The effect of childhood cultural capital on behavioral risks and health outcomes measured with GrimAge.

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Extended abstract

Aging is a complex process that affects individuals in various ways, and it is embedded in the life course with a longitudinal dimension. Decades of research have established that social class is a primary determinant of an individual's health condition (Smith et al. 1990; Gerdtham & Johannesson, 2004; Marmot & Wilkinson, 2000). In Bennert et al. (2009: 152) words, "differential health status is probably the most enduring and incontrovertible indication of class". However, researchers often overlook the implications of using different measures of socioeconomic status (SES) in their models (Turrell, et al. 2003). Several studies have shown that the use of different SES indicators produces significantly divergent results, since they representing different dimensions of the underlying myriad of mechanisms connecting health and social forces (Geyer et al., 2006; Hoffman 2018; Shavers, 2007; Turrell et al,. 2003; Festin et al., 2017).

While social epidemiology and sociology of health have focused mainly on the role of economic capital indicators to assess the impacts of childhood conditions on elder health (Abel, 2008; Song, 2013), the representation of cultural capital is lagging. Cultural capital plays a crucial role in class differences in habit and taste formation, which affect the acquisition of unhealthy habits. "The resources needed to select or adopt specific health-relevant lifestyles emerge from the interplay between economic, social and cultural capital risks." (Abel 2008: 3). In order to be disposed first you need to be exposed (Bourdieu & Wacqant, 2005), and to be exposed individuals need, firstly, access to the resources that conform the action, mainly economic capital, but also a pre-existing system of values and tastes that sets what is deemed as preferable over other actions. Only if both align the specific action will take place and the individual will be exposed to it.

For instance, in order to cook a specific meal, the ingredients and cooking utensils are needed, but also the knowledge of the recipe and a system of predispositions that lead us to prefer this specific dish over other possibilities. Socialization, according to the Bourdieuan framework, is instilled through experience and repetition; as a form of

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subtle unconscious social conditioning (Bourdieu 1984). Dispositions and tastes are embodied schemes of classification brought to life through practices (Bourdieu 1986). Class-specific culture is possible because individuals are socialized in similar environments with similar conditions to people in the same class position, hence creating a system of socioeconomically patterned differences in health habits.

As a result, research has consistently shown a higher prevalence of behavioral risks among individuals with lower SES compared to those with higher SES (Kurtze et al., 2013; Skalickà et al., 2009; Östergren et al., 2019; Dieker et al., 2019, Kulik et al., 2013, etc.), and the consequences of behavioral risks are more severe for those with lower SES (Pampel & Rogers, 2004; Mäkelä & Paljärvi, 2008). The benefits of a healthy lifestyle are amplified for those with higher SES (Blaxter, 1990). To address this phenomenon effectively, it is necessary to have a proper understanding of its action mechanisms, which begins with comprehending the multidimensional nature of social class and the role of cultural capital. The emphasis that cultural capital theories put on childhood as a crucial moment for habit and taste-formation is coherent with Heckman's (2006) theories of critical periods of education. Heckman (2006) showed that interventions in preschool periods yield the best returns to investments with greater and more durable positive impacts on children's skill formation. This denotes the relevance of the life course perspective and, in particular, of childhood timing, hence, measures that are able to capture this chronological dimension are crucial.

In terms of health measures, several studies have proposed DNA methylation, measured by methylation clocks or epigenetic clocks, as a relevant mediator between social and environmental factors during development and health risks later in life (Barker et al. 2018; Fujii et al. 2022; Rathod et al. 2021; Tobi et al. 2018). Additionally, as the pace of DNAm change is faster in the pediatric age range than in adulthood (Alisch, et al., 2012; Marioni, et al., 2019; McEwen, et al., 2020), some authors suggest that childhood could be a crucial period of vulnerability to insults that modify DNA methylation. Both of these characteristics makes them a perfect candidate for a lifecourse approach as the one employed in this paper.

Out of the currently available epigenetic clocks, GrimAge, which was constructed as a linear combination of chronological age, gender, and DNA-based surrogate biomarkers for seven plasma proteins and smoking pack-years, appeared to stand out among its

peers in matters of correlation with disease status, age-related clinical phenotypes and mortality (Hillary, et al., 2021; Maddock, et al., 2019 & 2020). Acceleration measured with GrimAge (AgeAccelGrim) was associated with a large number of age-related conditions, lifestyle factors, and clinical biomarkers (Lu, et al., 2019). GrimAge has also shown an association between early life trauma and a higher rate of epigenetic aging, unlike the other epigenetic clocks, and the authors of this study hypothesized that these relationships could be found with this clock due to the fact that GrimAge contains a larger number of CpGs in its algorithm (1030 unique CpGs) and taps the impacts of age-related molecular changes as well as endogenous and external stress factors (Hamlat, et al., 2021). Furthermore, Grimage is particularly suited to capture the impact of behavioral risks (mainly, but not reduced to, smoking) thus, making it an ideal candidate for this project.

Methodology

For this study, we have used information from The Health and Retirement Survey (HRS) from every wave of the core dataset (1992-2018) and the modules of epigenetic clocks (2020) and life history mail survey (2015 and 2017). The information reflects the population aged 51 and older and their spouses regardless of their age, who reside in households in the US. The final sample for the study includes individuals present in both datasets, life-history mail survey (n=11,755) and epigenetic clocks (n=4,018), which brings the total number of respondents to n=3,102. Beside the retrospective data on events and shifts in health and SES throughout life-course, HRS also contains information on health and SES at the time of the interview (Fisher and Ryan, 2018).

Scientific studies are using Structural Equation Modeling (SEM), a potent multivariate approach, to investigate and assess multivariate linkages between variables which allows to model the whole lifecycle while capturing the complexity and interdependence of the different stages. Since SEMs test the direct and indirect impacts on hypothesized correlations, it differs from other modeling methodologies. Numerous life course research using epigenetic clocks and health have employed it, including the prediction of mortality with independence of genetic influence (Föhr, et al., 2021), lifespan and healthspan (Lu, et al., 2019) or aging-related diseases just to give some examples (Wu, et al., 2021).

For our purpose, we have established a SEM framework (Figure 1) in which a latent variable was created to evaluate the influence of childhood SES and cultural capital as independent measures in the performance of aging, being the epigenetic aging measured with the Grimage algorithm and scoring. This latent variable influences also directly and indirectly the rest of the variables which at the end will be associated with the GrimAge measure to test the hypothesis of the influence of early conditions (in this case in childhood) and epigenetic aging. Following Warren (2009) and Hoffman et al. (2018) we present the life course in three stages, ranging from childhood to elderhood and passing through adulthood. This cross-lagged panel model includes pathways of social causation, for instance, the arrow from childhood SES and education; and for health selection, the arrow of childhood health to education; with an autoregressive component to account for the path-dependent nature of the variables CSES to adult SES or CH to adult health. The most relevant mediator is behavioral risk at the time of the interview, which we hypothesize will mediate the effects of childhood cultural capital on old health. Other observed variables included in the model were years of education, main occupation during adulthood, household income at the time of answering and year of birth as a control for cohort effects and age. The parameters will be estimated using the Full Information Maximum Likelihood method (FIML) with robust standard errors, and standardized coefficients.

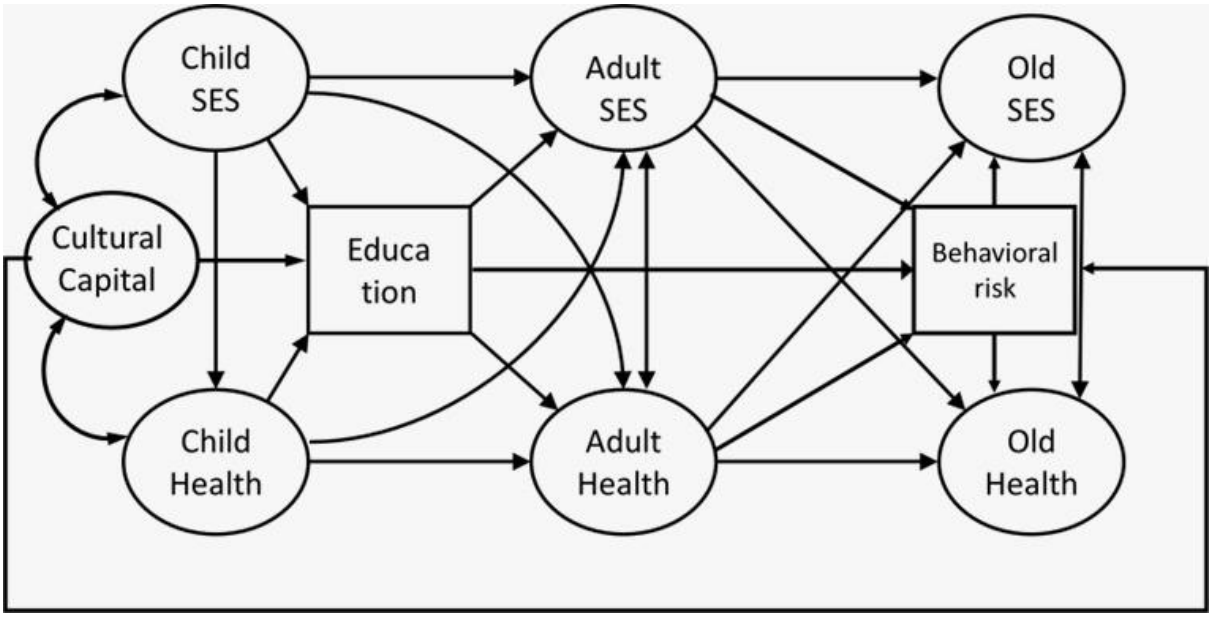

Figure 1: Model of life course with cultural capital and behavioral risks.