of the role of health separately from cognition. We adjust all models for age (within the 50-59 age group); sex; height (in cm); and current use of anti-depressant (selective serotonin reuptake inhibitors) or anti-psychotic/anti-manic medications (Anatomic Therapeutic Classification codes N06B and N05A) as they are associated with extrapyramidal side effects that may lead to physical slowing (Draganich et al., 2001; Poujol, Annweiler, Allali, Fantino, & Beauchet, 2010). Regression models for TUG are estimated using a gamma distribution. Most of the TUG scores cluster around the mean, but some respondents have extremely long times, producing a right-skew. A gamma distribution for the errors, instead of a normal distribution, fits this distribution better and yields appropriate standard errors. The interpretation of coefficients is the same as in a regression using a normal distribution

Results

Table 1 presents means and proportions for included variables. The mean TUG time is 8.03 s with a standard deviation of 1.5 s. The 90th percentile is 9.78 s. Table 2 examines differences in TUG times by subjective reports of lower-body mobility difficulties typically found in surveys: difficulty walking 100 m (or yards), running 1.5 km (or 1 mile), walking up one flight of stairs, and walking up several flights of stairs. To judge the substantive importance of a difference, the last column expresses the difference in mean TUG times between the two groups in standard deviation units. The mean differences in TUG times between those who do and do not report difficulty are highly statistically significant for all four items. All but one exceed ½ standard deviation, and two exceed 1 standard deviation.

Table 1. Characteristics of the Sample, TILDA, Ages 50 to 59 (*N* = 2,233).

Variable	*M*	*SD*	%
Tug time (s)	8.03	1.50	
Age (years)	54.5	2.92	
Female			49.9
Height (cm)	167.8	9.45	
Anti-psychotic drugs			1.6
Anti-depressant drugs			4.0
Father's education			
Less than primary			10.4
Primary			58.0
More than primary			23.7
Don't know			7.9
Childhood health			
Excellent			56.6
Very good			24.8
Good, fair, poor			18.6
Childhood in rural area			58.2
School completion age	16.8	2.64	
Never married			8.1
Smoking history			
Never smoked			41.7
Past < 30 years			27.4
Past ≥ 30 years			6.1
Current < 30 years			4.9
Current ≥ 30 years			19.9
BMI (kg/m^2)	28.7	5.36	
Arthritis			16.8
Diabetes			4.5
Stroke			0.7
Lung			11.9
Blood pressure			
Normal without medication			51.5
Normal with medication			12.4
High, takes no medication			9.6
High, takes medication			26.5
Orthostatic hypotension			3.7
MoCA (score)	25.5	3.15	

Note. TILDA = The Irish Longitudinal Study of Aging; BMI = body mass index; MoCA = Montreal Cognitive Assessment.

Table 2. Mean TUG Times by Task Difficulty and Proportion Having Difficulty, TILDA, Ages 50 to 59 (N = 2,233).

	Have difficulty		No difficulty			
Task	*M*	%	*M*	%	*p*	As % of *SD*
Walk 100 m	10.10	2.8	7.97	97.1	<.001	1.42
Run, jog 1.5 km	8.29	48.9	7.79	51.1	<.001	0.33
One flight stairs	9.54	3.4	7.98	96.6	<.001	1.04
Several flight stairs	8.69	20.5	7.86	79.5	<.001	0.55

Note. TUG = timed-up-and-go; TILDA = The Irish Longitudinal Study of Aging.

Table 3 presents results of the regression analysis. We organize the presentation of results around each equation and point out the ways that variables added in that equation mediate earlier variables. The TUG score is reported in seconds, and coefficients can be interpreted using this metric.

Examining Mediation

Because standard tests of mediation are not useful when either the target or intervening variables are multiple-category variables, we instead test for whether a variable changes significantly when other variables are added, using a Wald test which accommodates multiple-category variables. A significant change in the coefficient between equations indicates that the variables added in the second equation are mediators. For example, by comparing the coefficient for father's education in Models 1 and 2, the change in this coefficient when respondent's age at school completion is added in Model 2 is statistically significant ($p < .001$). This significant reduction in the father's education coefficient is evidence that respondent's education mediates the effect of father's education. In some cases, multiple variables are added to a model. In those cases, we determined which variables were responsible for mediation of previously included variables by estimating models (which are not shown) in which we add the new variables separately or in different combinations.

Table 3 Results

Model 1 includes early childhood events: father's education, respondent's childhood health, and rural residence. Those whose fathers completed primary or more advanced schooling have faster TUG times. Given the TUG

Table 3. Gamma Regression of TUG Time on Childhood, Early Adult, and Late Mid-Life Characteristics, TILDA, Ages 50 to 59 (*N* = 2,233).

	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Age (years)	0.051	0.011***	0.047	0.011***	0.042	0.010***	0.036	0.010***	0.035	0.010***
Female	−0.139	0.099	−0.115	0.095	−0.020	0.093	−0.048	0.094	−0.025	0.093
Height (cm)	−0.005	0.006	−0.003	0.006	−0.001	0.005	−0.001	0.005	0.002	0.005
Anti-psychotic drugs	0.507	0.341	0.474	0.340	0.397	0.318	0.367	0.315	0.305	0.317
Anti-depressant drugs	0.169	0.236	0.137	0.232	−0.080	0.186	−0.127	0.178	−0.164	0.177
Father's education										
Less than primary	Ref.	—	Ref.	—	Ref.	—	Ref.	—	Ref.	—
Primary	−0.463	0.142***	−0.423	0.137**	−0.314	0.124*	−0.289	0.119*	−0.274	0.114*
More than primary	−0.429	0.145**	−0.268	0.143	−0.180	0.129	−0.138	0.124	−0.114	0.120
Don't know	−0.059	0.237	−0.057	0.232	0.043	0.218	0.060	0.211	0.043	0.204
Childhood health										
Excellent	Ref.	—	Ref.	—	Ref.	—	Ref.	—	Ref.	—
Very good	0.400	0.082***	0.375	0.081***	0.375	0.079***	0.369	0.078***	0.360	0.077***
Good, fair, poor	0.405	0.094***	0.382	0.092***	0.377	0.085***	0.341	0.082***	0.315	0.079***
Childhood in rural area	−0.156	0.067*	−0.155	0.066*	−0.103	0.062	−0.080	0.061	−0.123	0.061*
School completion age			−0.066	0.012***	−0.039	0.012***	−0.038	0.012***	−0.026	0.012*
Never married					0.340	0.166*	0.328	0.163*	0.318	0.162*
Smoking history										
Never smoked					Ref.	—	Ref.	—	Ref.	—
Past < 30 years					0.021	0.067	0.033	0.067	0.056	0.067

(continued)

Table 3. (continued)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	B	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*	*B*	*SE*
Past ≥ 30 years					0.472	0.148**	0.462	0.142***	0.424	0.133**
Current < 30 years					0.320	0.198	0.254	0.185	0.232	0.183
Current ≥ 30 years					0.407	0.091***	0.400	0.089***	0.393	0.089***
BMI (kg/m^2)					0.055	0.007***	0.051	0.007***	0.050	0.007***
Arthritis							0.163	0.082*	0.154	0.081
Diabetes							0.692	0.259**	0.634	0.246**
Stroke							1.082	0.437*	1.030	0.441*
Lung							0.111	0.101	0.090	0.099
Blood pressure										
Normal without medication							Ref.	—	Ref.	—
Normal with medication							−0.098	0.109	−0.093	0.108
High, takes no medication							−0.115	0.099	−0.127	0.099
High, takes medication							−0.143	0.074	−0.145	0.073*
Orthostatic hypotension							0.444	0.214*	0.447	0.208*
MoCA (score)									−0.047	0.012***
Constant	8.93		9.71		6.98		7.06		7.69	

Note. TUG = timed-up-and-go; TILDA = The Irish Longitudinal Study of Aging; BMI = body mass index; MoCA = Montreal Cognitive Assessment.
*Significant at the .05 level. **Significant at the .01 level. ***Significant at the .001 level.

Table 4. Logistic Models for 90th Percentile TUG Times, TILDA, Ages 50 to 59 (N = 2,233).

	Parallel to Model 2		Parallel to Model 5	
	OR	*SE*	OR	*SE*
Age (years)	1.09	0.033**	1.08	0.035*
Female	1.16	0.314	1.24	0.353
Height (cm)	1.01	0.017	1.02	0.017
Anti-psychotic drugs	2.96	1.204**	2.35	0.985*
Anti-depressant drugs	2.50	0.958*	1.67	0.684
Father's education				
Less than primary	Ref.	—	Ref.	—
Primary	0.46	0.118**	0.57	0.147*
More than primary	0.64	0.184	0.86	0.254
Don't know	1.19	0.395	1.52	0.504
Childhood health				
Excellent	Ref.	—	Ref.	—
Very good	1.71	0.354**	1.79	0.390**
Good, fair, poor	1.88	0.383**	1.68	0.348*
Childhood in rural area	0.71	0.128	0.71	0.132
School completion age	0.86	0.032***	0.92	0.036*
Never married			1.60	0.543
Smoking history				
Never smoked			Ref.	—
Past < 30 years			1.17	0.253
Past ≥ 30 years			1.61	0.566
Current < 30 years			2.13	0.886
Current ≥ 30 years			2.10	0.462***
BMI (kg/m^2)			1.08	0.018***
Arthritis			1.22	0.267
Diabetes			2.14	0.665*
Stroke			5.04	2.729**
Lung			1.06	0.283
Blood pressure				
Normal without medication			Ref.	—
Normal with medication			0.64	0.172
High, takes no medication			0.57	0.178
High, takes medication			0.73	0.164
Orthostatic hypotension			1.76	0.668
MoCA score			0.90	0.026***
Constant	0.09		0.01	

Note. TUG = timed-up-and-go; TILDA = The Irish Longitudinal Study of Aging; OR = odds ratio; BMI = body mass index; MoCA = Montreal Cognitive Assessment.
*Significant at the .05 level. **Significant at the .01 level. ***Significant at the .001 level.

metric—time in seconds required to complete the task—a negative coefficient indicates a faster TUG time. Rating one's childhood health as less than excellent is associated with a significant increase in TUG time of over 0.4 of a second. We discuss the possibility that retrospective accounts of childhood health are anchored in current health at the end of the Table 3 results. Model 1 also includes growing up in a rural area, which is associated with a faster TUG time.

Model 2 adds age at school completion. There is about a 4-year difference between completion of each of three of the major levels of schooling (primary completion, a secondary leaving certificate, and a university degree). A 4-year difference is associated with a 0.26 s reduction in TUG times, slightly greater than the mean difference between 50- to 54- and 55- to 59-year-old respondents. The change between Model 1 and Model 2 in the Model 1 variables indicates the degree to which respondent's education mediates these earlier variables. Father's education is significantly mediated by the addition of respondent's age at school completion ($p < .001$). The association of childhood health with TUG is also significantly reduced by the addition of education in the second equation ($p = .031$), but it remains substantial in size and statistically significant in this and later equations.

In Model 3, current smokers and past smokers who smoked over 30 years have TUG times that are more than 0.4 s slower than non-smokers. A 5-point higher BMI, slightly less than 1 standard deviation, is associated with a predicted 0.28 s slower TUG time. The addition of the two health behaviors, smoking and BMI, in Model 3 is primarily responsible for the significant reduction in the education association with TUG between Models 2 and 3 ($p < .001$). The rural childhood coefficient is reduced by about one third and becomes non-significant in Model 3, a statistically significant reduction ($p = .006$) from Model 2. Smoking is the primary mediating variable. More of those with rural backgrounds have never smoked (44.1% vs. 37.5%) and fewer are long-term current smokers (17.5% vs. 23.4%). Smoking significantly mediates rurality ($p = .026$), but neither BMI nor the never-married status taken alone mediates rurality significantly.

In Model 4, arthritis, diabetes, and stroke are associated with slower TUG times. Having had a stroke is associated with times that are 1 s slower, and diabetes is associated with about two thirds of a second slower time in the final equation. While only 4% of the sample fits our definition of hypotension, they have substantially slower TUG times—about 0.4 s slower. In Model 5, poor cognition is associated with slower TUG times. The rural coefficient increases significantly ($p = .001$) and becomes statistically significant again when cognition is added in Equation 5. Those with rural backgrounds have slightly lower cognitive scores (25.1 vs. 26.0).

In sum, our mediation results indicate that father's education and childhood health are mediated by respondent's age at school completion. Rural childhood residence and age at school completion are mediated by smoking and, in the case of education, by BMI as well.

The Anchoring of Retrospective Childhood Health Reports

One issue with the interpretation of retrospective accounts of childhood health is the possible anchoring of childhood recollections in current health. We address this issue in two ways. First, we estimated a model (not shown) including a five-category self-rated current health measure in line with the suggestion of Vuolo et al. (2014). Adding self-rated current health to Model 5 reduces the coefficients of childhood health significantly, compared with Model 5, declining from 0.36 to 0.27 for the very good and from 0.32 to 0.16 for the combined good, fair, or poor categories. Although the change is significant, both childhood health contrasts remain statistically significant at the .05 level.

As an additional test of the sensitivity of the results to anchoring, we used data from Wave 2 of TILDA to examine change in TUG over 2 years (equations not shown). There are a number of important caveats to this analysis. First, a longitudinal analysis answers a very different question from the focus of this article: It examines whether a covariate is associated with short-term change in mid-life and does not examine the cumulative effect of a covariate. The outcome of interest is change in TUG, not the level of TUG. It would be possible for the true structural effect to be significant in one but not the other. Second, the Wave 2 measure was collected by interviewers in the respondent's home and is likely to be less reliable than the standardized clinic measure because of variation in chair height and floor surface.[1] This lower reliability is likely to increase random error variance in a difference score.

We analyzed change in two ways, as a regressed-change score and as a difference score using the same covariates as in Model 5. In both cases, the combined good, fair, or poor category was associated with greater TUG decline and was significant at the .05 level. The very good versus excellent contrast was not associated with significant change in TUG. When we added adult self-reported health to the longitudinal models, the combined good, fair, or poor contrast remained significant in the regressed-change model. In the difference model, it predicted slower TUG times but was not significant. In addition to the previously mentioned caveats, it is important to note that a longitudinal analysis does not address all possible conceptualizations of endogeneity. Yet, the continuing role for poor childhood health in decline in mid-life mobility in three of the four models provides some evidence that retrospective childhood health reflects more than anchoring in current perceived health.

Table 4 Results

Table 4 reports odds ratios from a logistic regression analysis that contrasts the slowest 10% with the remaining respondents. Overall, with the exception of the anti-psychotic medications which become significant and rural childhood and a few of the adult health measures, which are not significant, the results for the interval outcome and the 90th percentile cutoff are quite similar.

Discussion

In recent years, a number of large national studies using probability samples of the older population, including the U.S. Health and Retirement Study (HRS), the Survey of Health and Retirement in Europe (SHARE), the English Longitudinal Study of Aging (ELSA) as well as TILDA, have incorporated physical and biomedical measures into their data collection protocols. This development reflects the increasing interest in combining biomedical and social measures across disciplines, and it is important to furthering our knowledge of the relationship between social characteristics and health. While they raise some measurement issues, the biomedical measures are validated measures with clinical implications. When they replace the standard functioning measures of past years asking for a respondent evaluation of "difficulty" with a particular task, they avoid the subjective nature of those questions allowing more valid comparisons across individuals. While subjective measures are useful for certain research questions, even analysis of subjective abilities is aided by a comparison with an objective measure. Thus, the use of the TUG measure in this research is indicative of an increasing trend that moves the analysis of functioning forward. TILDA's measurement is particularly strong given its use of a clinic evaluation by trained nurses in every other wave.

Childhood SEP, measured by father's education, is mediated by respondent's education. In turn, education is mediated by BMI and smoking. These SEP findings are consistent with the accumulation model for the cumulative effects of childhood SEP on mid-life health. We do not interpret the change in the education coefficient when cognition is added because cognition both selects into education and is increased by it, making causal interpretations difficult.

There is a substantial and direct association of reported childhood health with mid-life TUG times, with only a small portion of the effect mediated by educational attainment. There are three reasons for concluding that the finding is more than a reflection of current health: (a) as noted earlier, recent research finds global retrospective reports to have substantial reliability and validity; (b) childhood health retains its association with functioning after controlling for reported and measured adult health; and (c) childhood health reports remain significant controlling for a current global self-evaluation of health as well as in most of the longitudinal models.

Those with good childhood health achieve higher levels of education, perhaps a reflection of their family economic position and perhaps reflecting the way that poor health can impede progress in school. Yet, the absence of mediation of childhood health by measured adult health means that the model does not provide extensive insight into why childhood health is related to mid-life functional health. Such a result may be consistent with the critical period interpretation of childhood health. Nevertheless, there are alternative explanations, including possible measurement error in the proposed mediating variables or omitted variables that might mediate the relationship. TILDA collects a limited amount of information on early childhood and early adulthood exposures such as physical activity patterns that could mediate the association between early childhood health and mid-life mobility.

Better lower-body mobility among those with rural childhoods does not appear to reflect better nutrition or early childhood health as we hypothesized earlier. Rather, it is related to lower smoking rates among those with rural childhood. Those who are 50 to 59 years and have smoked 30 or more years began in adolescence or early adulthood, and the effects of smoking have accumulated over time.

The differences between the interval TUG measure and a 90th percentile cutoff are relatively small. A variable that becomes significant in the cutoff analysis reflects factors that affect extreme scores but are not particularly important overall. The overall picture is that the factors affecting the entire range of TUG times are the same ones that are associated with extreme scores. However, anti-psychotic medications stand out as a factor that affects extreme scores, but are not important overall.

Understanding the risk factors associated with functional decline in mid-life can help inform efforts designed to delay this decline. Our results suggest that childhood and adolescence play an important role in mid-life functional decline. Childhood health has a direct effect on later functioning and its association is mediated only to a small extent by education. Other adult statuses do not mediate childhood health. A second critical factor is health behaviors established in youth. Smoking, in particular, is amenable to change, and it is clear from our results that long-term smoking has detrimental effects on lower-body functioning. Maintenance of a lower BMI also has a substantial effect on mid-life functioning. Increased schooling is associated with lower levels of both smoking and BMI.

These findings reinforce the importance of a life-course perspective for investigation of differences in mid-life physical functioning and provide insight into possible early interventions to improve functioning.

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Note

1. The Irish Longitudinal Study of Aging (TILDA) design includes clinic evaluations in every other wave. The second clinical evaluation from Wave 3 is not yet available.

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