Historical Change in Midlife Health, Well-Being, and Despair: Cross-Cultural and Socioeconomic Comparisons

Frank J. Infurna[1], Omar E. Staben[1], Margie E. Lachman[2], & Denis Gerstorf[3,4]

[1] Arizona State University, Tempe, AZ
[2] Brandeis University, Waltham, MA
[3] Humboldt University, Berlin, Germany
[4] Pennsylvania State University, State College, PA

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Author Note

Frank J. Infurna, Department of Psychology, Arizona State University. Omar E. Staben, Department of Psychology, Arizona State University. Margie E. Lachman, Department of Psychology, Brandeis University. Denis Gerstorf, Department of Psychology, Humboldt University Berlin, Germany.

Correspondence should be addressed to Frank J. Infurna, Department of Psychology, Arizona State University, 950 S. McAllister Ave., Tempe, AZ 85287, Frank.Infurna@asu.edu

Abstract

Recent empirical evidence has documented that US middle-aged adults today are reporting lower mental and physical health than same-aged peers several decades ago. Individuals who attained fewer years of education have been most vulnerable to these historical changes. One overarching question is whether this phenomenon is confined to the US or whether it is transpiring across other high-income and upper-middle-income nations. To examine this question, we use nationally representative longitudinal panel data from five nations across different continents and cultural backgrounds (US, Australia, Germany, South Korea, and Mexico). Results revealed historical improvements in physical health for people in their 40s and early 50s across all five nations. Conversely, the direction of historical change in mental health vastly differed across nations. Later-born cohorts of US middle-aged adults exhibit worsening mental health and cognition. Australian middle-aged adults also experienced worsening mental health with historical time. In contrast, historical improvements for mental health were observed in Germany, South Korea, and Mexico. For US middle-aged adults, the protective effect of education diminished in later-born cohorts. Consistent across the other nations, individuals with fewer years of education were most vulnerable to historical declines or benefitted the least from historical improvements. We discuss potential reasons underlying similarities and differences between the US and other nations in these historical trends and consider the role of education.

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Public Significance: Recent empirical evidence has documented that large segments of US middle-aged adults are suffering more than in the past; one overarching question that arises is to what extent is this phenomenon confined to the US or whether it is transpiring in similar ways across other high-income and upper-middle-income nations around the globe? Middle-aged adults in each nation showed historical improvements in physical health until the early 50s, but middle-aged adults in the US and Australia experienced historical declines in mental health, whereas middle-aged adults in Germany, South Korea, and Mexico reported historical improvements in mental health. We discuss potential reasons why similarities and differences emerge in middle-aged adults across different nations and elaborate on directions for future research.

The narrative surrounding midlife health and well-being in the US has come to the public forefront in the last 5 years and has revealed disturbing trends. Case and Deaton (2015) initially observed a rise in what they called *deaths of despair* amongst White non-Hispanic men and women aged 45-54 in the US who solely attained a high school education. Although this research has garnered a good deal of attention, the findings pale in comparison to the health inequities that have long existed based on gender, race, and social class across the adult lifespan, particularly in midlife (Muening et al., 2018; Roux, 2017). Recent evidence documents that following the Great Recession, middle-aged adults today exhibit more daily stress, chronic illnesses, functional limitations, and lower psychological well-being than same-aged peers in earlier historical times (Almeida et al., 2020; Kirsch et al, 2019). This research suggests that current cohorts of US middle-aged adults are doing more poorly than earlier-born cohorts and revealed that low to middle-socioeconomic status (SES) individuals are disproportionally impacted.

Our objective is to put these results in a larger perspective by directly comparing the nature of such disparities in the US with other high-income and upper-middle-income nations from different continents and cultural backgrounds (Australia, Germany, South Korea, and Mexico). Such a direct comparative approach that involves nationally representative longitudinal panel data also allows for identifying possibly disadvantaged midlife population segments within and across nations who are either most vulnerable to historical declines or benefitted the least from historical improvements. We also consider the role of years of education, which offers insights into sociocultural dynamics (Cohen & Varnum, 2016; Varnum & Grossmann, 2017).

Historical Embeddedness and Cultural Significance of Midlife in the US

Lifespan developmental psychology has long postulated that historical embeddedness and cultural contextualism influence developmental processes across the adult lifespan (Baltes, 1987; Wahl & Gerstorf, 2018). This framework proposes that historical-cultural conditions, markedly influenced by events, norms, and processes existing in a given historical period and how these evolve over time have important implications for shaping development (Baltes et al., 1998). Examining the effects of historical-cultural conditions is typically done by studying similarities

and differences across persons based on their cohort or year of birth. A majority of research using this approach has focused on older adults aged 65 and older; a recent review by Gerstorf and colleagues (2020) concluded that older adults are getting younger or performing better than previous cohorts across mental and physical health and psychosocial indices. An area that has received much less attention is the extent to which middle-aged adults are doing better or more poorly compared to same-aged peers over historical time. Midlife is commonly referred to the period in the lifespan when individuals are aged 40 to 65 (Lachman, 2004) and regarded as a vibrant and pivotal period (Infurna et al., 2020; Lachman et al., 2015). Lifespan developmental psychology argues that development is a cumulative, lifelong process and studying cohort differences in midlife can help foreshadow the state of functioning for tomorrow's older adults.

Cultural significance of midlife. Middle-aged adults form the backbone of society. They carry much of the societal load through constituting most of the workforce, while simultaneously bridging the younger and older generations in the family through caregiving-related duties (Infurna et al., 2020; Lachman et al., 2015). Given the changing demographics of decreases in the number of children being born and the increasing number of older people, middle-aged adults are more relevant than ever before as a significant resource for families and society (Feinberg, 2018). Midlife is also a period in the lifespan where pertinent domains, such as mental and physical health undergo significant changes. Physical functioning typically begins to show decline and the onset of chronic illnesses arise, such as high blood pressure, cancer and arthritis (Lachman, 2004). Crystallized cognitive abilities, on average, are high and stable, but fluid abilities show initial decrements in midlife (Baltes et al., 1998). Focusing on mental health and well-being, there are conflicting reports with research showing depression and distress highest and well-being lowest in midlife (Blanchflower & Oswald, 2020), whereas others find that well-being increases during adulthood or is relatively stable (Galambos et al., 2020). The significance of midlife is further exemplified by empirical evidence demonstrating across nations that better health in midlife–as indexed by health-promoting behaviors (e.g., physical activity) and physiology (e.g., blood pressure)–foreshadows better health in old age (Laurner et al., 1995).

These findings not only highlight the importance of examining changes in mental and physical health in midlife, but also call for giving more attention to how they evolve over historical time by comparing trends across cohorts and nations.

Changing expectations in midlife. The very nature and expectations surrounding midlife is shifting in the context of changes in the timetables of younger adults and longevity of older adults and historical changes seen in social, cultural, and economic life arenas within- and across nations. Infurna and colleagues (2020) discuss two core challenges that middle-aged adults are confronting more than ever before: the changing nature of intergenerational dynamics (i.e., raising children, caregiving for aging parents/in-laws, and custodial grandparenting) and financial vulnerabilities. These cultural processes of shifting demands, expectations, and values placed on middle-aged adults have the potential to exert its toll on mental and physical health. For example, US middle-aged adults are confronting more parenting pressures than ever before (Ebbert et al., 2019), as well as having to (re)launch adult children due to a historically challenging labor market that has led to record numbers of young adults moving back home with their middle-aged parents (Feinberg, 2018). A direct impact of gains in life expectancy for middle-aged adults is having to take on more caregiving-related duties for their aging parents and other relatives, while continuing with full-time work (Reinhard et al., 2019). Increasing caregiving responsibilities across generations are transpiring while having to simultaneously contend with a shrinking social and healthcare safety net; such safety nets come in the form of few options of paid family leave and less comprehensive and accessible healthcare coverage that strains household budgets (Feinberg, 2018). US middle-aged adults are confronting financial vulnerabilities in the form of labor market volatility (stagnant wages and re-configuring one's job or unemployment) and reduced strength of workplace social ties (Case & Deaton, 2020). The re-structuring of corporate America has led to less investment in employee development and a destabilization of unions giving employees less power and input (Case & Deaton, 2020).

Historical Trends of Mental and Physical Health in Midlife Within- and Between-Nations

There are likely to be cross-national variations in the pressures put on middle-aged adults, which could result in similarities and differences in the extent to which midlife mental and physical health is changing across cohorts within- and between-nations. For example, compared to the US, middle-aged adults living in other nations may be less likely to suffer from depression because of differences in the frequency of multigenerational households and expectations surrounding caregiving for raising children and contributing to the care of aging family members (Johnson & Wiener, 2006). The nature and type of government programs pertaining to family leave and healthcare drastically differ across the nations included. In the US, there is no federally mandated program for paid family leave (e.g., adoption, having children, caregiving for a spouse/partner or parent); such limitations greatly strain financial, mental and physical health (Infurna et al., 2020). This contrasts with nations that have extensive programs (e.g., Germany) where parents can take up to a year and more of paid parental leave, in addition to subsidized childcare. Although the US has the Federal Family and Medical Leave Act, which provides unpaid time off for family leave, only eight states in the US have extended *paid* family leave policies specifically for caregiving for an adult relative (Reinhard et al., 2019). People who are responsible for an aging loved one are often in midlife and working; therefore, they are at major risk for economic insecurity and declines in mental and physical health, along with reduced hours at work and having to change jobs or decide between caregiving and work(Feinberg,2018).

Historical advancements in healthcare and life expectancy are not universally experienced across low-, middle-, and high-income countries. The US spends more than any other nation on healthcare, but this has not translated into longer and healthier lives (Woolf & Aron, 2013). Rising healthcare costs and out-of-pocket spending in the US are leading to disruptions to medical care, substantial debt, and the threatening of household budgets (Grande et al., 2013). Conversely, nations that operate a universal healthcare system have experienced steady increases in life expectancy, whereas the US has been stagnant/declining (Olshansky et al.,2012). Stronger social safety nets in European nations helped buffer middle-aged adults from negative health effects from the Great Recession (Margerison-Zilko et al., 2016). Access to

family care and an obligatory healthcare system may provide middle-aged adults with resources that buffer the frequent strains they are confronted with; research has documented that a lack of social policy pertaining to family leave and healthcare are linked to poorer well-being among parents and earlier deaths in the US (Beckfield & Bambra, 2016; Glass et al., 2016).

Historical trends of midlife mental and physical health in the US. Historical changes in intergenerational relationships, coupled with more job and financial insecurities have made middle-aged adults more vulnerable to mental and physical health declines (Forbes & Krueger, 2019). The challenges confronting US middle-aged adults has coincided with historical shifts in their mental and physical health. In addition to rising rates of deaths of despair, prevalence rates of disability and metabolic disease in midlife have increased (Chen & Soan, 2015). Studies have documented increasing mental distress over historical time in middle-aged adults (Blanchflower & Oswald, 2020). Yet there is controversy about these patterns. For example, some have found that depressed affect is lowest in midlife (Sutin et al., 2013) and others have found that well-being remains relatively high and stable across adulthood (Galambos et al., 2020). Therefore, a lot remains to be understood regarding the variations that take place in midlife mental and physical health and whether patterns are consistent across cohorts and nations.

Cross-national comparisons of midlife mental and physical health. Empirical evidence showing historical declines in midlife mental and physical health has primarily been found in US samples. The limited literature on cross-national comparisons suggests that the health of US middle-aged adults is lagging behind other nations. Research comparing midlife adults in the US and England using 2002 data found US middle-aged adults reported more chronic illnesses, and this pattern extended to biological markers of disease (Banks et al., 2006). Research using cross-sectional data from 2012 showed that US middle-aged adults exhibit higher rates of disability and chronic illness than same-aged peers in European and Asian nations (Lee et al., 2018). Limitations of findings include its cross-sectional nature and focus on only physical health. Our study will address these limitations by examining within-person longitudinal change in cohort differences on mental and physical health across five countries, with findings

distinguishing universal trends vs those idiosyncratic to particular countries. We will additionally examine mental health to help evaluate whether trends are historically increasing, decreasing, or remaining stable across key outcomes of midlife.

Empirical approach to testing cohort differences in midlife mental and physical health within- and between-nations. Lifespan developmental psychology discusses how development is profoundly shaped and co-regulated by the cultural and subcultural characteristics of the nation people are living in (Baltes, 1987). We seek to examine to what extent historical trends in declining midlife mental and physical health are confined to the US or transpiring in other countries around the globe. To do so, we examine historical trends in midlife mental and physical health from a US sample and Australia, Germany, South Korea, and Mexico. We chose these countries and panel surveys because they represent different continents, encompass different cultural backgrounds and perspectives (i.e., East vs. West vs. variations in ethnicity, i.e., Asian, Hispanic, and SES heterogeneity), have similarities and differences in government programs pertaining to family leave and healthcare, as well as differ in economic development by including countries that are considered high-income (US, Australia, Germany, and South Korea), as well as upper-middle-income (Mexico; see UN, 2020). Furthermore, the included nations and panel surveys allowed comparison in historical trends across nations because of similar types of mental and physical health outcomes being collected around a common time frame (early 2000s to present day).

Historical Change in Midlife Mental and Physical Health: Variations by Education

Researchers have emphasized that there are many different forms of culture beyond the operationalization of cross-national comparisons (i.e., East vs. West, nationality, and race/ethnicity). Following this tradition, in addition to comparing country-level results, we also conceptualize culture as differences by SES (educational attainment) within each nation (see Cohen & Varnum, 2016; Stephens et al., 2014). Stephens and colleagues (2014) discuss how social class is considered a subculture within a broader culture (i.e., nation) because of the socializing contexts of home, school, and workplace, each of which have downstream effects on

inequalities and disparities. This is also consistent with and extends the view from Varnum and Grossman (2017) in that culture is defined as "a shared set of ideas, norms, and behaviors common to a group of people inhabiting a geographic location" such that there is also within-group variation in a geographic location that is in part structured by socioeconomic factors. For example, in the US, empirical evidence has long shown disparities in physical health across SES (Adler et al., 1994), whereas other nations do not show such disparities (Miyamoto et al., 2018). We consider this approach important because the effects of SES and the amount of heterogeneity in SES may vary across nations (e.g., SES may be less important in some cultures than in others). This suggests that educational attainment may be a key factor in understanding how cultures change over time. A consistent and striking finding across the studies that have found a worsening of midlife mental and physical health among later-born cohorts in the US is that such trends occur at a more rapid pace among those with fewer years of education (see Kirsch et al., 2019). Put differently, having more education, to a certain extent, is a protective factor against historical trends of declining mental and physical health among US middle-aged adults. One potential explanation for this is there is a premium that comes with more education, such as the availability of better jobs that are less physically demanding, more job security and higher pay, as well as greater accessibility to affordable healthcare (Case & Deaton, 2020).

The Present Study

The objective of the present study is to examine whether the worsening of middle-aged adults' mental and physical health is confined to the US or whether it is transpiring in similar ways across other high- and upper-middle-income nations. We also empirically test whether these historical trends are generalizable across levels of educational attainment within nations. Using historical change as a lens constitutes a tool that helps us identify how and why gaps between population segments currently exist, and whether they have been narrowing or widening over the past decades. Evidence of worsening of US midlife mental and physical health has used cross-sectional data that compares functioning between cohorts within datasets, such as MIDUS data from 1995 and 2012 (Kirsch et al., 2019). Moving ahead, we use longitudinal data that

permits the examination of within-person change and how this may have been shaped by the historical times people are living in (see Galambos et al., 2020). To do so, we utilize longitudinal panel data from nationally representative datasets in the US, Australia, Germany, South Korea, and Mexico. By comparing findings across nations with similarities and differences across cultural backgrounds and perspectives, government programs pertaining to family leave and healthcare, and economic development/policy, we are positioned to provide comparisons in and identify the nature of historical trends or cohort differences in the mental and physical health of middle-aged adults. This can also offer clues into predictors and sources of national differences in hopes of rethinking what influences mental and physical health for cohorts of middle-aged adults (for research providing insights on differential predictors of health and well-being across nations, see Kitayama et al., 2015; Ryff et al., 2015).

Methods

Longitudinal panel surveys consisting of nationally representative samples were used from five different nations, including the U.S. Health and Retirement Study (HRS), Household, Income, and Labour Dynamics of Australia (HILDA), German Socio-Economic Panel Study (SOEP), Korean Longitudinal Study of Aging (KLoSA), and Mexico Health and Aging Study (MHAS). Descriptions of participants, procedures and data accessibility for each study are reported in previous publications (HRS: McArdle et al.,2007; HILDA: Watson, 2010; SOEP: Wagner et al.,2007; KLoSA: Park et al.,2007; MHAS: Wong et al.,2017). We chose outcomes across the mental and physical health domains because these have conceptually and empirically been shown to be pertinent for middle-aged adults (Infurna et al., 2020). We note that not all studies included the same exact measures. For physical health, three out of five studies assessed health conditions and each study assessed physical functioning and self-rated health. Each study included measures pertaining to mental health, and cognition was included in two studies. Previous research has shown evidence to suggest cross-national equivalence in the measures included (Hu & Lee, 2011; Jain et al., 2016; Jebb et al., 2020), but we note that measurement equivalence continues to be one of the major challenges for cross-cultural comparisons and we

elaborate on this in the Supplemental Online Materials (SOM). Due to space constraints, we provide a brief description of each study design, sample, and measures in the main text and present more detailed information on the measures, sample demographics (Table S1), and data collection time periods (Figures S1-S5) in the SOM. In each study, years of educational attainment was used as our indicator of SES. For our analyses, we included those observations in which participants were aged 40 (if available) thru 65 and participants were removed when they reached age 66 because this is the generally accepted age range for midlife (Lachman, 2004).

Participants, Study Designs, and Measures

United States: HRS. The HRS is a nationally representative sample of households in the contiguous US of noninstitutionalized adults aged 50 years and older and their spouse (spouses younger than age 50 were included). Participants provide biennial reports on economic, psychosocial, mental, and physical health information. The HRS collects data via in-person and telephone interviews and every six years recruits a new cohort to refresh the sample.

We use biennial data obtained between 1992 and 2018 on functional limitations ([I]ADL; Rodgers & Miller, 1997), self-rated health (single-item), health conditions, depressive symptoms (CES-D; Radloff, 1977), and episodic memory (immediate and delayed recall). Our total sample for our analyses included 28,219 participants who were aged 40 thru 65 during the course of the study. The birth years represented in the data ranged from 1930 to 1969 (M = 1948, SD = 10.62).

Australia: HILDA. The HILDA is a nationally representative panel study of households in Australia. Within a household, all persons aged 15 and over were invited to participate. Data are collected via face-to-face and telephone interviews and self-completed questionnaires.

We use annual data obtained between 2001 and 2018 on general perceptions of health, physical functioning, vitality, and mental health from the SF-36 (Ware et al., 1994) and single-item on life satisfaction. The total sample for our analyses included 10,836 participants aged 40 thru 65 during the study. The birth years represented are 1936 to 1969 (M = 1955, SD = 8.77).

Germany: SOEP. The SOEP is a nationally representative panel study of households initiated in 1984 and covers residents of West and East Germany. All family members older than

age 16 in a household were eligible for participation. Data is collected via face-to-face interviews and self-completed questionnaires. To reduce potential effects of the Berlin Wall coming down in 1989 and increase comparability with the other studies, we use data from 1992 through 2018.

Life satisfaction and self-rated health were assessed annually with single-items. Our sample for these analyses included 27,822 participants aged 40 thru 65 during the course of the study. The birth years represented in the data are from 1927 to 1969 (M = 1953, SD = 10.56).

Mental and physical health were assessed biennially from 2002 onwards using the SF-12 (Ware et al., 1994). Our total sample for these analyses included 22,610 participants aged 40 thru 65 during the study. The birth years represented are 1937 to 1969 (M = 1956, SD = 8.98).

South Korea: KLoSA. The Korean Longitudinal Study of Aging began in 2006 and biennially collects data from people aged 45 and older who reside in South Korea not inclusive of Jeju Island. Data are collected via in-person computer assisted personal interviewing (CAPI).

We use biennial data obtained between 2006 and 2016 on functional limitations ([I]ADL; Rodgers & Miller, 1997), self-rated health (single-item), health conditions, cognition (MMSE), life satisfaction (single-item), and depressive symptoms (CES-D; Radloff, 1977). The sample for our analyses included 6,402 participants who were aged 45 thru 65 years during the course of the study. The birth years represented in the data are from 1938 to 1961 (M = 1951, SD = 6.20).

Mexico: MHAS. The MHAS began in 2001 as a panel survey of people aged 50 years and older and their partners, living in private dwellings in both urban and rural areas in Mexico.

We use data from 2001, 2003, 2012, 2015, and 2018 on functional limitations ([I]ADL; Rodgers & Miller, 1997), self-rated health (single-item), health conditions, and depressive symptoms (CES-D; Radloff, 1977). The total sample for analyses was 20,803 participants aged 40 thru 65 during the study. The birth years represented are 1936 to 1969 (M = 1953, SD = 9.20).

Statistical Analyses

Time-in-study, age, and cohort. Following Gerstorf et al. (2019), we examined intraindividual change as *time-in-study*, a time-varying variable quantified for each assessment as the number of years since baseline (T1) and centered at the middle of each individual's repeated

measures time-series. Age-related differences (age gradients) were examined as individuals' *chronological age* (at their middle assessment) and centered at age 55, close to the average age within each of the samples. Cohort-related differences were examined as individuals' *birth year*. Birth year was centered such that the earliest-born participants within each study served as the reference (for details, see Tables S2-S9 notes in SOM).

Data analysis. Intraindividual changes, age-related, and history-related differences were examined using growth curve models (Grimm et al., 2017). We analyzed our data using growth curve models because our objective was to track how key indicators of physical and mental health develop as people move through midlife (i.e., within-person change) and how this may differ across historical times (i.e., between-person differences). For further conceptual and methodological reasoning of our selection of using growth curve models, please see SOM. Two models were estimated for each outcome within each sample. The first model examined whether there are cohort differences in levels and rates of change across each outcome and specified as

$$outcome_{ti} = \beta_{0i} + \beta_{1i}\,(timeinstudy_{ti}) + \beta_{2i}\,(timeinstedy^2_{ti}) + e_{ti} \quad (1)$$

where person *i*'s score on the outcome at observation *t*, $outcome_{ti}$, is modeled as a function of a person-specific intercept, β_{0i}; a person-specific linear slope coefficient, β_{1i}; a person-specific quadratic slope coefficient, β_{2i}, and residual error e_{ti}. Individual differences in the person-specific coefficients were modeled as

$$\beta_{0i} = \gamma_{00}+\gamma_{01}\,(age_i) + \gamma_{01}\,(birthyear_i) + \gamma_{02}\,(birthyear^2_i) + \gamma_{03}\,(birthyear_i * age_i) + \gamma_{04}\,(birthyear^2_i * age_i)+u_{0i},$$

$$\beta_{1i} = \gamma_{10}+\gamma_{11}\,(age_i) + \gamma_{12}\,(birthyear_i) + \gamma_{13}\,(birthyear^2_i) + \gamma_{14}\,(birthyear_i * age_i) + \gamma_{15}\,(birthyear^2_i * age_i)+u_{1i},$$

$$\beta_{2i} = \gamma_{20}, \quad (2)$$

(i.e., Level 2 model) where γ_{00}, γ_{10} and γ_{20} are the sample means or fixed-effects from the model and u_{0i} and u_{1i} estimate between-person differences in each parameter and are assumed to be normally distributed, correlated with each other, and uncorrelated with the residual errors, e_{ti}.

In the second model, we examined the role of education and accounted for gender and race (in the US sample) in the person-specific intercepts and linear rates of change, β_{0i} and β_{1i}; and tested all interaction terms with birth year. To maintain parsimony, if birthyear^2 was not

statistically significant, we dropped it and its interactions from the model. Person-level predictors were effect-coded/centered so that parameters indicated the average trajectory and differences associated with a particular variable (rather than a particular group). Models were fit using SAS (Proc Mixed; Littell et al., 2006). Following good practice (e.g., Grimm et al., 2017), we used Full Information Maximum Likelihood procedures to accommodate incomplete data under usual missing at random assumptions (Little & Rubin, 1987), with included variables (i.e., age, gender, and education) serving as attrition-informative variables that alleviate longitudinal selectivity for outcomes (McArdle, 1994). Background information on this procedure can be found in the SOM.

Results

The results are presented by category of outcome (physical health and mental health), followed by analyses pertaining to education. Our attention is focused on describing similarities and differences in cohort effects within and across nations. The SOM contains more detailed explanation of findings (e.g., age-related changes, gender and race differences), as well as Tables S2 to S9 provide the parameter estimates from the longitudinal models for each outcome.

Historical Trends of Health and Well-Being in Middle-Aged Adults

Physical health. Results from growth curve models examining cohort-related differences in physical health are shown in Tables S2 and S3. Significant cohort effects were found for most outcomes with the magnitude and direction differing. Figure 1 graphically illustrates the findings for the US, Australia, and Germany and Figure 2 graphically illustrates the findings for South Korea and Mexico. For each figure and those that follow for mental health and education, the figures show for each cohort as a long, thin line the age and selection trends across midlife from age 40 to age 65 and as short-thick lines the model-implied within-person changes over 5 years with 1-year age increments. From Figures 1 and 2, it can be obtained that later-born cohorts across each nation, on average, reported fewer health conditions (Figure 1A, Figure 2A, and 2D). On average, later-born cohorts across each nation (except for Germany) reported better physical functioning (Figure 1B, 1D, 1F, 2B, 2E). Consistent across each nation, later-born cohorts, on average, reported better self-rated health (Figure 1C, 1E, 1G, 2C, and 2F). For the US, later-born

cohorts showed historical improvements for physical functioning and self-rated health from ages 40 to 55, with advantages dissipating in the late 50s and early 60s. In sum, we observed historical improvements for people in their 40s and early 50s in physical health across all five nations.

Mental health. Results from growth curve models examining cohort-related differences in mental health are shown in Tables S4 and S5. Significant cohort effects were found for most outcomes with the magnitude and direction differing across them. Figure 3 graphically illustrates the findings for the US, Australia, and Germany and Figure 4 graphically illustrates the findings for South Korea and Mexico. For the US and Australia, Figure 3 demonstrates that later-born cohorts, on average, reported poorer overall mental health in the form of more depressive symptoms (Figure 3A), poorer memory (Figure 3B), and lower levels of mental health and well-being (Figures 3C, 3D, and 3E). In the US, when comparing at age 55 those born 1930 to 1939 with those born 1960 to 1969, the later-born cohort reported 0.60 more symptoms (d = 0.39). Historical trends in the rate of within-person change were observed in the US such that depressive symptoms increased over time, but were relatively stable for those born 1940 to 1949 and eventually declined for those born after 1950. In Australia, differences between earlier-born (1936-1949) and later-born (1960-1969) cohorts were in the medium effect size range for life satisfaction (d = 0.26) and mental health (d = 0.50). In contrast to this historical worsening in the US and Australia, later-born cohorts in Germany, South Korea, and Mexico each showed historical improvements in mental health (Figure 3F, 3G, Figure 4A, 4B, 4D) and cognition (Figure 4C). In Germany, for example, differences between earlier-born and later-born cohorts were in the medium to large effect size range for life satisfaction (d = .91) and mental health (d = .52). In Germany, historical trends in the rate of within-person change were also observed with later-born cohorts reporting increasing life satisfaction and mental health across midlife. Broadly speaking, we observed historical worsening of mental health and well-being in the US and Australia, but historical improvements in Germany, South Korea, and Mexico.

Education. Results from growth curve models that additionally included education and controlled for gender and race are shown in Tables S6 to S9. The general picture that

consistently emerged across each of the nations was that attaining more years of education was associated with better functioning across the outcomes examined and by and large this did not differ across cohorts. There are some qualifications, though, to this picture of the advantages of education, particularly in the US in that the protective effects of education were diminished in later-born cohorts. Figure 5 graphically illustrates the findings for depressive symptoms, self-rated health, and memory. Figures 5A and 5B show that the differences between participants who attained a high school education vs. those who attained a college education is smaller for later-born cohorts. Attaining more years of education was associated with fewer depressive symptoms, but the protective effect for those who attained a college education dissipated in later-born cohorts (see those born in 1950 to 1959 and 1960 to 1969 in Figure 5B). The amount of historical increases in depressive symptoms is larger for those who completed college. Self-rated health revealed a similar pattern to that of depressive symptoms (see Figure 5C and 5D); more years of education was associated with higher levels of self-rated health, but this effect reversed in later-born cohorts with those attaining a college education reporting stronger declines across midlife (see those born in 1960-1969) than their well-educated age peers in earlier-born cohorts (see those born 1940 to 1949). Focusing on episodic memory, those who attained more years of education were more likely to exhibit better memory, but this effect was reduced in later-born cohorts (see Figures 5E and 5F) with those attaining a college education exhibiting lower levels of memory in later-born cohorts than their well-educated age peers in earlier-born cohorts.

Discussion

Our findings demonstrate that historical declines in US middle-aged adults' mental and physical health do not necessarily generalize across other nations. Similar to the US, later-born cohorts of middle-aged adults in Australia exhibited historical declines in mental health. In contrast, we observed historical improvements in midlife mental and physical health in Germany, South Korea, and Mexico. Consistent across nations, those who attained fewer years of education benefitted the least from historical improvements. However, in the US, there was evidence to suggest that the protective effect of educational attainment dissipated in later-born cohorts. Our

discussion elaborates on potential reasons underlying similarities and differences in historical changes across nations and SES and provides directions for future research.

Historical Trends of Mental and Physical Health in Midlife

Our findings follow a long scientific tradition that has utilized a lifespan developmental psychological framework in the study of cohort effects and cultural change across the lifespan. Research from Glen Elder (1974) documented how growing up during the Great Depression was profoundly shaped by how old the children were when they were going through the experience. Warner Schaie's (1994) research found that trends in cognitive functioning differ in magnitude and direction by ability; historical improvements across cohorts were observed for inductive reasoning and verbal meaning, whereas number skills declined. Sutin and colleagues (2013) observed that later-born cohorts increased in well-being, but that cohorts who lived through the economic challenges of the early 20th century had lower well-being than those who lived during more prosperous times. A rich body of empirical evidence indicates that historical improvements in cognition, health, and well-being across a myriad of different countries have been most pronounced for those in the Third Age (i.e., their 60s and 70s; Gerstorf et al., 2020). In contrast, middle-aged adults in the US and Australia – but not the three other nations examined here – are trending in the opposite direction. These results offer insights into potential predictors and causes of national differences in what contributes to mental and physical health for middle-aged adults.

Linkage of findings to research on cultural change. Our findings complement previous research that observed global shifts toward individualist values and practices over the past 50-100 years (see Grossmann & Varnum, 2015; Santos et al., 2017). Such global shifts could be attributable to greater population density and its associations with higher marriage age, decreased fertility, and later degree completion (Sng et al., 2017). Similar research on young adults that has covered over 40 years of time observed that recent cohorts are displaying increases in external locus of control, decreases in civic interest and trust and increases in individualistic traits (Twenge & Campbell, 2010). Individualization and modernization carry psychological costs, such as reductions in close social connections and support structures that are key when it comes

to maintaining mental and physical health. Overlapping across previous findings and the current investigation is how cultural differences remain sizeable and are likely driven by socioeconomic and demographic factors, social orientation and capital, and ecological pressures.

Here, we observed in the US and other high-income and upper-middle-income nations that population-level changes in mental and physical health can occur over a short period of time. Our findings in the US of declining mental health across cohorts is similar to recent research showing that middle-aged adults post the 2008 Great Recession are reporting poorer overall mental and physical health across various outcomes (Almeida et al., 2020; Kirsch et al., 2019), as well as research showing mental distress increasing in US middle-aged adults since the early 1990s (Blanchflower & Oswald, 2020). The physical health of US middle-aged adults in their 40s and early 50s historically improved, but such improvements disappeared in later midlife (i.e., late 50s and early 60s). This complements research showing that adults in their early 60s are exhibiting more functional limitations and disabilities today than earlier cohorts (Seeman et al., 2010). Memory showed historical declines across cohorts, which contrasts with findings of historical improvements, such as the Flynn effect, in general cognition (Schaie, 1994). Research suggests that longer exposure to economic downturns is associated with poorer cognition (Burgard & Kalousova, 2015). One possible explanation for such dissipating improvements for later-born cohorts of US middle-aged adults is consequences of the Great Recession, which involved poorer physiology and increased work stress, income inequality, and healthcare costs (Burgard & Kalousova, 2015). Earlier-born cohorts in our US sample (i.e., those born in the 1930s and 1940s) were in midlife during the 1990s and early 2000s, whereas later-born cohorts of middle-aged adults were in their late 40s and 50s during the time leading up to and following the Great Recession. During times of recession, governments implement austerity measures that could disrupt prevention and treatment services provided by the public health and medical care systems and reduced funding to social protection programs, even as demands may rise (Burgard & Kalousovia, 2015).

Cross-national comparisons of cohort differences in midlife mental and physical health. Of the nations included, Australia's changes most closely mirrored those of the US in that there were historical declines in later-born cohorts' mental health, but general improvements in physical health. Similar to the US, Australia is in the midst of an opioid epidemic that has led to many lives lost in death, whereas there is no evidence of this in Germany and other European nations, as well as South Korea (Lee, 2019; Shipton et al., 2018). The opioid epidemic has likely led to weakened family and community relationships and taken a toll on worker productivity, income, and gainful employment (Shipton et al., 2018). Economic research has shown increases in psychosocial job stressors and job insecurity, as well as greater government austerity measures that have reduced access to preventive social and health services, especially in regions with higher unemployment rates (Milner et al., 2014). The lack of employee commitment to workers may leave the worker without any feeling of connection and/or need to stay or be connected to work and/or a good employee. Long-term deterioration in employment opportunities could lead to rising income inequality, wage stagnation, less social protection and employment benefits, and intergenerational decline in employment security (Glymour et al., 2014).

A common theme for the findings pertaining to Germany, South Korea, and Mexico was historical improvements in both mental and physical health across cohorts of middle-aged adults. One overarching commonality across these nations for cohorts of middle-aged adults is the amount of socioeconomic changes that occurred. In the case of Germany, the fall of the Berlin Wall in 1989 led to expansion of employment opportunities through investment of West German companies into East Germany, and West German regions with high concentration of households with social ties to the East exhibited substantially higher growth in income per capita in the early 1990s (Burchardi & Hassan, 2013). The fall of the Berlin Wall led to added years of life expectancy and broader trends of improvements in modifiable cardiovascular disease factors (Vogt, 2013). Follow-up analyses examining whether findings pertaining to Germany differed for those living in West or East Germany in 1989 did not reveal any differences in cohort effects based on location. Of note is also that the economy in Germany was hardly hit by the Great

Recession. In the case of South Korea, the nation underwent short-term but intense socioeconomic changes after the liberation from the Japanese occupation during World War II (Heo et al., 2017). By taking into consideration when the KLoSA data were collected, 2006 to 2016, this was following the Asian financial crisis that began in 1997 and devastated the South Korean economy and altered many components of society until the mid-2000s (Lee & Yi, 2018). Furthermore, research shows high levels of social and political trust among South Koreans, largely due to now well-functioning economic, political, and welfare systems (Lee & Yi, 2018).

Mexico has seen gains in economic activity and healthcare reform in the last several decades, which could be driving the observed historical improvements in mental and physical health. The implementation of NAFTA improved economic activity through export-led growth driven by sales of manufactured goods, declines in inflation and surge in non-oil exports and foreign direct investment (Moreno-Brid et al., 2005). Focusing on healthcare reform, Mexico has seen substantial long-term public investment in its healthcare system through institutional and human resource development, and adoption of conceptual frameworks (WHO framework for health system performance), resulting in improvements in life expectancy and decreases in infant/child mortality (Frenk et al., 2006). By offering social protection in health via insurance to all citizens, reform is aimed to reduce catastrophic and out-of-pocket spending while promoting efficiency, equitable resource distribution and better-quality care (Knaul & Frenk, 2005).

Potential explanations for cross-national differences. A big-picture question that arises from our findings is why historical trends in the US and Australia differed from those observed in Germany, South Korea, and Mexico? Furthermore, our findings contradict recent research from the WHO showing global increases in depression over time that spans generations (e.g., Baby Boomers, Generation X; WHO, 2017). Potential explanations span methodological and conceptual considerations. Methodologically, the nature of the analyses differs in that the WHO used cross-sectional data that confounds age and cohort, whereas we examined cohort changes using within-person longitudinal data. The contrasting approaches has been long-debated in the literature and due to space limitations cannot be given further attention here (see for example,

Galambos et al., 2020). Conceptually, there are idiosyncrasies within nations that could lead to differences in historical trends observed here and with the WHO; we elaborate on them below.

At this juncture, we can only speculate, but we believe that nation-level differences in resource availability and economics have contributed to these differences. The nations included in our analyses profoundly differ in their healthcare systems. The US spends the most on healthcare, but ranks poorly on accessibility, patient safety, coordination, efficiency, and equity (Case & Deaton, 2020). Although the Affordable Care Act resulted in the uninsured rate declining and expansion of Medicare and Medicaid (Obama, 2016), the out-of-pocket costs associated with attaining healthcare continue to rise. Rising healthcare costs have a direct impact on one's ability to put money in savings and retirement accounts, utilize preventive treatments (statins, hypertensives), and pay monthly bills (Case & Deaton, 2020; Infurna et al., 2020). Furthermore, lack of a centralized healthcare system may be a contributing factor in the opioid crisis in the US; Lee (2019) argues that a national healthcare system could help strictly monitor the distribution of such potent medications, whereas people who abuse are ambiguous under a private healthcare system that is under control of private insurance companies.

Another major factor to consider is the nature of employment. The last several decades have seen the landscape of work altered, which has implications for mental and physical health (see Dutton & Heaphy, 2003). Case and Deaton (2020) argue that the globalization of the economy, coupled with the outsourcing of American manufacturing jobs and the dehumanization of employees via the destabilization of unions has held great impact. Life-long commitment to a singular job is unlikely, and long-term commitment to the employee is also increasingly uncommon (Case & Deaton, 2020). Current cohorts of middle-aged adults are living in a time of rising income inequality and stagnant wages. The stagnation of wages and benefits, and lack of linkage, commitment and security from employers, coupled with large amounts of student debt, are dampening one's ability to buy a home, start a family, and weigh on them and so may contribute to the historical worsening of mental and physical health.

Another factor to consider is changing family demographics that could lead to increasing stress among middle-aged people. There have been historical shifts in family composition given that today more people are unpartnered, do not have children, and are marrying later, along with people having more and different types of relationships due to remarriages and blended families (Fingerman, 2017). The result is more people who are single, in addition to middle-aged adults having fewer siblings with whom to share family stresses and burdens (Feinberg, 2018). At the same time, increasing numbers of middle-aged adults are taking on caregiving responsibilities for their aging parents and (re)launching grown-up children into adulthood (Reinhard et al., 2019). This showcases the double-edged sword nature of relationships; not all relationship types are beneficial for mental and physical health (Fingerman, 2017; Walen & Lachman, 2000).

Historical Change in Midlife Mental and Physical Health: Variations by Education

A consistent finding across the nations included was that individuals who attained more years of education were more likely to exhibit better functioning across the outcomes included. This finding, with a few exceptions in the US, did not differ across cohorts, suggesting that attaining more years of education has universal beneficial effects and coincides with opportunities for advanced education having increased dramatically for recent cohorts (Gerstorf et al., 2020). There are several possibilities for why this may be. Research on SES has long shown how individuals attaining more years of education are more likely to have better coping strategies for handling stress and engage in health-promoting behaviors, such as more physical activity and less likely to smoke and drink excessively (Adler et al., 1994). There is a premium that comes with attaining more years of education, such as the availability of better jobs that are less physically demanding, come with more job security and higher pay (Case & Deaton, 2020). Put differently, those who do not continue their education beyond high school are experiencing historical trends of more job insecurity, which can impact the meaning and status that work confers and less accessibility to affordable and high-quality healthcare (Case & Deaton, 2020).

Education findings specific to the US. A surprising exception that was specific to the US was that the benefits of attaining more years of education dissipated or waned for later-born

cohorts of middle-aged adults. This is exemplified in Figure 5, where those who attained a college education and were born in the 1960s reported stronger increases in depressive symptoms, declines in self-rated health, and lower levels of episodic memory across midlife than their similarly well-educated age peer in earlier historical times. Why might this be? One explanation could be due to degree inflation or the movement to require college degrees for entry level jobs that previously did not require advanced education. Another explanation is that the many challenges of midlife permeate all levels of education. Recent decades have seen a rise in parenting pressures in the form of investment in children's success and greater involvement in school and extracurricular activities, which can negatively impact both kids and parents across mental health and substance use (Ebbert et al., 2019). Adult children of those in midlife have increasing difficulty in finding long-term job stability because of fewer job prospects, which can create a financial burden and weigh on the mental health of middle-aged parents (Infurna et al., 2020). On the other end of the generation spectrum is middle-aged adults' involvement in caregiving duties and worries for aging family members. A recent AARP survey found that in 2017, family caregivers in the US provided 34 billion hours of care with their unpaid contributions valued at approximately $470 billion (Reinhard et al., 2019). On top of this, middle-aged adults are currently facing unprecedented financial vulnerabilities due to labor market instability and a shrinking social and healthcare safety net due to a lack of family policies and comprehensiveness and accessibility to affordable healthcare services and coverage. These issues/problems in the US are not solely confined to those with low SES, but recent decades have seen individuals from all gradients of SES feeling the impact.

Future research exploring other SES factors. We note that our focus on education was driven by previous research (Case & Deaton, 2015; Kirsch et al., 2019), but research has also shown the importance of other indices of SES in contributing to pertinent outcomes in midlife, including relative comparisons and social status. For example, Carol Graham's (2009) research on relative comparisons to others highlights the importance of identifying and monitoring trends in well-being and how future beliefs (i.e., hope and optimism) are linked to health, well-being,

and economic opportunities. Analogous to this is Keith Payne's (2017) research on the subjective social status ladder, which revealed that where people place themselves on the ladder in relation to others is predictive of health, well-being and economic outcomes. Future research would benefit from examining the extent to which these indicators of how people view themselves in relation to others is a potential moderator of cohort differences.

Limitations and Future Directions

In closing, we note several study limitations that signal the need for future research. First, our focus was on identifying the existence of cohort differences in midlife mental and physical health within- and across nations. Future research is needed to comprehensively examine gender and race differences. For example, we found gender differences in historical change across several nations, with later-born cohorts of women in the US reporting lower self-rated health and more depressive symptoms and in Australia, later-born cohorts of women reported poorer vitality (see SOM for further description). This falls in line with research showing that women are disproportionally impacted by some of the expectations of midlife, such as caregiving duties (Feinberg, 2018). We also found that in South Korea, later-born cohorts of women reported better self-rated health, fewer depressive symptoms and exhibited better cognition.

In the US sample, individuals who were white were more likely to report better mental and physical health across outcomes. Only one race by cohort interaction was significant; later-born cohorts of individuals who were white, on average, exhibited fewer depressive symptoms. These findings call for more research on mechanisms for gender and race differences within- and across nations and what individual- and nation-level resources could mitigate such disparities.

A second limitation was that we did not include nation-level factors in our analyses because of the lack of integrated longitudinal data sets across countries; we were restricted in what data were available to test the questions at hand. However, in the US and Australia, we found similarities in declining mental health, whereas historical improvements were observed across the outcomes examined for Germany, South Korea, and Mexico. This points to future research needing to examine whether differences in government programs pertaining to family

leave and healthcare, as well as neighborhood and economic indicators (e.g., GINI coefficient, residential mobility) could account for such nation-level differences. Research within the US has found that individuals who lived in states that have implemented more conservative policies were more likely to experience a reduction in life expectancy from 1970-2014 (Montez et al., 2020). A third limitation was our focus on high- and upper-middle-income nations; future research is needed to examine whether our findings extend to other nations with different cultural backgrounds and perspectives. It is an open-question whether similar trends transpire in nations across the income spectrum. A fourth limitation centers on the measures not entirely being the same across studies and the designs slightly differing. Research on cross-national measurement equivalence is continuing to evolve, with a focus on harmonization (Hu & Lee, 2011). Lastly, our focus on descriptively identifying national differences in midlife mental and physical health limited our ability to examine individual-level factors that could operate as resources individuals can rely on to mitigate against historical declines. Psychosocial resources, such as social support and control beliefs are prime factors to first focus on due to existing research demonstrating their ability to promote resilience and their malleability to intervention (see Infurna et al., 2020).

Conclusion

Our findings paint a picture of historical changes in the mental and physical health of middle-aged adults that differs across nations. Given the challenging circumstances currently confronting the world in the midst of the COVID-19 pandemic, it is an open question as to what the long-term ramifications will be, but due to its apparent economic, social, and psychological consequences (Vanderweele, 2020). Initial research has shown how adults are doing more poorly now, as compared to before the COVID-19 pandemic (APA, 2020). We speculate that our findings pertaining to the worsening of mental health in later-born cohorts of US middle-aged adults and disparities based on SES, gender, and race could continue and extend to physical health outcomes and to cohorts born in the 1970s and 1980s. Insights into individual- and nation-level resources can help identify factors that can make a difference in promoting health and well-being across time for the greater good for middle-aged adults and the families who rely on them.

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Figure Caption

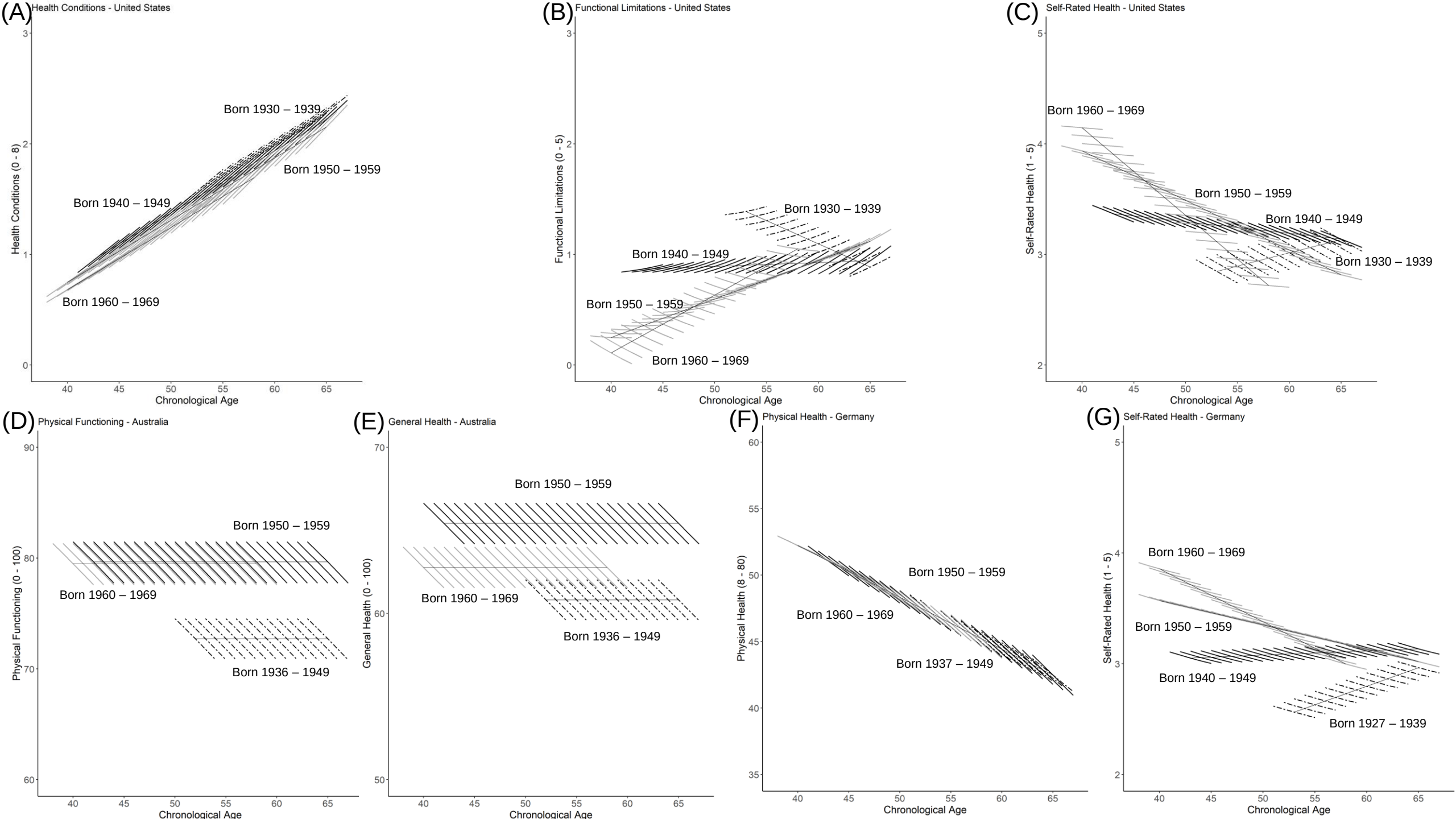
Figure 1. Cohort differences in model-implied trajectories in physical health for the US, Australia, and Germany. Across the nations, later-born cohorts reported fewer health conditions and functional limitations and better self-rated health. In the US, later-born cohorts reported better self-rated health and fewer functional limitations across ages 40 to 55, but improvements dissipated in the late 50s and early 60s.

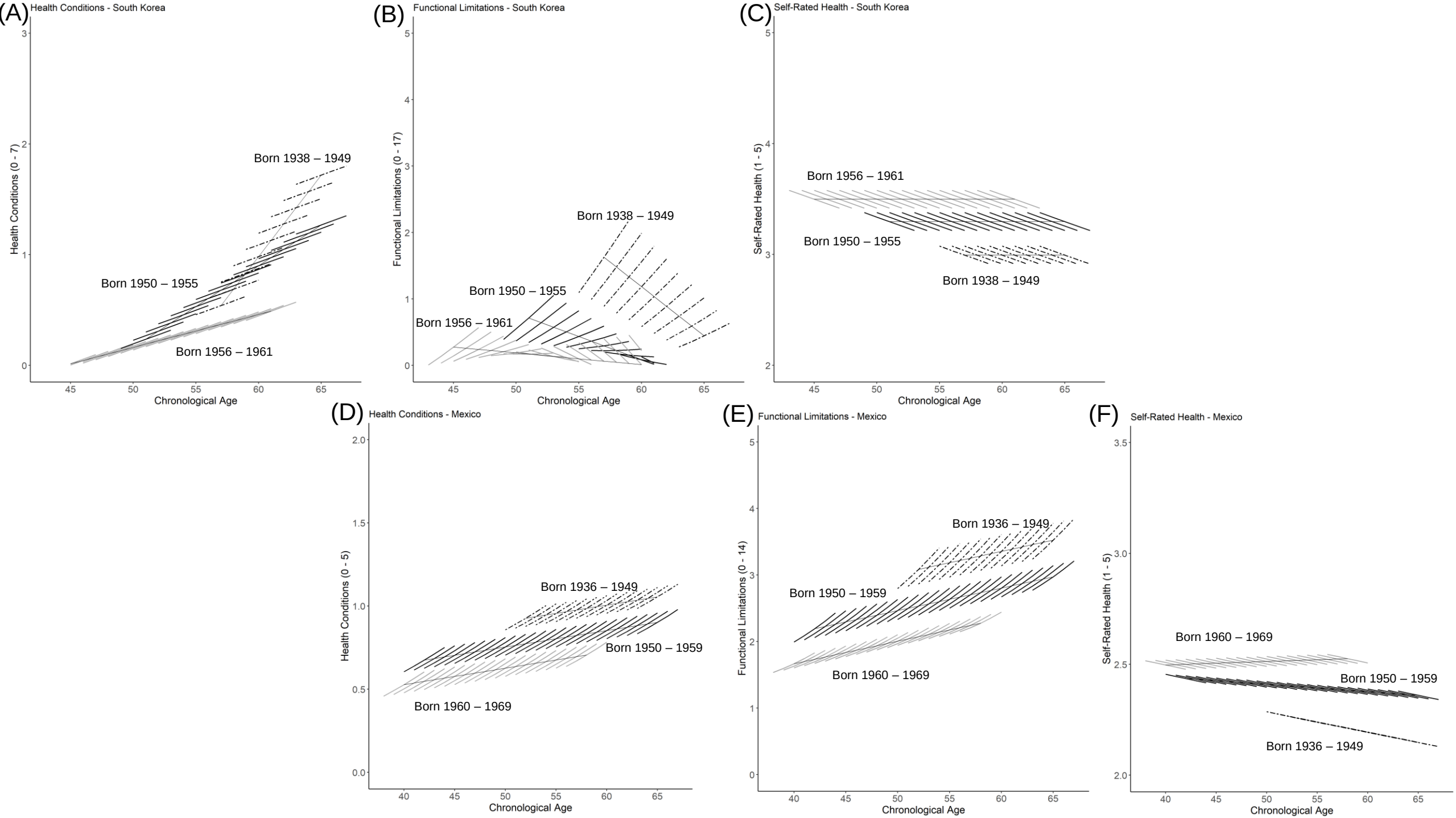
Figure 2. Cohort differences in model-implied trajectories in physical health for South Korea and Mexico. Later-born cohorts in each nation reported fewer health conditions and functional limitations and better self-rated health.

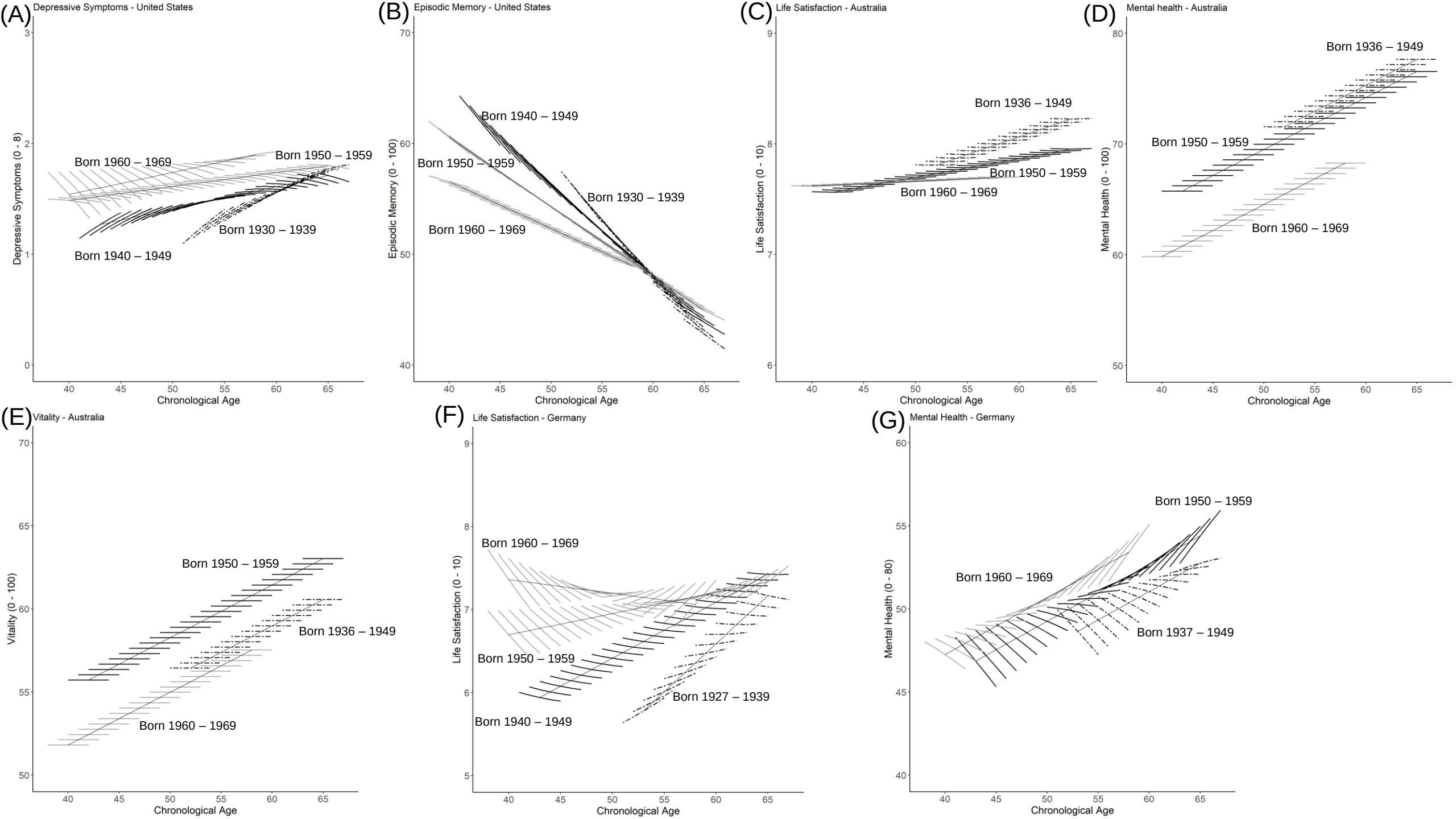
Figure 3. Cohort differences in model-implied trajectories for mental health and well-being in the US, Australia, and Germany. In the US and Australia, later-born cohorts exhibited poorer mental health and well-being, whereas for Germany improvements in mental health and well-being were observed across cohorts.

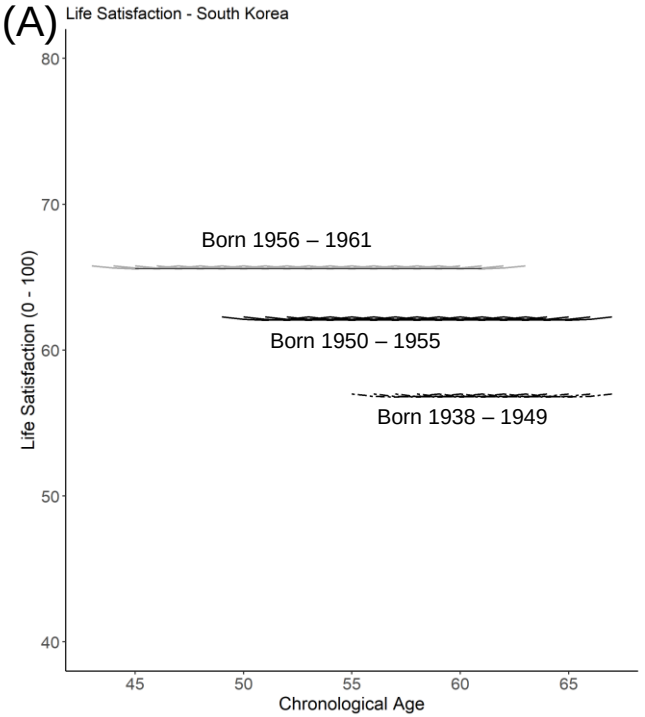
Figure 4. Cohort differences in model-implied trajectories for mental health and well-being in South Korea and Mexico. In each nation, on average, later-born cohorts reported better mental health and well-being.

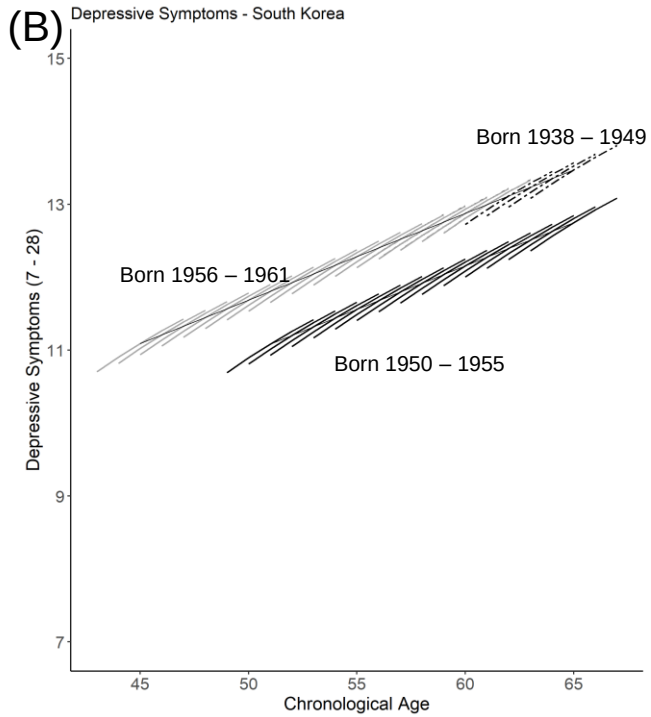
Figure 5. The effect of education on cohort differences for depressive symptoms, self-rated health, and episodic memory in the US. Broadly speaking, attaining more years of education was beneficial for earlier-born cohorts, but this dissipated for later-born cohorts in that the amount of historical increases in depressive symptoms and historical declines in self-rated health and episodic memory is larger for those who completed college. This is exemplified with the differences between those who attained a high school education vs. those who attained a college education becoming smaller over successive birth cohorts. For example, for those born in the 1930s, there is a noticeable difference in depressive symptoms between the two education groups at age 55, whereas this gap dissipates for those born in the 1960s. A similar pattern is observed for episodic memory and self-rated health.

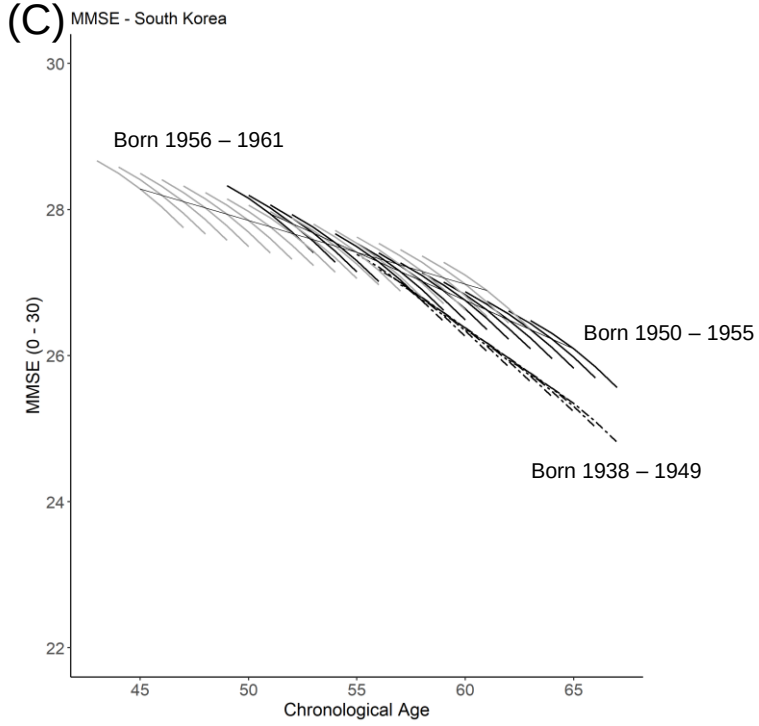

(A)
Health Conditions - United States
Health Conditions (0 - 8)
Chronological Age
Born 1930 – 1939
Born 1950 – 1959
Born 1940 – 1949
Born 1960 – 1969
(B)
Functional Limitations - United States
Functional Limitations (0 - 5)
Chronological Age
Born 1930 – 1939
Born 1940 – 1949
Born 1950 – 1959
Born 1960 – 1969
(C)
Self-Rated Health - United States
Self-Rated Health (1 - 5)
Chronological Age
Born 1960 – 1969
Born 1950 – 1959
Born 1940 – 1949
Born 1930 – 1939
(D)
Physical Functioning - Australia
Physical Functioning (0 - 100)
Chronological Age
Born 1950 – 1959
Born 1960 – 1969
Born 1936 – 1949
(E)
General Health - Australia
General Health (0 - 100)
Chronological Age
Born 1950 – 1959
Born 1960 – 1969
Born 1936 – 1949
(F)
Physical Health - Germany
Physical Health (8 - 80)
Chronological Age
Born 1950 – 1959
Born 1960 – 1969
Born 1937 – 1949
(G)
Self-Rated Health - Germany
Self-Rated Health (1 - 5)
Chronological Age
Born 1960 – 1969
Born 1950 – 1959
Born 1940 – 1949
Born 1927 – 1939

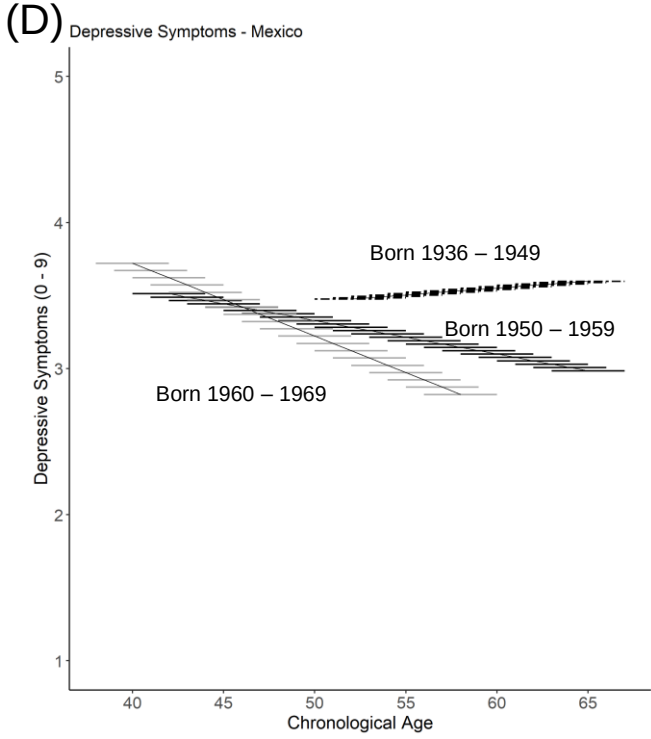

(A)
Health Conditions - South Korea
Health Conditions (0 - 7)
Chronological Age
Born 1938 – 1949
Born 1950 – 1955
Born 1956 – 1961
(B)
Functional Limitations - South Korea
Functional Limitations (0 - 17)
Chronological Age
Born 1938 – 1949
Born 1950 – 1955
Born 1956 – 1961
(C)
Self-Rated Health - South Korea
Self-Rated Health (1 - 5)
Chronological Age
Born 1956 – 1961
Born 1950 – 1955
Born 1938 – 1949
(D)
Health Conditions - Mexico
Health Conditions (0 - 5)
Chronological Age
Born 1936 – 1949
Born 1950 – 1959
Born 1960 – 1969
(E)
Functional Limitations - Mexico
Functional Limitations (0 - 14)
Chronological Age
Born 1936 – 1949
Born 1950 – 1959
Born 1960 – 1969
(F)
Self-Rated Health - Mexico
Self-Rated Health (1 - 5)
Chronological Age
Born 1960 – 1969
Born 1950 – 1959
Born 1936 – 1949

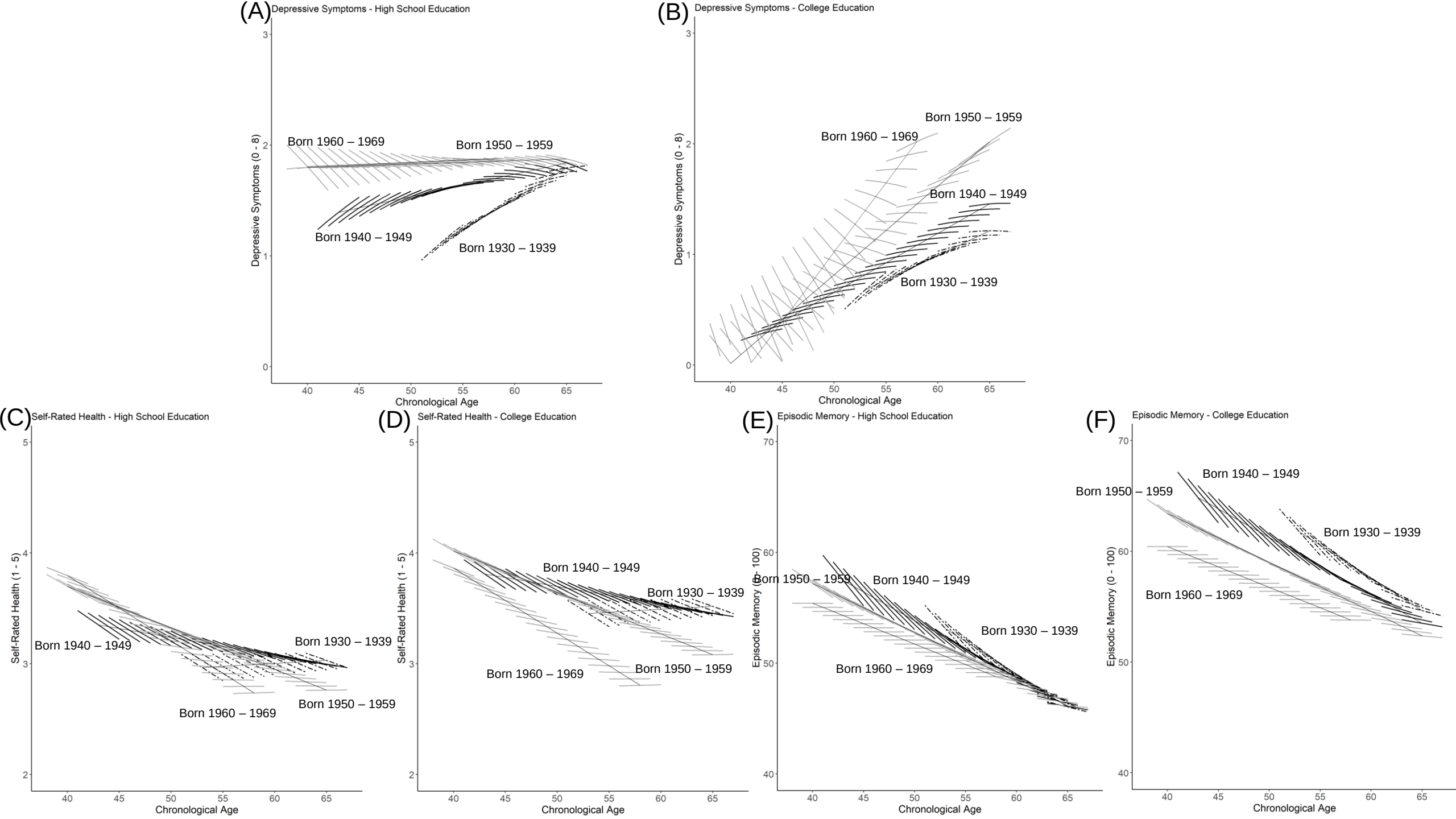

(A)
Depressive Symptoms - United States
Depressive Symptoms (0 - 8)
Chronological Age
Born 1960 – 1969
Born 1950 – 1959
Born 1930 – 1939
Born 1940 – 1949
(B)
Episodic Memory - United States
Episodic Memory (0 - 100)
Chronological Age
Born 1940 – 1949
Born 1950 – 1959
Born 1930 – 1939
Born 1960 – 1969
(C)
Life Satisfaction - Australia
Life Satisfaction (0 - 10)
Chronological Age
Born 1936 – 1949
Born 1950 – 1959
Born 1960 – 1969
(D)
Mental health - Australia
Mental Health (0 - 100)
Chronological Age
Born 1936 – 1949
Born 1950 – 1959
Born 1960 – 1969
(E)
Vitality - Australia
Vitality (0 - 100)
Chronological Age
Born 1950 – 1959
Born 1936 – 1949
Born 1960 – 1969
(F)
Life Satisfaction - Germany
Life Satisfaction (0 - 10)
Chronological Age
Born 1960 – 1969
Born 1950 – 1959
Born 1927 – 1939
Born 1940 – 1949
(G)
Mental Health - Germany
Mental Health (0 - 80)
Chronological Age
Born 1950 – 1959
Born 1960 – 1969
Born 1937 – 1949


(A)
Life Satisfaction - South Korea
Life Satisfaction (0 - 100)
80
70
60
50
40
Born 1956 – 1961
Born 1950 – 1955
Born 1938 – 1949
45
50
55
60
65
Chronological Age


(B)
Depressive Symptoms - South Korea
Depressive Symptoms (7 - 28)
15
13
11
9
7
Born 1938 – 1949
Born 1956 – 1961
Born 1950 – 1955
45
50
55
60
65
Chronological Age


(C)
MMSE - South Korea
MMSE (0 - 30)
30
28
26
24
22
Born 1956 – 1961
Born 1950 – 1955
Born 1938 – 1949
45
50
55
60
65
Chronological Age


(D)
Depressive Symptoms - Mexico
Depressive Symptoms (0 - 9)
5
4
3
2
1
Born 1936 – 1949
Born 1950 – 1959
Born 1960 – 1969
40
45
50
55
60
65
Chronological Age


(A)
Depressive Symptoms - High School Education
Depressive Symptoms (0 - 8)
Chronological Age
Born 1960 – 1969
Born 1950 – 1959
Born 1940 – 1949
Born 1930 – 1939
(B)
Depressive Symptoms - College Education
Depressive Symptoms (0 - 8)
Chronological Age
Born 1950 – 1959
Born 1960 – 1969
Born 1940 – 1949
Born 1930 – 1939
(C)
Self-Rated Health - High School Education
Self-Rated Health (1 - 5)
Chronological Age
Born 1940 – 1949
Born 1930 – 1939
Born 1950 – 1959
Born 1960 – 1969
(D)
Self-Rated Health - College Education
Self-Rated Health (1 - 5)
Chronological Age
Born 1940 – 1949
Born 1930 – 1939
Born 1960 – 1969
Born 1950 – 1959
(E)
Episodic Memory - High School Education
Episodic Memory (0 - 100)
Chronological Age
Born 1950 – 1959
Born 1940 – 1949
Born 1930 – 1939
Born 1960 – 1969
(F)
Episodic Memory - College Education
Episodic Memory (0 - 100)
Chronological Age
Born 1950 – 1959
Born 1940 – 1949
Born 1930 – 1939
Born 1960 – 1969

SOM for Measures Section

Classification of Included Nations

In the current study, we included Mexico, which is considered an upper-middle-income and developing nation and the United States, Australia, Germany, and South Korea, which are considered high-income nations. The distinction follows the United Nations (Millennium Development Indicators: World and Regional Groupings, 2003; UN, 2020) that uses the per capita gross national income (GNI) established by the World Bank to classify countries by their level of development. In particular, upper-middle-income countries are those with between $3,996 and $12,375 per capita GNI and high-income countries are those with incomes of more than $12,375 per capita GNI (UN, 2020). We note that although the countries included are classified as upper-middle-income and high-income nations, given that our goal is to compare the findings pertaining to the US of increasing deaths of despair and declining mental and physical health across nations, we deliberately chose countries from other parts of the world that are comparable in rankings to the US.

Selection of Measures

We strongly believe that measurement invariance across nations and cultures has always been and continues to be one of the major challenges for cross-cultural comparisons. We acknowledge that integrated data sources exist that allow cross-sectional comparisons of the same measure across many different nations (e.g., Gallup poll, World Values Survey, etc.). However, such an integrated data source is not available for longitudinal data, thereby precluding any direct comparison of repeated within-person assessments across nations within the same data set. We can thus only operate with a work around of conducting parallel analyses of independent data sets that contain at face value similar constructs. To reduce the number of unknowns, we have thus decided to (a) focus on domains that have been demonstrated — in the limited cross-national research that exists so far — to be pertinent for middle-aged adults (midlife peaks in

distress and well-being, Blanchflower & Oswald, 2020); onset of decline for cognition and physical health: Hughes et al., 2018; Chen & Sloan, 2015; Infurna et al., 2020) and (b) select measures that have long been recognized and broadly used in cross-national comparisons and for which measurement and cross-national equivalence has been suggested in other studies (e.g., Hu & Lee, 2011; Jain et al., 2016; Jebb et al., 2020; Miyamoto et al., 2018; Stephens et al., 2014).

Data Collection Time Periods

Each of the five panel surveys included data collected in similar time periods, from the early 2000s to 2018. Although the frequency of data collection varied, the fact that data were collected during the same time period further enables us to compare historical trends on mental and physical health across nations. This is especially the case for persons born in the 1940s, 1950s, and 1960s and across all five countries. Furthermore, the HRS and SOEP contain data from the 1990s onwards. This inclusion of additional data provides us with the opportunity to more completely explore historical trends for persons born in the 1930s (i.e., 1930 to 1939; see Figures 1 to 5). To further allow for the comparability of our findings across cohorts and nations, in our statistical models we center age for all models and all nations at age 55 — an age period that is contained in each of the cohorts shown in Figures S1 to S5 and falls in the middle of the age range that is typically considered midlife.

Figures S1-S5 graphically illustrates the number of observations provided for each birth year bin (i.e., 1930-1939, 1940-1949, 1950-1959, 1960-60) at age of assessment for each study. This further shows the degree of overlap in the assessments across the birth years and how the most amount of overlap is observed for the birth years in the 1940s, 1950s, and 1960s, with age 55 being encompassed in each birth year bin.

Taken together, data for the studies included have been collected in roughly similar windows of historical time and are directly comparable across a broad age range of midlife for people born across multiple decades at around the middle of the last century.

Measures

United States: HRS. Eight items from the Center for Epidemiologic Studies-Depression (CES-D) scale (Radloff, 1977) were used to assess *depressive symptoms*. Items asked participants whether they had (1) or had not (0) experienced the following symptoms "much of the time during the past week": feeling depressed, everything was an effort, restless sleep, was not happy, felt lonely, did not enjoy life, felt sad, and could not get going. The sum across items is taken as an indicator of the number of depressive symptoms an individual experienced frequently. The shorter scale with different response format (yes or no vs. several response categories ranging from *rarely or none of the time* to *most or all of the time*) used in the HRS has demonstrated highly similar construct and external validity as the standard CES-D (see Kohout, Berkman, Evans, & Cornoni-Huntley, 1993; Steffick, 2000). Wave-to-wave correlations ranged from .53 to .60. The intraclass correlation was 0.527 indicating that 53% of the total variance in depressive symptoms was between-person variance and 47% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Functional limitations were measured using a composite sum index of the number of everyday activities participants reported having any difficulty completing, including walking several blocks, climbing one flight of stairs, pushing or pulling large objects, lifting or carrying 10 lb (4.53 kg) of weight, and picking up a dime. Higher scores represent greater functional limitations or poorer physical functioning (Rodgers & Miller, 1997). Although abbreviated versions of standard activities of daily living (ADL) and instrumental activities of daily living (IADL) questionnaires were used, the HRS's measures of functional limitations are comparable with the standard scales (see Fonda & Herzog, 2004; Rodgers & Miller, 1997). Wave-to-wave correlations ranged from .68 to .75. The intraclass correlation was 0.676, indicating that 68% of the total variance in functional limitations was between-person variance and 32% was within-

person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Health conditions were assessed with a sum index of the number self-reported physician-diagnosed medical conditions, including high blood pressure, diabetes, cancer or malignant tumor, lung disease, heart condition, stroke, psychiatric problems, and arthritis. A sum score was created and higher scores indicate reporting more health conditions. Wave-to-wave correlations ranged from .89 to .92. The intraclass correlation was 0.784, indicating that 78% of the total variance in health conditions was between-person variance and 22% was within-person variance. The data thus appeared to contain both more between-person differences than within-person variation over time.

Self-rated health was assessed using a single-item asking participants to rate his or her health on a five-point scale ranging from 1 (excellent) to 5 (poor). The item was reverse scored so that higher scores indicate better self-reported health. Wave-to-wave correlations ranged from .66 to .71. The intraclass correlation was 0.664, indicating that 66% of the total variance in self-rated health was between-person variance and 34% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Episodic memory was measured using a unit-weight composite of performances on the immediate and delayed free-recall tests (see Ofstedal, Fisher, & Herzog, 2005). The immediate recall test was typically given during the first interview quarter and asked participants to recall as many nouns as possible from a list of 10 nouns selected from four lists. For the delayed recall test, interviewers asked participants after a period of about five minutes again to recall as many nouns as possible out of the original word list. We used the percentage of words correctly remembered from both tests, ranging from 0 to 20, with higher scores representing more words remembered or better memory. In the 1992 and 1994 assessments, the word lists included 20

words, instead of 10 words. Because the data were skewed and scores were much lower for these assessments, we did not include them in our analyses. Furthermore, our statistical models accounted for practice effects by including occasion-specific parameters (see Ghisletta et al., 2014). Wave-to-wave correlations ranged from .39 to .63. The intraclass correlation was 0.499, indicating that 50% of the total variance in episodic memory was between-person variance and 50% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Australia: HILDA. Participants' reported on their *life satisfaction* annually, answering the question "How satisfied are you with your life, all things considered?" using a 0 (*totally unsatisfied*) to 10 (*totally satisfied*) rating scale. This item has been used widely in psychological research (see Fujita & Diener, 2005; Lucas et al., 2003). Wave-to-wave correlations ranged from .54 to .65. The intraclass correlation was 0.548, indicating that 55% of the total variance in life satisfaction was between-person variance and 45% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Mental health was measured using the mental health subscale of the SF-36 (Gerstorf, Windsor, Hoppmann, & Butterworth, 2013; Ware et al., 1994). This measure consists of five items that asked whether participants "been a nervous person", "felt so down in the dumps nothing could cheer you up", "felt calm and peaceful", "Felt down", and "been a happy person" during the past 4 weeks. Items were answered on a scale from 1 (all of the time) to 6 (none of the time). Following standard scoring procedures (see Ware et al., 1994), mental health was standardized using the Australian normed population averages and standard deviations, with higher scores indicating better mental health. Wave-to-wave correlations ranged from .60 to .72. The intraclass correlation was 0.620, indicating that 62% of the total variance in mental health was between-person variance and 38% was within-person variance. The data thus appeared to

contain both substantial amounts of between-person differences and within-person variation over time.

Vitality is a subscale of the SF-36 that consists of four items that asked whether participants were "full of life", "have a lot of energy", "felt worn out", or "felt tired" during the past 4 weeks. Items were answered on a scale from 1 (all of the time) to 6 (none of the time). Following standard scoring procedures (see Ware et al., 1994), vitality was standardized using the Australian normed population averages and standard deviations, with higher scores indicating better vitality. Wave-to-wave correlations ranged from .63 to .74. The intraclass correlation was 0.647, indicating that 65% of the total variance in vitality was between-person variance and 35% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

General health is a subscale of the SF-36 that consists of 5 items, answered on a scale from 1 to 5. Specific items asked whether participants "got sick a little easier than other people," "were as healthy as anybody they knew," "expected their health to get worse," "overall health," and "health rated as compared to a year ago." Following standard scoring procedures (see Ware et al., 1994), general health was standardized using the Australian normed population averages and standard deviations, with higher scores indicating better general health. Wave-to-wave correlations ranged from .73 to .83. The intraclass correlation was 0.745, indicating that 75% of the total variance in general health was between-person variance and 25% was within-person variance. The data thus appeared to contain both more between-person differences than within-person variation over time.

Physical functioning is a subscale of the SF-36 that consists of 10 items asking participants whether, during the past 4 weeks, their health limited them across various activities, answered on a scale, "yes, limited a lot," "yes, limited a little," and "no, not limited at all." Specific items asked whether participants' health limited them in "vigorous activities" and

"moderate activities," and difficulty with the ability to "lift, carry groceries," "climb several flights of stairs," "climb one flight of stairs," "bend, kneel," "walk a mile," "walk several blocks," "walk one block," "bathe, dress." Following standard score procedures (see Ware et al., 1994), physical functioning was standardized using the Australian normed population averages and standard deviations, with higher scores indicating better physical functioning. Wave-to-wave correlations ranged from .61 to .80. The intraclass correlation was 0.665, indicating that 67% of the total variance in physical functioning was between-person variance and 33% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Germany: SOEP. We use data on life satisfaction that was provided annually from 1992 to 2018. Participants' reported on their *life satisfaction* annually, answering the question "How satisfied are you with your life, all things considered?" using a 0 (*totally unsatisfied*) to 10 (*totally satisfied*) rating scale. This item has been used widely in psychological research (see Fujita & Diener, 2005; Gerstorf, Hueluer, Wagner, Kunzmann, & Ram, 2018; Lucas et al., 2003). Wave-to-wave correlations ranged from .53 to .65. The intraclass correlation was 0.509, indicating that 51% of the total variance in life satisfaction was between-person variance and 49% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Self-rated health was assessed annually between 1992 to 2018. using a single-item asking participants to rate his or her health on a five-point scale ranging from 1 (excellent) to 5 (poor). The item was reverse scored so that higher scores indicate better self-reported health. Wave-to-wave correlations ranged from .61 to .68. The intraclass correlation was 0.556, indicating that 56% of the total variance in self-rated health was between-person variance and 44% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

The SF-12 was included beginning in 2002 and given to participants biennially through 2018. The *mental health* component of the SF-12 includes items pertaining to vitality, social functioning, role emotional, and mental health, with specific items including the extent to which participants in the last 4 weeks felt "run-down, melancholy", "well-balanced", "used energy", "accomplished less due to emotional problems", "less careful due to emotional problems", and "limited socially due to health last 4 weeks". Wave-to-wave correlations ranged from .49 to .56. The intraclass correlation was 0.487, indicating that 49% of the total variance in mental health was between-person variance and 51% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

The *physical health* component of the SF-12 includes items pertaining to physical functioning, role physical, bodily pain, and general health. Specific items included "current self-rated health", "health affecting ascending stairs", "state of health affects tiring tasks", "strong physical pain in last 4 weeks", "accomplished less due to physical problems", and "limited socially due to health last 4 weeks". Wave-to-wave correlations ranged from .68 to .72. The intraclass correlation was 0.611, indicating that 61% of the total variance in physical health was between-person variance and 39% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

South Korea: KLoSA. *Life satisfaction* was assessed at each biennial assessment using a single item that asked participants how satisfied they are with their overall quality with life using a scale from 0 (dissatisfied) to 100 (satisfied). Wave-to-wave correlations ranged from .47 to .57. The intraclass correlation was 0.456, indicating that 46% of the total variance in life satisfaction was between-person variance and 54% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Depressive symptoms were comprised of seven items and asked participants how often they reported the following symptoms in the past week using a scale from 1 (rarely or none of the time [less than one day]), 2 (some or a little of time [1~2 days]), 3 (occasionally or a moderate amount of time [3~4 days]), and 4 most of all of the time [5~7 days]). Specific items included "I felt depressed", "I felt that everything I did was an effort", "I was happy (reverse scored)", "my sleep was restless", "I enjoyed life (reverse scored)", "I felt lonely", and "I could not get "going". A sum score was created with higher values indicative of reporting more depressive symptoms. Wave-to-wave correlations ranged from .41 to .48. The intraclass correlation was 0.320 indicating that 32% of the total variance in depressive symptoms was between-person variance and 68% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Self-rated health was assessed using a single-item asking participants to rate his or her health on a five-point scale ranging from 1 (very good) to 5 (very bad). The item was reverse scored so that higher scores indicate better self-reported health. Wave-to-wave correlations ranged from .55 to .60. The intraclass correlation was 0.471, indicating that 47% of the total variance in self-rated health was between-person variance and 53% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Health conditions were assessed with a sum index of the number self-reported physician-diagnosed medical conditions, including high blood pressure, diabetes or high blood sugar or not, cancer or malignant tumor, chronic lung disease, liver disease, heart-related disease, cerebrovascular disease, emotional nervous or psychiatric problems, arthritis and prostatic disease. A sum score was created and higher scores indicates reporting more health conditions. Wave-to-wave correlations ranged from .91 to .96. The intraclass correlation was 0.822, indicating that 82% of the total variance in health conditions was between-person variance and

18% was within-person variance. The data thus appeared to contain both more between-person differences than within-person variation over time.

Functional limitations were assessed by combining an activities of daily living (ADL) and instrumental activities of daily living (IADL) scales. For each item, a 1 was assigned if participants needed to be helped partially or fully in order to complete each task, otherwise, given a 0. The ADL component consisted of seven items and inquired whether participants needed help with dressing, washing face and hair and brushing teeth, bathing and showering, eating prepared food, getting in/out of bed and walking across a room, using the toilet, and continence. The IADL component consisted of 10 items and inquired whether participants need help with grooming, household chores, preparing meals, doing laundry, going out to nearby places, using transportation, shopping at a shop, managing money, making and taking a call and taking medications. The two components were summed with higher scores indicating greater functional limitations. Wave-to-wave correlations ranged from .60 to .64. The intraclass correlation was 0.648, indicating that 65% of the total variance in functional limitations was between-person variance and 35% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

The Korea version of the Mini-Mental State Examination (MMSE) was used to assess overall *cognition* and cognitive tasks like thinking and learning. The MMSE index is the number of correctly answered questions with the high score being 30. Scores below 17 indicate the participant is suspected of dementia, scores in the range of 18-23 indicate the respondent has a decline in cognitive function, and a score of 24 or more suggests the respondent is considered normal. The measure consists of measures pertaining to cognitive ability regarding time (date-year-month-day), place (city), memory test (memorizing three words), attention and calculation, memory test, use of belongings, sentence pronunciation, and following direction. Furthermore, our statistical models accounted for practice effects by including occasion-specific parameters

(see Ghisletta et al., 2014). Wave-to-wave correlations ranged from .69 to .75. The intraclass correlation was 0.508, indicating that 51% of the total variance in cognition was between-person variance and 49% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Mexico: MHAS. *Depressive symptoms* were measured with a modified version of the CES-D that includes 9 items, asking participants whether they reported experiencing certain feelings the majority of the time during the week prior to the interview (coded as 1) or not (coded as 0). Specific items included "depressed", "everything was an effort", "restless sleep", "happiness (reverse scored)", "loneliness", "enjoy life (reverse scored)", "sadness", "felt tired", and "had a lot of energy (reverse scored)". A sum score was created with higher values indicative of reporting more depressive symptoms. Wave-to-wave correlations ranged from .42 to .51. The intraclass correlation was 0.614, indicating that 61% of the total variance in depressive symptoms was between-person variance and 39% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Self-rated health was assessed using a single-item asking participants to rate his or her health on a five-point scale ranging from 1 (excellent) to 5 (poor). The item was reverse scored so that higher scores indicate better self-reported health. Wave-to-wave correlations ranged from .38 to .43. The intraclass correlation was 0.419, indicating that 42% of the total variance in self-rated health was between-person variance and 58% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Functional limitations were assessed from 14 items that cover both ADL and IADL indices. The stem for each item asked participants "Because of a health problem, do you have difficulty with …". Participants responded to each item with a yes or no. The specific items

were: walking several blocks, running or jogging one kilometer, difficulty walking one block, sitting for about two hours, getting up from a chair after sitting for long periods, climbing several flights of stairs without resting, climbing one flight of stairs without resting, difficulty with stooping, kneeling, or crouching, reaching or extending your arms above shoulder level, pulling or pushing large objects like a living-room chair, lifting or carrying objects weighing over 5 kg, like a heavy bag of groceries, picking up a 1 peso coin from the table, difficulty with dressing, including putting on shoes and socks, and does anyone ever help you get dressed. A sum score was created with higher values indicative of greater functional limitations. Wave-to-wave correlations ranged from .48 to .61. The intraclass correlation was 0.459, indicating that 46% of the total variance in functional limitations was between-person variance and 54% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Health conditions were assessed with a sum index of the number self-reported physician or medical-personnel diagnosed medical conditions, including hypertension, diabetes, cancer or malignant tumor, lung disease, heart condition, stroke, and arthritis. A sum score was created and higher scores indicates reporting more health conditions. Wave-to-wave correlations ranged from .53 to .68. The intraclass correlation was 0.548, indicating that 55% of the total variance in health conditions was between-person variance and 45% was within-person variance. The data thus appeared to contain both substantial amounts of between-person differences and within-person variation over time.

Selection of Statistical Model of Analyses

We acknowledge that alternative modeling approaches would have been feasible with the data at hand. In the end, multiple reasons had led us to select the growth curve models over such alternatives (Grimm, Ram, & Estabrook, 2017). To begin with, our major objective has been to track how key indicators of physical and mental health develop as people move through their

midlife years (i.e., within-person change) and how this may differ across historical times (i.e., between-person differences). With this rationale in mind, we selected the use of growth curve models as an analytic approach that represents good practice and is well-established in the broader developmental and adult development literature. Doing so puts us in the position that results obtained from our analyses can directly be compared with a myriad of other empirical reports in a straightforward manner. Second, the type of model we opted for represents a parsimonious way to model levels at a given age and time-related trends and do so in ways that are immediately comparable across the five national data sets – an inclusion of non-linear (e.g., quadratic) trends in some of the studies but not others would have hampered direct comparability. Third, we acknowledge that certain modeling techniques such as latent basis models may at times selectively outperform the growth curve models used here. A major disadvantage of latent basis models is that they cannot accommodate time-unstructured data. Yet, the latter (growth curve models) have repeatedly been demonstrated to provide robust alternatives and offer the genuine advantage that incorporation of predictor variables (here, birth year as our variable of prime interest) is possible in straightforward ways that are directly comparable across models; something that is unfortunately not always a given for analytic alternatives such as a latent basis model. Methodologically, we did test different model/covariance structures such as auto-regressive versus unstructured and the approach of unstructured we utilize here provided the most parsimonious way to examine our research questions.

Full information maximum likelihood. As background information, the approach utilized has repeatedly been shown to indeed provide estimates of average within-person change in the overall sample whether or not an individual stayed in the sample over time (i.e., missing at random [MAR] assumption; see Gerstorf et al., 2007). In addition, we note that Full Information Maximum Likelihood estimation procedures (FIML, as implemented here) and alternative

approaches such as Multiple Imputation are both working on missing-at-random (MAR) assumptions – with the attrition-related variables informing the parameter estimation. We think the relevant question is about whether the MAR assumptions are justifiable – and whether all the attrition-relevant variables have been tested and/or included. To begin with, FIML approaches have indeed been found effective and robust even in the presence of moderate violations of MAR assumptions as long as attrition-informative variables are included in the estimation (cf. Lövdén, Ghisletta, & Lindenberger, 2004). This is so because in longitudinal studies, the data are correlated across measurement occasions. Thus, even in the presence of (relatively minor) selectivity effects in change, the initial level is to some degree predictive of the missing value after dropout --- that is, the level data carry information about observed, and unobserved, change. Accordingly, with likelihood analyses under MAR we can, at least to some extent, account for selectivity effects in change in addition to capturing the largest selectivity effects (i.e., level). Therefore, analyses under the MAR assumption offer a relatively robust approach to the present research questions (see also Rabbitt et al., 2004). The attrition-informative variables included in our models were age, gender, and education.

SOM for Results Section

In the following, we elaborate on results arising from our analyses that go beyond those describing similarities and differences in cohort effects within and across nations. We also discuss findings pertaining to gender differences within each nation.

Physical health. Age trends were observed in the US across each of the three physical health outcomes. On average, increasing age was associated with more health conditions across cohorts. Focusing on functional limitations and self-rated health, those born in the 1930s, on average, exhibited declining functional limitations and slight improvements in self-rated health, whereas those born in the 1950s and 1960s exhibited an opposite trend in that increasing age was associated with increasing functional limitations and declining self-rated health. Those born in

the 1940s, on average, showed relative stability across age for both functional limitations and self-rated health.

For middle-aged adults in Australia, only level differences were observed across cohorts with the within-person age trends being similar over time.

Focusing on Germany, the age trend for self-rated health mimicked that of the US in that those born in the 1930s, on average, reported slight increases in self-rated health over age and those in the 1940s exhibited relative stability. For cohorts of persons born in the 1950s and 1960s, age trends revealed declines over chronological age.

Focusing on South Korea, health conditions showed an age trend of general increases over chronological age across cohorts, whereas functional limitations showed declines over chronological age and no age trend was observed for self-rated health.

Focusing on Mexico, health conditions and functional limitations showed slight age trends of increases over chronological cage, whereas self-rated health showed declines, but later-born cohorts the change was not as strong.

Mental health. Focusing on the US, age trends were observed for both depressive symptoms and episodic memory. Later-born cohorts in the US, on average, exhibited higher levels of depressive symptoms, but relative stability across age. This contrasts with episodic memory in that each cohort showed declines over chronological age and the rate differed across the cohorts shown.

Focusing on Australia, of the three outcomes of mental health, only life satisfaction showed differences in age trends across cohorts. Later-born cohorts, on average, reported stability in life satisfaction across chronological age, whereas earlier-born cohorts reported increases over chronological age. The trajectories for mental health and vitality show each outcome being lowest in the 40s and early 50s, with gradual increases over chronological age.

Focusing on Germany, age trends were observed for both life satisfaction and mental health. Earlier-born cohorts in Germany reported steady increases in life satisfaction, with this leveling off for later born cohorts. General increases over age were observed across cohorts for mental health.

Focusing on South Korea, age trends were observed for both depressive symptoms and general cognitive status (MMSE). There were slight increases in depressive symptoms over chronological age. The rate of decline in general cognitive status differed across cohorts, with later-born cohorts exhibiting less steep declines across chronological age.

Focusing on Mexico, later-born cohorts exhibited declining trends of depressive symptoms over chronological age, as compared to earlier-born cohorts that showed relative stability.

Summary of age trend findings. Across the nations included, we observed a non-convergence of age trends. Such non-convergence across the various outcomes examined is a typical finding (for review, see Sliwinski, Hoffman, & Hofer, 2010) and reflects the fact that in long-term longitudinal studies that when, for example, 55-year olds in a given study age 5 years, they will not necessarily show the same patterns as those who started participating in the study as 60-year olds — the latter typically start off at higher levels of functioning (here, fewer functional limitations). This is the very reason why it is so important to separate the age and selection trend from the within-person change effects/trends that we are primarily interested in.

Gender. Across the nations, there were both main effects of gender and to some extent gender moderating cohort effects. On average, women in the US, Australia, and Mexico reported poorer mental health and physical health. Regarding cognition, women, on average in the US exhibited better memory, whereas in South Korea women exhibited poorer cognition. In Germany, the only main effect of gender was women reporting better mental health.

Focusing on gender moderating the impact of cohort, interestingly, there were differences between the US and Australia with South Korea. Later-born cohorts of women in the US, on

average, reported lower self-rated health and more depressive symptoms and in Australia, later-born cohorts of women reported poorer vitality. Conversely, in South Korea, later-born cohorts of women reported better self-rated health and fewer depressive symptoms and exhibited better cognition. In Germany and Mexico, there were no evidence to suggest for gender moderating cohort differences across each of the outcomes examined.

Findings pertaining to race in the US sample. In the second model for the US sample, we included race as a covariate, which was coded 1 = White and 0 = non-White (African American, Hispanic, or Other). We found that there was a main effect for race, such that individuals who were white, on average, were more likely to report fewer health conditions, fewer functional limitations and better self-rated health, and exhibit fewer depressive symptoms and better memory. There was only one race by cohort interaction that was statistically significant and it was for depressive symptoms; later-born cohorts of individuals who were white, on average, exhibited fewer depressive symptoms.

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Table S1

Descriptive Information and Measures of Mental and Physical Health for Each of the Datasets Used in the Current Study

	United States (HRS)	Australia (HILDA)	Germany (SOEP)	South Korea (KLoSA)	Mexico (MHAS)
Data Collection Years	1992 to 2018 (biennially)	2001 to 2018 (annually)	1992 to 2018 (annually) 2002 to 2018 (biennially)	2006 to 2016 (biennially)	2001, 2003, 2013, 2015, 2018
Sample Size	*N* = 28,219	*N* = 10,836	*N* = 27,822 *N* = 22,610	*N* = 6,402	*N* = 16,564
Age Range	40 – 65	40 – 65	40 – 65	45 – 65	40 – 65
Years of Education	*M* = 12.61 (*SD* = 3.21), range: 0 to 17	*M* = 13.32 (*SD* = 2.46), range: 11 to 20	*M* = 11.98 (*SD* = 2.74), range: 7 to 18 *M* = 12.24 (*SD* = 2.75), range: 7 to 18	*M* = 9.34 (*SD* = 4.36), range: 0 to 20	*M* = 5.99 (*SD* = 4.80), range: 0 to 22
Gender (% Women)	56%	52%	49%	55%	57%
Race/Ethnicity (% White)	68%				
Year of birth	*M* = 1948 (*SD* = 10.62), range: 1930 to 1969	*M* = 1955 (*SD* = 8.77), range: 1936 to 1969	*M* = 1953 (*SD* = 10.56), range: 1927 to 1969 *M* = 1956 (*SD* = 8.98), range: 1937 to 1969	*M* = 1951 (*SD* = 6.20), range: 1938 to 1961	*M* = 1953 (*SD* = 9.20), range: 1936 to 1969
Mental Health Measures	Depressive symptoms (CES-D), Episodic memory (Immediate and Delayed Recall)	Life satisfaction (single-item), Mental health (SF-36), Vitality (SF-36)	Life satisfaction (single-item), Mental health (SF-12)	Life satisfaction (single-item), Depressive symptoms (CES-D), General cognition (MMSE)	Depressive symptoms (CES-D)

Physical Health Measures	Self-rated health (single-item), Functional limitations (ADL, IADL), Number of health conditions	General health (SF-36), Physical functioning (SF-36)	Self-rated health (single-item), Physical health (SF-12)	Self-rated health (single-item), Functional limitations (ADL, IADL), Number of health conditions	Self-rated health (single-item), Functional limitations (ADL, IADL), Number of health conditions

Note. HRS = Health and Retirement Study. HILDA = Household, Income, and Labour Dynamics of Australia. SOEP = German Socioeconomic Panel Study. KLoSA = Korean Longitudinal Study of Aging. MHAS = Mexico Health and Aging Study. CES-D = Center for Epidemiologic Studies-Depression. MMSE = Mini-Mental State Examination. ADL = Activities of Daily Living. IADL = Instrumental Activities of Daily Living. For the SOEP, data collection for life satisfaction and self-rated health was annually from 1992 to 2018 and for mental and physical health biennially from 2002 to 2018. For the SOEP, the second set of descriptive information for demographics refers to the sample that provided data on mental and physical health biennially from 2002 to 2018.

Table S2

Growth models Examining Cohort differences Across Physical Health in United States, Australia, and Germany

	United States: HRS						**Australia: HILDA**				**Germany: SOEP**			
	Health conditions		Functional limitations		Self-rated health		Physical Functioning		General Health		Physical Health		Self- Rated health	
Parameters	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Fixed Effects														
Intercept	1.71*	0.02	1.18*	0.03	3.01*	0.03	75.54*	0.79	63.03*	0.80	46.38*	0.15	2.83*	0.02
Time	0.08*	0.003	0.03*	0.005	-0.05*	0.004	-0.93*	0.18	-0.61*	0.16	-0.67*	0.06	-0.03*	0.004
Time^2	0.0003*	0.00008	0.002	0.0001	-0.00009	0.0001	-0.01*	0.002	0.0009	0.002	-0.01	0.005	0.0008*	0.00006
Age	0.06*	0.004	-0.03	0.006	0.02*	0.005	-0.28	0.14	0.07	0.14	-0.39*	0.02	0.02*	0.003
Age × Time	0.0005	0.0005	0.002	0.0008	0.002^	0.0007	0.04	0.03	0.03	0.03	0.007	0.008	0.001	0.0006
Cohort														
Year of Birth	-0.007*	0.001	-0.05*	0.005	0.04*	0.004	0.71*	0.14	0.53*	0.15	-0.006	0.02	0.04*	0.003
Year of Birth^2	--	--	0.001*	0.0002	-0.002*	0.0001	-0.027*	0.007	-0.03*	0.007	--	--	-0.001*	0.00008
Year of Birth × Time	0.0004*	0.0001	0.003*	0.0007	0.001*	0.0006	0.06	0.03	0.04	0.03	-0.009	0.005	-0.0005	0.0005
Year of Birth^2 x Time	--	--	-0.0002*	0.00003	-0.00006	0.00002	-0.002	0.001	-0.002	0.001	--	--	0.00003	0.00002
Year of Birth × Age	-0.0002	0.0002	0.005*	0.0007	-0.003	0.0006	-0.02	0.02	-0.03	0.03	-0.0004	0.001	-0.003*	0.0003
Year of Birth^2 x Age	--	--	-0.00007	0.00002	0.00004*	0.00002	-0.0004	0.0005	-0.0008	0.0005	--	--	0.0001	0.000008
Year of Birth × Age × Time	0.00008*	0.00002	-0.0002	0.00009	0.00004	0.00008	-0.003	0.003	-0.001	0.003	-0.0004	0.001	0.00006	0.00005
Year of Birth^2 x Age x Time	--	--	-0.00005	0.000003	-0.00015	0.000003	0.00001	0.00007	-0.00008	0.00006	--	--	0.000008	0.000001
Random effects														
Var intercept	1.79*	0.02	1.42*	0.01	0.84*	0.009	337.68*	5.37	369.16*	5.57	65.69*	0.88	0.47*	0.005
Var. time	0.009*	0.0001	0.006*	0.0002	0.002*	0.00007	1.31*	0.04	1.22*	0.03	0.83*	0.03	0.002*	0.001
Cov. Intercept, time	0.06	0.001	0.02*	0.001	0.005*	0.0007	6.59*	0.39	3.21*	0.35	3.71*	0.15	0.003*	0.0004
Residual variance	0.19*	0.001	0.50*	0.002	0.39*	0.002	151.33*	0.81	102.11*	0.55	31.79*	0.20	0.35*	0.001

Note. ^ = p = .01, * p < .01. Intraclass correlation (ICC). ICC for HRS Outcomes: Health Conditions = 0.784; Functional Limitations = 0.676; Self-rated Health = 0.664. ICC for Australia Outcomes: Physical functioning = 0.665; General Health = 0.745. ICC for Germany Outcomes: Physical Health = 0.611; Self-rated health = 0.556.

Table S3

Growth models Examining Cohort Differences Across Physical Health in South Korea, and Mexico

	South Korea: KLoSA						Mexico: MHAS					
	Functional limitations		Self-rated health		Health conditions		Functional limitations		Health conditions		Self-rated health	
Parameters	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Fixed Effects												
Intercept	0.60*	0.07	3.25*	0.03	0.54*	0.04	3.02*	0.05	0.91*	0.01	2.28*	0.01
Time	0.11*	0.02	-0.04*	0.01	0.04*	0.009	0.14*	0.009	0.04*	0.002	-0.01*	0.002
Time^2	0.003*	0.0007	-0.001	0.0004	-0.0003	0.0003	0.005*	0.0007	0.001*	0.0002	-0.00008	0.0003
Age	-0.08*	0.01	-0.01	0.006	0.08*	0.01	0.03*	0.009	0.01*	0.002	-0.007^	0.003
Age × Time	-0.02*	0.05	0.004	0.002	0.005	0.002	-0.003	0.001	-0.00004	0.0004	-0.009^	0.0004
Cohort												
Year of Birth	-0.12*	0.03	0.03*	0.006	0.03	0.02	-0.05*	0.004	-0.01*	0.001	0.01*	0.001
Year of Birth^2	0.007*	0.003	--	--	-0.004^	0.002	--	--	--	--	--	--
Year of Birth × Time	-0.03*	0.007	0.004	0.002	0.004	0.003	-0.004	0.008	-0.0003	0.0002	-0.00002	0.0002
Year of Birth^2 x Time	0.001	0.0007	--	--	-0.0006	0.0003	--	--	--	--	--	--
Year of Birth × Age	0.009^	0.004	0.0008	0.0004	-0.007*	0.002	-0.001^	0.0007	-0.0006	0.0002	0.0005*	0.0002
Year of Birth^2 x Age	-0.00002	0.002	--	--	-0.00004	0.0001	--	--	--	--	--	--
Year of Birth × Age × Time	0.002	0.001	0.00003	0.0001	-0.0009	0.0004	0.0002	0.0001	0.00003	0.00003	0.00005	0.00003
Year of Birth^2 x Age x Time	0.000006	0.00004	--	--	0.00003	0.00002	--	--	--	--	--	--
Random effects												
Var intercept	1.69*	0.04	0.29*	0.008	0.83*	0.02	5.29*	0.09	0.49*	0.007	0.29*	0.006
Var. time	0.01*	0.0008	0.003*	0.0002	0.006*	0.0001	0.19*	0.009	0.01*	0.0007	0.002*	0.0006
Cov. Intercept, time	0.06*	0.004	-0.004*	0.0009	0.02*	0.001	0.02*	0.002	0.002*	0.0008	0.003*	0.00009
Residual variance	0.72*	0.009	0.35*	0.004	0.05*	0.0007	4.62*	0.05	0.31*	0.003	0.39*	0.004

Note. ^ = p = .01, * p < .01. Intraclass correlation (ICC). ICC for South Korea Outcomes: Functional limitations = 0.648; Self-rated health = 0.471; Health conditions = 0.822. ICC for Mexico Outcomes: Functional limitations = 0.459; Health conditions = 0.548; Self-rated health = 0.419.

Table S4

Growth models Examining Cohort differences Across Mental Health in United States, Australia, and Germany

	United States: HRS				**Australia: HILDA**						**Germany: SOEP**			
	Depressive Symptoms		Episodic Memory		Vitality		Life Satisfaction		Mental Health		Life Satisfaction		Mental Health	
Parameters	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Fixed Effects														
Intercept	1.40*	0.031	52.85*	0.58	53.83*	0.71	7.87*	0.03	73.19*	0.61	6.31*	0.04	50.04*	0.26
Time	0.03*	0.004	-1.00*	0.09	-0.14	0.17	0.001	0.006	-0.02	0.15	0.02*	0.007	-0.07	0.10
Time^2	-0.002*	0.0002	-0.007	0.003	-0.004	0.002	0.001*	0.0002	-0.002	0.002	0.002*	0.0001	-0.02*	0.006
Age	0.03*	0.006	-0.97*	0.09	0.32*	0.13	0.03*	0.005	0.47*	0.11	0.10*	0.006	0.36*	0.05
Age × Time	-0.0008	0.0007	-0.04*	0.02	0.002	0.03	0.002	0.001	0.02	0.03	-0.005*	0.001	0.03	0.02
Cohort														
Year of Birth	0.02*	0.0002	-0.09*	0.07	0.33*	0.13	-0.01*	0.003	0.25^	0.11	0.07*	0.005	0.18*	0.05
Year of Birth^2	--	--	--		-0.02*	0.007	--	--	-0.02*	0.006	-0.001*	0.0001	-0.005	0.002
Year of Birth × Time	-0.003*	0.0003	0.02*	0.003	0.03	0.03	0.001	0.0007	0.03	0.03	-0.008*	0.0009	0.007	0.02
Year of Birth^2 x Time	--	--	--	--	-0.003	0.002	--	--	-0.002	0.001	0.0003*	0.00003	0.002	0.001
Year of Birth × Age	-0.0008^	0.0008	-0.02*	0.002	-0.02	0.01	-0.001*	0.0003	-0.02	0.01	-0.004*	0.0006	0.003	0.005
Year of Birth^2 x Age	--	--	--	--	-0.0005	0.0005	--	--	-0.0007	0.0004	0.00002	0.00001	-0.0006	0.0001
Year of Birth × Age × Time	-0.0003*	0.00004	-0.001*	0.0004	-0.00009	0.003	0.00006	0.00003	-0.0003	0.003	0.0008*	0.00009	0.007*	0.002
Year of Birth^2 x Age x Time	--	--	--	--	-0.0001	0.00006	--	--	-0.00005	0.00005	-0.0007*	0.00002	-0.0002*	0.00005
Random effects														
Var intercept	2.39*	0.03	137.28*	1.70	275.58*	4.32	1.34*	0.02	198.08*	3.16	1.73*	0.02	59.61*	1.04
Var. time	0.004*	0.0002	0.17*	0.02	2.92*	0.29	0.007*	0.0002	0.73*	0.03	0.008*	0.0002	5.13*	0.47
Cov. Intercept, time	0.06*	0.002	0.86*	0.15	0.93*	0.03	0.005*	0.002	1.88*	0.22	0.009*	0.002	0.14^	0.06
Residual variance	1.89*	0.009	138.34*	0.78	132.60*	0.70	1.01*	0.005	108.39*	0.58	1.42*	0.005	45.92*	0.31

Note. ^ = p = .01, * p < .01. Intraclass correlation (ICC). ICC for US Outcomes: Depressive symptoms = 0.527; Episodic memory = 0.499. ICC for Australia Outcomes: Vitality = 0.647; Life satisfaction = 0.548; Mental health = 0.620. ICC for Germany Outcomes: Life satisfaction = 0.509; Mental health = 0.487.

Table S5

Growth models Examining Cohort Differences Across Mental Health in South Korea, and Mexico

	South Korea: KLoSA						Mexico: MHAS	
	Life satisfaction		Depressive symptoms		MMSE		Depressive symptoms	
Parameters	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Fixed Effects								
Intercept	61.18*	0.64	11.53*	0.14	27.41*	0.12	3.42*	0.04
Time	-0.55	0.26	0.18*	0.06	-0.23*	0.05	0.009	0.007
Time^2	0.05*	0.01	-0.007*	0.002	-0.01*	0.005	-0.0006	0.0009
Age	0.34	0.15	0.12*	0.04	-0.14^	0.06	-0.004	0.008
Age × Time	0.13	0.06	-0.01	0.007	0.006	0.012	0.0007	0.001
Cohort								
Year of Birth	0.59*	0.13	-0.02	0.05	0.012	0.05	-0.02*	0.003
Year of Birth^2	--	--	0.01*	.005	--	--	--	--
Year of Birth × Time	0.11	0.05	-0.01	0.02	0.006	0.01	-0.0005	0.0007
Year of Birth^2 x Time	--	--	0.0006	0.001	--	--	--	--
Year of Birth × Age	0.14	0.009	0.01	0.007	0.007*	0.002	-0.003	0.0005
Year of Birth^2 x Age	--	--	-0.0007	0.0003	--	--	--	--
Year of Birth × Age × Time	0.003	0.002	0.0009	0.003	-0.0007	0.0005	-0.0002*	0.0001
Year of Birth^2 x Age x Time	--	--	0.00006	0.00009	--	--	--	--
Random effects								
Var intercept	137.73*	3.71	3.87*	0.12	5.46*	0.14	3.05*	0.06
Var. time	1.29*	0.10	0.06*	0.004	0.04*	0.003	0.03*	0.005
Cov. Intercept, time	-3.37*	0.44	0.11*	0.02	0.06*	0.01	0.006*	0.0009
Residual variance	159.60*	1.92	6.63*	0.08	4.49*	0.06	3.81*	0.04

Note. ^ = p = .01, * p < .01. Intraclass correlation (ICC). ICC for South Korea Outcomes: Life satisfaction = 0.456; Depressive symptoms = 0.320; MMSE = 0.508. ICC for Mexico Outcome: Depressive symptoms = 0.614.

Table S6

Growth Models Examining Cohort and Education Differences Across Physical Health in United States, Australia, and Germany

	United States: HRS						**Australia: HILDA**				**Germany: SOEP**			
	Health conditions		Functional limitations		Self-rated health		Physical Functioning		General Health		Physical Health		Self-Rated Health	
Parameters	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Fixed Effects														
Intercept	1.76*	0.02	1.15*	0.03	3.01*	0.03	74.30*	0.83	62.34*	0.84	46.07*	0.15	2.92*	0.02
Time	0.08*	0.003	0.03*	0.004	-0.05*	0.004	-0.82*	0.21	-0.64*	0.18	-0.67*	0.06	-0.03*	0.004
Time^2	0.0003*	0.00008	0.002*	0.0001	-0.00005	0.0001	-0.01*	0.002	0.0009	0.002	-0.009	0.005	0.0008*	0.00006
Age	0.05*	0.004	-0.02*	0.006	0.007	0.005	-0.35^	0.15	-0.01	0.15	-0.33*	0.03	0.01*	0.004
Age × Time	-0.00004	0.0005	0.002*	0.0008	0.003*	0.0007	0.02	0.04	0.04	0.04	0.01	0.008	0.002*	0.0007
Cohort														
Year of Birth	-0.008*	0.001	-0.03*	0.005	0.02*	0.004	0.61*	0.16	0.42*	0.16	-0.0006	0.02	0.03*	0.003
Year of Birth^2	--	--	0.0008*	0.0001	-0.0008*	0.0001	-0.03*	0.008	-0.03*	0.008	--	--	-0.0009*	0.0001
Year of Birth × Time	0.0003	0.0002	0.004*	0.0007	0.002*	0.0006	0.03	0.04	0.04	0.03	-0.008	0.005	0.0004	0.0005
Year of Birth^2 x Time	--	--	-0.0002*	0.00003	-.00001	0.00002	-0.0008	0.002	-0.004*	0.002	--	--	-0.0004	0.0002
Year of Birth × Age	0.00005	0.0002	0.004*	0.0007	-0.001^	0.0006	-0.02	0.02	-0.03	0.01	-0.003	0.001	-0.002*	0.0003
Year of Birth^2 x Age	--	--	-0.00004	0.00002	-0.00005	0.00002	-0.0005	0.0005	-0.001	0.0006	--	--	-0.00004	0.00008
Year of Birth × Age × Time	0.00007*	0.00003	-0.0003*	0.00009	0.00003	0.00007	-0.0006	0.003	-0.004	0.003	-0.001*	0.0003	0.000008	0.00005
Year of Birth^2 x Age x Time	--	--	-0.00004	0.000003	-0.00002	0.00002	-0.00002	0.00008	-0.00008	0.00007	--	--	0.000004	0.000001
Correlates														
Education	-0.09*	0.007	-0.11*	0.01	0.12*	0.008	2.04*	0.34	1.29*	0.35	0.73*	0.05	0.05*	0.009
Education x Time	-0.003*	0.0008	0.002	0.001	0.0009	0.001	-0.05	0.07	0.004	0.07	0.03	0.02	0.002	0.001
Education x Year of Birth	0.002*	0.0004	0.0008	0.002	0.002	0.001	-0.09	0.06	-0.05	0.06	0.002	0.006	0.0004	0.001
Education x Year of Birth^2	--	--	0.00003	0.00005	-0.0001*	0.00004	0.005	0.003	0.005	0.003	--	--	0.00002	0.00004
Education x Age	0.004	0.001	0.003	0.002	-0.002	0.001	-0.05	0.06	-0.02	0.06	-0.02	0.009	-0.001	0.0013
Education x Age x Year of Birth	-0.0001	0.0002	0.000007	0.0002	-0.0001	0.0002	0.009	0.007	0.008	0.006	0.001	0.002	0.0001	0.0001
Education x Age x Year of Birth^2	--	--	0.000005	0.000006	-0.00007	0.00005	-0.0001	0.0002	-0.00001	0.0002	--	--	-0.00006	0.00003
Education x Year of Birth x Time	0.000004	0.00005	-0.0007*	0.0002	-0.00009	0.0002	0.02	0.01	-0.004	0.01	-0.002	0.002	-0.00004	0.00002
Education x Year of Birth^2 x Time	--	--	--	--	0.000001	0.000006	-0.0009	0.0007	0.0007	0.0006	--	--	0.00002^	0.00006
Education x Age x Time	0.0001	0.0002	-0.0004	0.0003	-0.0003	0.0002	0.02	0.01	-0.005	0.01	-0.008^	0.003	-0.0005	0.0002
Education x Age x Time x Year of Birth	0.000008	0.000007	0.00006	0.00003	0.00001	0.00001	-0.001	0.001	0.001	0.001	0.00006	0.0001	0.00003	0.00001
Woman	0.21*	0.02	0.43*	0.02	0.03	0.02	-2.14*	0.56	2.40*	0.58	0.27	0.17	0.05^	0.02
Woman x Time	-0.003	0.001	-0.0008	0.002	0.009*	0.001	-0.07	0.03	0.03	0.03	-0.05	0.03	-0.003*	0.001
Woman x Year of Birth	-0.0002	0.004	-0.008^	0.003	0.004	0.003	-0.02	0.09	-0.17	0.09	0.005	0.01	-0.004	0.002
Woman x Year of Birth^2	0.000009	0.0002	0.0002	0.0001	-0.0004*	0.0001	-0.0001	0.005	0.005	0.005	--	--	0.0001	0.00008
White	-0.26*	0.03	-0.35*	0.03	0.33*	0.02	--	--	--	--	--	--	--	--
White x Time	-0.008*	0.002	-0.01*	0.002	-0.01*	0.002	--	--	--	--	--	--	--	--
White x Year of Birth	-0.005	0.004	-0.006	0.004	0.003	0.003	--	--	--	--	--	--	--	--
White x Year of Birth^2	0.0004^	0.0002	0.0004	0.0002	-0.0003*	0.0001	--	--	--	--	--	--	--	--
Random Effects														
Var intercept	1.73*	0.02	1.23*	0.01	0.71*	0.008	321.75*	5.14	361.30*	5.47	65.69*	0.88	0.45*	0.005
Var. time	0.009*	0.0001	0.005*	0.0001	0.002*	0.00008	1.30*	0.04	1.21*	0.04	0.83*	0.03	0.002*	0.00005
Cov. Intercept, time	0.06*	0.001	0.04*	0.001	0.007*	0.0006	6.17*	0.37	3.10	0.34	3.71*	0.15	0.003*	0.0004
Residual variance	0.19*	0.001	0.52*	0.003	0.39*	0.002	151.33*	0.81	102.10	0.55	31.79*	0.20	0.35*	0.001

Note. ^ = p = .01, * p < .01.

Table S7

Growth Models Examining Cohort and Education Differences Across Physical Health in South Korea, and Mexico

	South Korea: KLoSA						Mexico: MHAS					
	Functional limitations		Self-rated health		Health conditions		Functional limitations		Health conditions		Self-rated health	
Parameters	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Fixed Effects												
Intercept	0.46*	0.07	3.39*	0.03	0.55*	.04	2.22*	0.08	0.79*	0.02	2.63*	0.02
Time	0.08*	0.02	-0.05*	0.01	0.06*	0.008	0.10*	0.01	0.03*	0.004	-0.007^	0.003
Time^2	0.003*	0.0006	-0.001	0.0005	-0.0003	0.0001	0.002*	0.0010	0.0006*	0.0002	0.0008	0.0002
Age	-0.05*	0.02	-0.01	0.007	0.06*	0.0009	0.05*	0.02	0.01*	0.002	-0.02	0.003
Age × Time	-0.01*	0.005	0.005	0.002	0.0006	0.002	0.002	0.003	0.00007	0.0006	-0.001*	0.0006
Cohort												
Year of Birth	-0.06*	0.01	0.02*	0.006	-0.0008	0.008	-0.03*	0.008	-0.01*	0.002	0.004	0.001
Year of Birth^2	--	--	--	--	--	--	--	--	--	--	--	--
Year of Birth × Time	-0.01*	0.004	0.006	0.002	-0.002	0.001	0.0007	0.001	0.0002	0.0005	-0.0004	0.0003
Year of Birth^2 x Time	--	--	--	--	--	--	--	--	--	--	--	--
Year of Birth × Age	0.0008	0.001	0.001*	0.0005	-0.002*	0.0006	-0.0002	0.0001	0.0002	0.0003	0.0005	0.0003
Year of Birth^2 x Age	--	--	--	--	--	--	--	--	--	--	--	--
Year of Birth × Age × Time	0.0003	0.0002	-0.00002	0.0001	0.000005	0.0001	-0.0002	0.0002	0.0001	0.00006	0.00005	0.00003
Year of Birth^2 x Age x Time	--	--	--	--	--	--	--	--	--	--	--	--
Correlates												
Education	-0.03	0.01	0.06*	0.007	-0.01	0.009	-0.13*	0.01	-0.02*	0.002	0.05*	0.002
Education x Time	-0.006	0.004	-0.005	0.003	0.003	0.002	-0.006*	0.002	-0.0003	0.0004	0.00005	0.0004
Education x Year of Birth	0.004	0.003	-0.002	0.001	-0.004	0.002	0.002	0.001	0.0005	0.0003	-0.0003	0.0003
Education x Year of Birth^2	--	--	--	--	--	--	--	--	--	--	--	--
Education x Age	0.003	0.003	-0.004	0.002	-0.005	0.002	0.003	0.002	0.001	0.0006	-0.001^	0.0005
Education x Age x Year of Birth	0.004	0.003	0.00009	0.0001	0.00004	0.001	-0.0001	0.0002	0.00001	0.00004	0.00005	0.00003
Education x Age x Year of Birth^2	--	--	--	--	--	--	--	--	--	--	--	--
Education x Year of Birth x Time	0.001	0.0008	0.0007	0.0006	-0.0008	0.0004	0.0003	0.0002	0.00003	0.00007	-0.00002	0.00007
Education x Year of Birth^2 x Time	--	--	--	--	--	--	--	--	--	--	--	--
Education x Age x Time	0.002	0.001	0.0007	0.0007	-0.0009	0.0005	0.0005	0.0004	-0.00006	0.0001	-0.00001	0.0001
Education x Age x Time x Year of Birth	0.00002	0.00005	-0.00005	0.00003	0.00006	0.00002	-0.00005	0.00003	0.00002	0.000008	--	--
Woman	-0.32*	0.04	-0.11*	0.02	0.06	0.02	1.25*	0.06	0.31*	0.02	-0.14*	0.02
Woman x Time	-0.005	0.005	0.01*	0.003	0.0003	0.002	0.001	0.009	-0.002	0.002	0.007*	0.002
Woman x Year of Birth	0.002	0.006	0.008*	0.003	-0.01	0.003	0.004	0.008	-0.003	0.002	-0.0007	0.002
Woman x Year of Birth^2	--	--	--	--	--	--	-0.00001	0.0007	-0.0003	0.0002	0.00009	0.0002
Random effects												
Var intercept	1.67*	0.04	0.25*	0007	0.76*	0.01	4.65*	0.09	0.48*	0.008	0.22*	0.006
Var. time	0.01*	0.0008	0.003*	0.0002	0.006*	0.0001	0.19*	0.001	0.01*	0.0001	0.002*	0.0001
Cov. Intercept, time	0.06*	0.004	-0.002*	0.0009	0.03*	0.001	0.02*	0.009	0.002*	0.0008	0.0003*	0.0006
Residual variance	0.72*	0.009	0.35*	0.004	0.06*	0.0008	4.64*	0.06	0.31*	0.004	0.39*	0.005

Note. ^ = p = .01, * p < .01.

Table S8

Growth Models Examining Cohort and Education Differences Across Mental Health in United States, Australia, and Germany

	United States: HRS				**Australia: HILDA**						**Germany: SOEP**			
	Depressive Symptoms		Episodic Memory		Vitality		Life Satisfaction		Mental Health		Life Satisfaction		Mental health	
Parameters	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Fixed Effects														
Intercept	1.39*	0.05	51.79*	0.43	58.23*	0.46	7.89*	0.03	72.82*	0.62	6.37*	0.04	49.66*	0.16
Time	0.05*	0.007	-0.83*	0.06	-0.14	0.19	-0.008	0.006	-0.04	0.15	0.03*	0.007	-0.30*	0.07
Time^2	-0.002*	0.0002	0.007^	0.003	-0.004	0.002	0.001*	0.0002	-0.002	0.002	0.002*	0.0001	-0.02*	0.006
Age	0.04*	0.009	-0.57*	0.05	0.23	0.13	0.02*	0.005	0.38*	0.11	0.098	0.007	0.40*	0.02
Age × Time	-0.006*	0.001	0.06*	0.01	0.0004	0.04	0.003	0.001	0.02	0.03	-0.006*	0.001	0.07*	0.01
Cohort														
Year of Birth	0.04*	0.007	-0.07*	0.02	0.25	0.14	-0.01*	0.003	0.17	0.11	0.06*	0.005	0.19*	0.02
Year of Birth^2	-0.0009*	0.0002	--	--	-0.023*	0.007	--	--	-0.02*	0.006	-0.001*	0.0002	--	--
Year of Birth × Time	-0.006*	0.001	0.03*	0.003	0.03	0.04	0.001	0.0007	0.03	0.03	-0.008*	0.0009	0.05*	0.007
Year of Birth^2 x Time	0.0001*	0.00004	--	--	-0.003	0.001	--	--	-0.001	0.001	0.0004*	0.00003	--	--
Year of Birth × Age	-0.004	0.001	0.007*	0.003	-0.03	0.01	-0.001*	0.0003	-0.02	0.01	-0.004*	0.0006	-0.003	0.002
Year of Birth^2 x Age	0.0001*	0.00003	--	--	-0.0004	0.0005	--	--	-0.0008	0.0004	0.00003	0.00001	--	--
Year of Birth × Age × Time	-0.0003^	0.0001	-0.002*	0.0004	-0.0007	0.003	0.00004	0.00004	-0.0005	0.003	0.0008	0.0009	0.0006	0.0004
Year of Birth^2 x Age x Time	0.00001*	0.000004	--	--	-0.0001	0.00007	--	--	-0.00005	0.00005	-0.0007*	0.0002	--	--
Correlates														
Education	-0.13*	0.01	2.07*	0.08	1.06*	0.31	-0.01	0.01	0.71*	0.15	-0.0006	0.02	0.23*	0.05
Education x Time	-0.02	0.002	0.02	0.01	0.01	0.06	0.006*	0.002	0.02	0.03	0.01*	0.002	0.008	0.02
Education x Year of Birth	-0.007*	0.002	-0.03*	0.004	-0.04	0.06	0.002	0.001	-0.009	0.02	0.01*	0.002	-0.0005	0.006
Education x Year of Birth^2	0.0004*	0.00008	--	--	0.002	0.003	--	--	--	--	-0.0003*	0.00007	--	--
Education x Age	-0.005	0.003	-0.03	0.02	0.02	0.06	0.005*	0.002	0.03	0.02	0.01*	0.002	0.01	0.009
Education x Age x Year of Birth	0.001*	0.0003	0.0007	0.0007	0.006	0.006	-0.0001	0.0001	-0.001	0.001	-0.0004	0.0002	-0.0005	0.0005
Education x Age x Year of Birth^2	-0.0002	0.000009	--	--	-0.0002	0.0002	--	--	--	--	-0.00006	0.000005	--	--
Education x Year of Birth x Time	-0.0002	0.0003	-0.001	0.0008	0.002	0.01	-0.0005	0.0002	0.0005	0.003	-0.0008^	0.0003	0.0003	0.002
Education x Year of Birth^2 x Time	0.00002	0.00001	--	--	0.0002	0.0006	--	--	--	--	0.00001	0.00001	--	--
Education x Age x Time	-0.0002	0.0004	-0.002	0.003	0.0007	0.01	-0.0008	0.0004	-0.002	0.004	-0.001*	0.0004	0.002	0.004
Education x Age x Time x Year of Birth	0.0001*	0.00004	-0.00002	0.0001	0.0004	0.001	0.000007	0.00001	0.0002	0.0002	0.00004	0.00002	-0.00005	0.0001
Woman	0.33*	0.03	6.76*	0.26	-1.74*	0.51	0.11*	0.04	-1.27*	0.44	-0.04	0.04	1.43*	0.19
Woman x Time	0.002	0.003	0.06^	0.03	0.01	0.03	-0.003	0.003	-0.01	0.03	-0.003	0.002	-0.007	0.03
Woman x Year of Birth	-0.01	0.004	-0.11^	0.04	-0.21*	0.08	0.0006	0.003	-0.11	0.07	-0.008	0.004	-0.008	0.01
Woman x Year of Birth^2	0.006*	0.002	-0.001	0.002	0.005	0.004	--	--	0.004	0.004	0.0003	0.0002	--	--
White	-0.31*	0.04	5.98*	0.32	--	--	--	--	--	--	--	--	--	--
White x Time	0.003	0.005	0.04	0.03	--	--	--	--	--	--	--	--	--	--
White x Year of Birth	-0.015*	0.006	0.04	0.05	--	--	--	--	--	--	--	--	--	--
White x Year of Birth^2	0.0007	0.0002	-0.002	0.002	--	--	--	--	--	--	--	--	--	--
Random Effects														
Var intercept	2.14*	0.02	94.93*	1.32	269.60*	4.23	1.34*	0.02	194.72*	3.11	1.67*	0.02	58.57*	1.08
Var. time	0.004*	0.0002	0.17*	0.02	0.92*	0.03	0.007*	0.002	0.73*	0.03	0.008*	0.0002	4.20*	0.30
Cov. Intercept, time	0.06*	0.002	0.83*	0.13	2.81*	0.28	0.004^	0.002	1.81*	0.22	0.008*	0.001	5.08*	0.48
Residual variance	1.89*	0.01	138.51*	0.79	132.63*	0.70	1.01*	0.005	108.40*	0.58	1.41*	0.005	45.73*	0.32

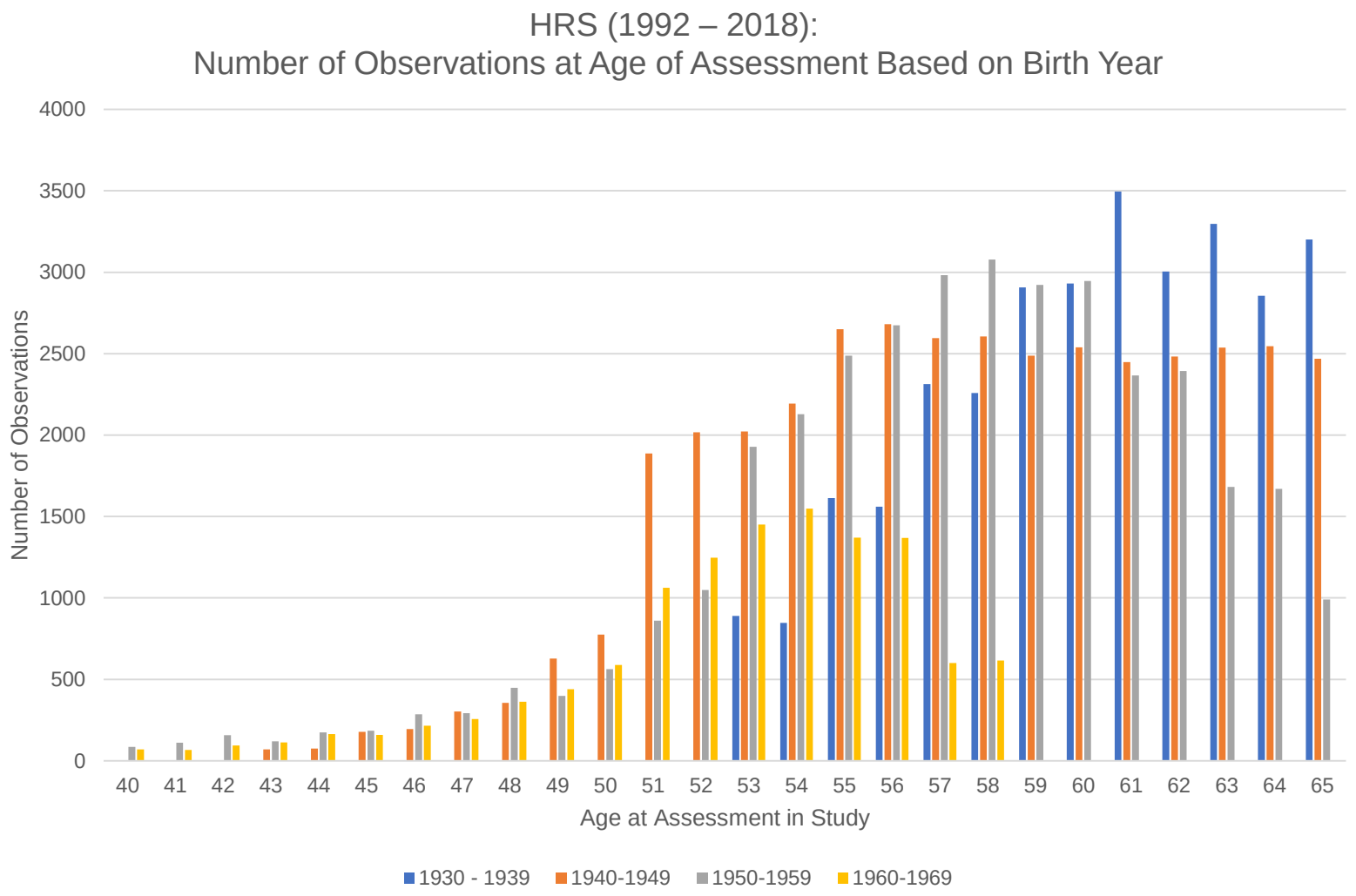
Note. ^ = p = .01, * p < .01.

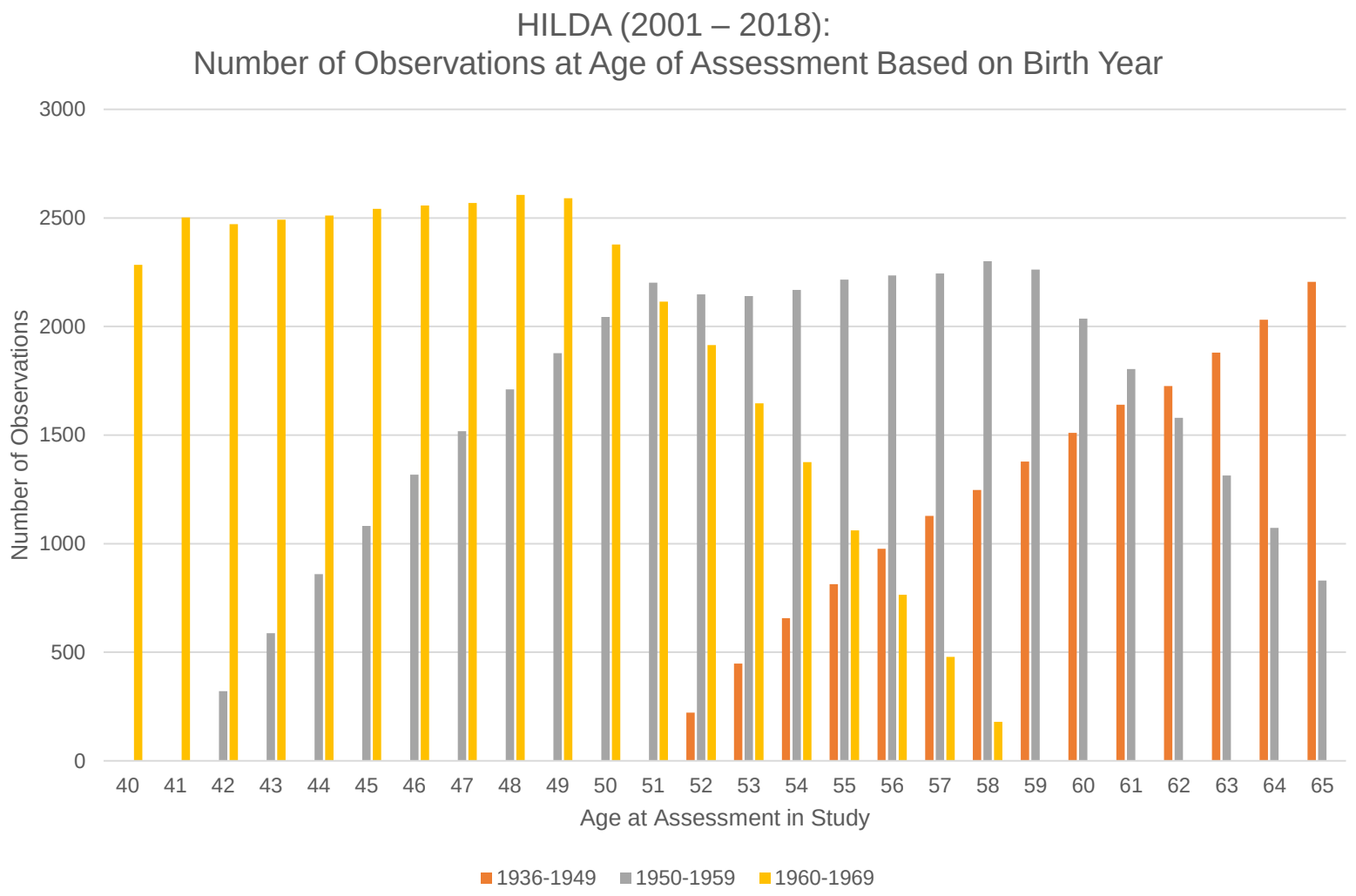
Table S9

Growth Models Examining Cohort and Education Differences Across Mental Health in South Korea, and Mexico

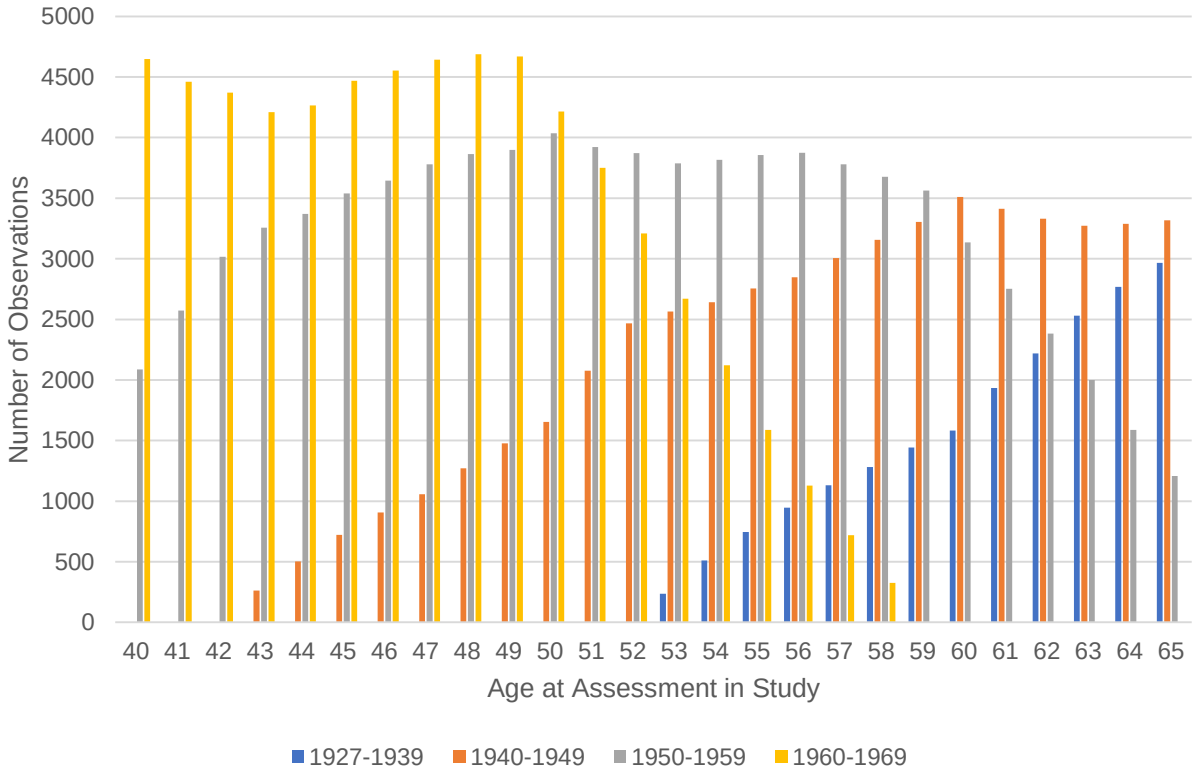
	South Korea: KLoSA						Mexico: MHAS	
	Life satisfaction		Depressive symptoms		MMSE		Depressive symptoms	
Parameters	Est.	*SE*	Est.	*SE*	Est.	*SE*	Est.	*SE*
Fixed Effects								
Intercept	64.46*	0.68	11.03*	0.13	27.97*	0.12	2.57*	0.06
Time	-0.93*	0.28	0.23*	0.06	-0.21*	0.06	-0.01	0.01
Time^2	0.05*	0.009	-0.006*	0.002	-0.02*	0.005	-0.003*	0.0007
Age	0.21	0.15	0.18*	0.02	-0.14^	0.06	0.02	0.01
Age × Time	0.18*	0.06	-0.02	0.01	-0.003	0.013	0.003	0.003
Cohort								
Year of Birth	0.20	0.14	0.13*	0.03	-0.06	0.04	-0.002	0.006
Year of Birth^2	--	--	--	--	--	--	--	--
Year of Birth × Time	0.17*	0.05	-0.01	0.01	0.002	0.01	0.0001	0.001
Year of Birth^2 x Time	--	--	--	--	--	--	--	--
Year of Birth × Age	0.02	0.01	-0.006*	0.002	0.0005^	0.002	-0.001	0.001
Year of Birth^2 x Age	--	--	--	--	--	--	--	--
Year of Birth × Age × Time	0.001	0.002	0.0004	0.0005	0.0001	0.0005	-0.0002	0.0002
Year of Birth^2 x Age x Time	--	--	--	--	--	--		
Correlates								
Education	1.46*	0.15	-0.15*	0.03	0.25*	0.028	-0.13*	0.008
Education x Time	-0.15^	0.06	0.03	0.01	0.02	0.01	-0.002	0.001
Education x Year of Birth	-0.09*	0.03	0.01	0.001	-0.01	0.005	0.002*	0.0009
Education x Year of Birth^2	--	--	--	--	--	--	--	--
Education x Age	-0.12*	0.03	0.02	0.007	-0.007	0.006	0.003	0.002
Education x Age x Year of Birth	0.002	0.002	-0.0002	0.0004	-0.0004	0.004	-0.00007	0.0001
Education x Age x Year of Birth^2	--	--	--	--	--	--	--	--
Education x Year of Birth x Time	0.02	0.01	-0.003	0.002	-0.003	0.002	0.00009	0.0002
Education x Year of Birth^2 x Time	--	--	--	--	--	--	--	--
Education x Age x Time	0.03	0.01	-0.004	0.003	-0.005	0.003	0.0002	0.00002
Education x Age x Time x Year of Birth	-0.0007	0.0006	0.0002	0.0001	0.0003*	0.0001	0.00001	0.00003
Woman	1.05*	0.38	0.16	0.07	-0.18*	0.07	0.95*	0.05
Woman x Time	-0.03	0.07	-0.01	0.01	0.005	0.01	-0.005	0.007
Woman x Year of Birth	0.14	0.06	-0.03*	0.01	0.04*	0.01	0.005	0.006
White x Year of Birth^2	--	--	--	--	--	--	--	--
Random effects								
Var intercept	121.42*	3.40	3.73*	0.11	4.43*	0.12	2.52*	0.06
Var. time	1.25*	0.10	0.06*	0.004	0.04*	0.004	0.03*	0.005
Cov. Intercept, time	-2.61*	0.42	0.12*	0.01	0.10*	0.01	0.006*	0.0009
Residual variance	159.51*	1.91	6.62*	0.08	4.50*	0.06	3.83*	0.04

Note. ^ = p = .01, * p < .01.

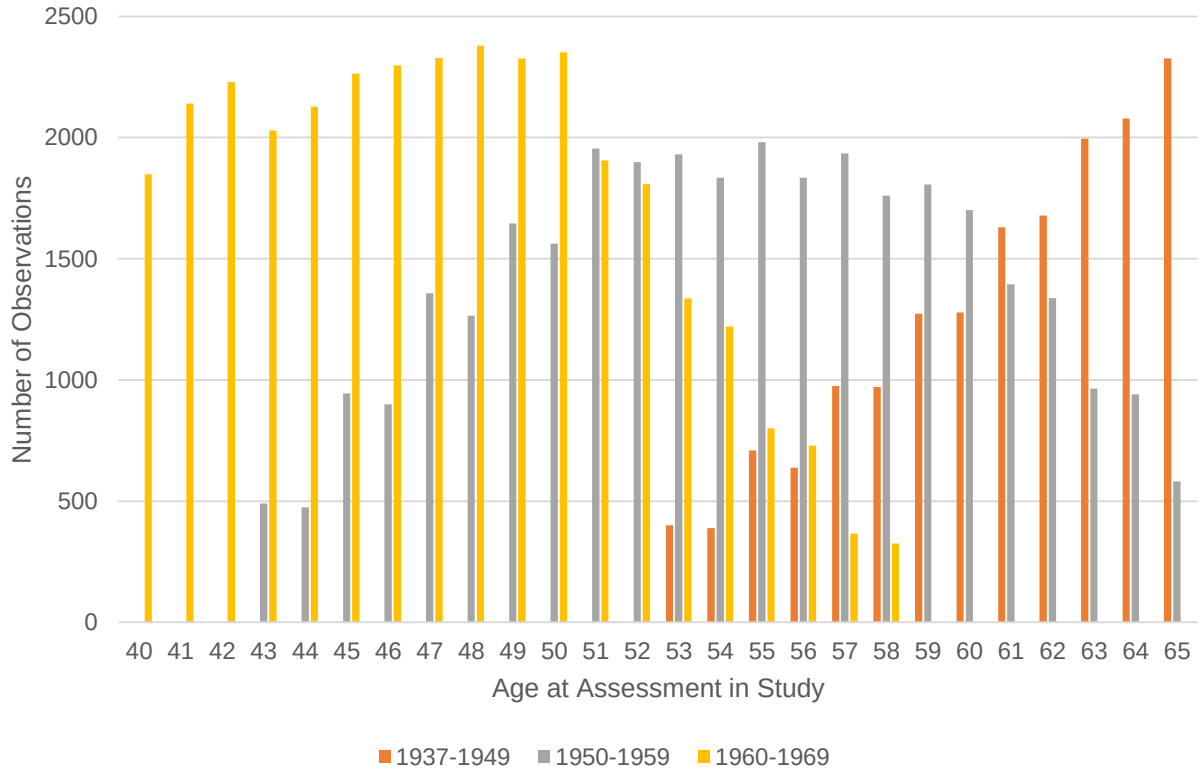

HRS (1992 – 2018):
Number of Observations at Age of Assessment Based on Birth Year
Number of Observations
4000
3500
3000
2500
2000
1500
1000
500
0
40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
Age at Assessment in Study
1930 - 1939
1940-1949
1950-1959
1960-1969

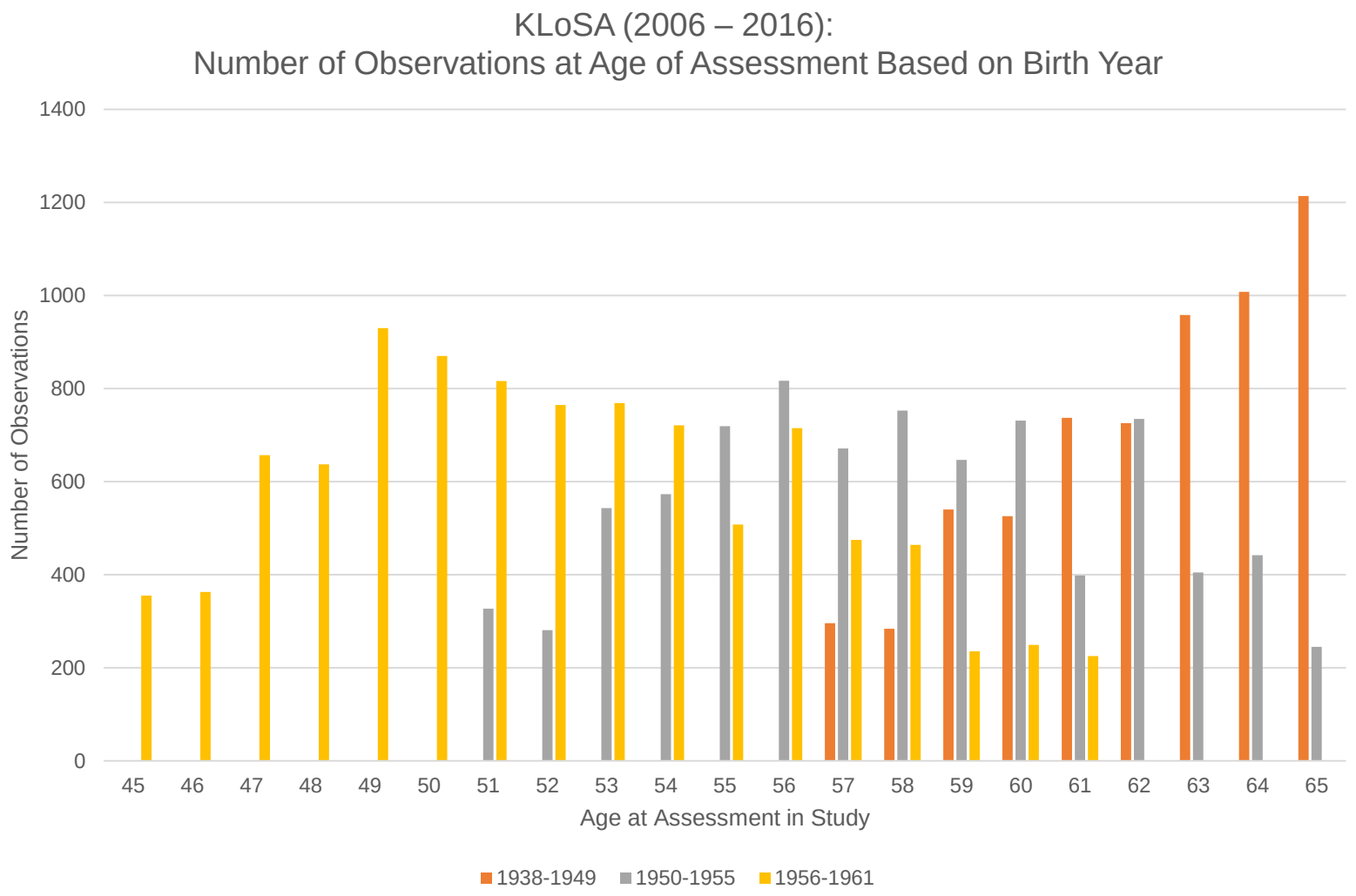

HILDA (2001 – 2018):
Number of Observations at Age of Assessment Based on Birth Year
Number of Observations
3000
2500
2000
1500
1000
500
0
40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
Age at Assessment in Study
1936-1949
1950-1959
1960-1969

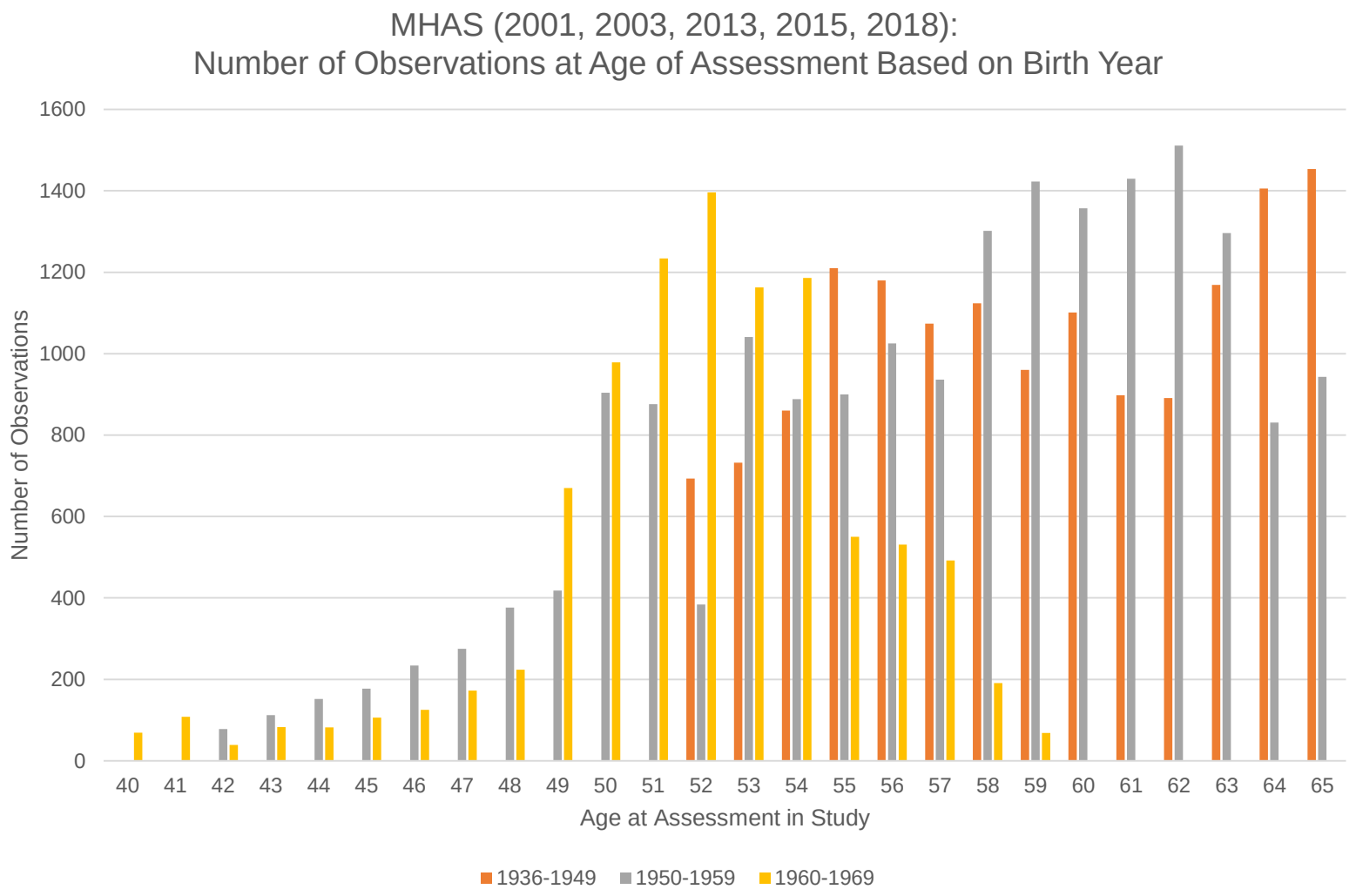
SOEP (1992 – 2018):
Number of Observations at Age of Assessment Based on Birth Years



SOEP (2002 – 2018):
Number of Observations at Age of Assessment Based on Birth Year




KLoSA (2006 – 2016):
Number of Observations at Age of Assessment Based on Birth Year
Number of Observations
1400
1200
1000
800
600
400
200
0
45
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60
61
62
63
64
65
Age at Assessment in Study
1938-1949
1950-1955
1956-1961


MHAS (2001, 2003, 2013, 2015, 2018):
Number of Observations at Age of Assessment Based on Birth Year
Number of Observations
1600
1400
1200
1000
800
600
400
200
0
40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65
Age at Assessment in Study
1936-1949
1950-1959
1960-1969