Race/Ethnicity, Nativity, and Gender Disparities in Mental Health Trajectories from Mid- to Later-Life: A Life Course-Intersectional Approach

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Abstract

Background Numerous studies have highlighted mental health disparities based on race/ethnicity, nativity, and gender across different life stages. However, few have investigated how the intersectionality of these factors influences mental health trajectories during midlife to late life. This study fills this gap by adopting a life course-intersectional approach, viewing mental health trajectories as dynamic processes shaped by the combined influences of race/ethnicity, nativity, and gender. It explores social, psychological, and physiological pathways contributing to these disparities.

Design Using data from the Health and Retirement Study (2006–2018; $N = 38,049$ observations) and growth curve models, this study examines how intra-individual trends in depressive symptoms (measured as CES-D scale, 07) are influenced by the intersection of race/ethnicity, nativity, and gender. It also investigates the impact of objective and subjective social isolation and physical health on group disparities in mental health trajectories.

Results The findings reveal that, during mid- to early late-life, most Black and Hispanic Americans experience higher levels of depressive symptoms compared to their White counterparts (disparities ranging from 0.184 to 0.463 for men and 0.117 to 0.439 for women). However, this disadvantage diminishes for US-born Hispanic men and US-born Black women (0.014–0.031 faster decrease rates compared to US-born White), while it intensifies for Hispanic immigrants (0.017–0.018 slower decrease rates compared to US-born White) in advanced ages. Mediation analysis demonstrates that both social isolation and physical health contribute to these disparities, with physical health explaining a larger portion, particularly in differences between immigrant Hispanic women and US-born Whites.

Conclusion This study underscores the importance of a life course-intersectional approach in understanding mental health disparities. It emphasizes the need for improved social welfare systems and community-level interventions targeting the specific challenges faced by older Hispanic immigrants, especially women who encounter multiple forms of oppression.

Keywords Race/ethnicity · Nativity · Gender · Depressive symptoms · Life course · Intersectionality

Introduction

Mental health holds immense importance for individuals during their mid- to late-life stages [1]. This period of life is often characterized by significant transitions [2], such as retirement, changes in family dynamics, and adjustments to physical health, which can have a profound impact on mental well-being and overall quality of life [3]. A plethora of studies in the social sciences has documented the differential mental health outcomes based on race/ethnicity, nativity, and gender across various life stages. Among these disparities, the higher prevalence of depression among women compared to men has been extensively observed in different cultures and age groups [4, 5]. Conversely, racial/

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ethnic differences in mental health are complex, with some studies showing advantages for Blacks and Hispanics in certain mental health indicators compared to Whites, despite their disadvantages in socioeconomic situations [6–8]. The mental health disparities between Hispanics and Whites are less studied, but existing research is complicated due to the significant heterogeneity within the Hispanic population. A major contributing factor to this heterogeneity is the nativity-immigrant status, as unique challenges and experiences faced by immigrant populations may make them more vulnerable to various mental health problems [9]. However, there is limited research exploring the intricate interactions and intersectionality of these factors, particularly during midlife to late life, and how they collectively shape mental health trajectories. Individual identities are not singular or mutually exclusive but deeply interconnected, producing and perpetuating social inequalities [10]. Neglecting the complexity of interlocking social identities can lead to a failure to recognize the most disadvantaged group [11]. This study aims to bridge this critical gap by adopting both life course and intersectional perspectives [12, 13] to comprehend disparities in mental health trajectories during individuals' mid- to late-life stages.

In addition to investigating mental health disparities, there is a growing body of literature that explores the explanations behind these disparities. Drawing on the fundamental cause theory [14] and stress process model [15], many studies try to explain how socioeconomic resources and life stressors link multiple social identities to individuals' psychological wellbeing. For instance, racism, xenophobia, and sexism play significant roles across various social domains, leading to health disparities based on race/ethnicity, nativity, and gender. In line with this literature, our study examines sociopsychological and physiological explanations for mental health disparities. Social isolation, encompassing both the objective lack of social ties and the subjective feeling of lacking support, is a recognized public health concern and has been identified as a crucial social and psychological predictor of various health outcomes [16], including mental health. Given that social isolation is unequally distributed across social groups [3, 17], it may serve as a potential mechanism linking social identities and mental health. Furthermore, there is extensive research on social disparities in the physical health [12], revealing that socially disadvantaged groups experience poorer physical health, including higher rates of chronic diseases and disabilities. Our study goes beyond this by investigating how disparities in physical health contribute to our understanding of mental health disparities.

Using data from the Health and Retirement Study (2006–2018), a nationally representative sample of individuals aged 50 and older in the United States, this study examines the intra-individual trends in depressive symptoms, a key indicator of mental health, and investigates how these trends are influenced by the intersection of race/ethnicity, nativity, and gender. The study aims to address three main research questions: (1) How do the combined effects of race/ethnicity and nativity contribute to mental health disparities among men and women in mid- and later life? (2) Do these mental health disparities diminish, remain constant, or increase over the life course of individuals' lives? (3) To what extent do disparities in physical health and social isolation contribute to the observed differences in mental health trajectories? Through answering these questions, the current study seeks to enhance our understanding of the complex interplay between race/ethnicity, nativity, and gender in shaping mental health outcomes from the life course perspective.

Race/Ethnicity, Nativity, and Gender Disparities in Mental Health

The literature on race/ethnicity, nativity, and gender disparities in mental health reveals complex patterns and variations in psychological well-being across different population groups. Empirical studies have contributed to our understanding of these disparities and shed light on the nuanced experiences of various communities. Several studies have examined the mental health outcomes of Black Americans compared to their White counterparts. Some findings indicate that Black Americans exhibit lower levels of psychological distress and disorders [8, 18, 19]. However, it is important to note that this lower prevalence of mental health issues does not negate the presence of mental health disparities for Black Americans. The constant exposure to disproportionate levels of stressful life events among Black Americans has been linked to higher levels of depressive symptoms in older adults [4, 9, 20, 21]. Similarly, studies exploring the mental health of Hispanic immigrants have revealed intriguing findings. These individuals often exhibit lower lifetime risks of anxiety, mood, impulse control, and substance use disorders compared to other population groups [22]. Additionally, Hispanic immigrants may experience higher levels of life satisfaction in later life [6]. However, the mental health outcomes of Hispanic immigrants can be influenced by various factors, such as acculturation stress and discrimination, which may contribute to disparities in mental health within this population [23].

In addition to race/ethnicity and nativity, gender is another important factor that contributes to mental health disparities. Extensive documentation reveals that women, regardless of their racial/ethnic background, tend to experience more adverse mental health outcomes in comparison to men [4, 9]. This effect is particularly pronounced among racial/ethnic minority older women who are exposed to multiple, intersecting, and cascading oppressions along

with race-related discrimination that heightens their vulnerability during later stages of life [24, 25]. For instance, Black women are disproportionately exposed to some of the highest rates of physical and psychological violence, childhood and sexual abuse, as well as mortality throughout their life course [26, 27]. On the other hand, less is explored about the gender-based mental health gap within Hispanic older adults, which may be further complexed by immigration status. Pew Research Center data indicates that Hispanic immigrant women exhibit notably lower educational attainment, labor force participation rates, and income compared to their native-born counterparts [28]. A striking 73% of Hispanic immigrant women report not speaking English at home or having limited English proficiency, weakening their power in sexual relations, family, and social integration within the U.S. society [28, 29]. Despite limited available evidence, it is important to recognize that Hispanic women represent one of the fastest-growing racial/ethnic groups in the U.S. who warrant increased attention [28]. As such, this study addresses gaps in existing literature by adopting a life course-intersectional perspective, offering insights into the intricate interplay of gender, race/ethnicity, nativity, and age dynamics.

Life Course and Intersectionality Lenses on Disparities in Mental Health

The inconsistencies observed in empirical evidence regarding mental health disparities can be attributed, in part, to variations in the life stages examined by different studies. Some studies focus on lifetime indicators [8, 22, 30], while others specifically investigate mental health outcomes in later life [4, 6, 9, 31]. To explain the dynamic development of mental health inequalities, researchers have proposed three theoretical hypotheses from the life course perspective. The first hypothesis is the cumulative advantages/disadvantage hypothesis [32]. This theory suggests that early structural advantages or disadvantages experienced by individuals accumulate over time, leading to the production and reproduction of further advantages or disadvantages. As a result, mental health inequalities between different racial/ethnic and nativity groups widen as individuals age. The second hypothesis is the persistent inequality hypothesis [33]. According to this perspective, intragroup stratification and associated influential factors remain relatively constant as groups age. This stability leads to persistent mental health gaps between different groups, resulting in ongoing disparities throughout the life course. In contrast, the aging-as-leveler hypothesis suggests that aging involves negative physical and psychological outcomes for both advantaged and disadvantaged groups [34]. However, because the advantaged groups have more to lose, they may experience more pronounced negative effects. As a result,

mental health inequalities tend to dissipate with time as the negative impact of aging affects all individuals, regardless of their initial advantages or disadvantages. Given the contradictory conclusions drawn from previous research on depression trajectories [4, 20, 31, 35, 36], adopting a life course perspective becomes imperative in scientific studies of mental health disparities.

The intersectionality of race/ethnicity, nativity, and gender is another important aspect to consider when examining mental health disparities. Previous research has shown that immigrants in the U.S. generally have better health outcomes compared to their native-born counterparts due to the selective nature of the migration process [37]. Sociocultural factors, such as health behaviors and social support, along with the return migration of immigrants in poor health during later life, contribute to the overall health advantage of immigrants in the U.S. [38]. However, it is important to recognize that the advantage experienced by immigrants may change as individuals age. For example, it is found that US-born White older adults have better health outcomes compared to their US-born Black and Hispanic counterparts, but they fare worse than foreign-born White and Hispanic individuals in terms of chronic conditions and functional limitations [12]. Moreover, the health advantage observed among Hispanic immigrants may be offset by the negative effects of cumulative exposure to racialized assimilation processes, which can lead to earlier health deterioration. In contrast, the health advantage of US-born Whites remains relatively stable across the life course [12]. These findings highlight the complex interplay of immigration status, physical health, and exposure to racialized processes, which can complicate the relationship between race/ethnicity and mental health outcomes. Adopting a life course-intersectional lens allows us to better understand the interlocking nature of marginalized identities, thereby shedding light on underlying sociopsychological factors that contribute to mental health disparities, particularly among the most disadvantaged groups.

Social Isolation and Physical Health as Mediating Mechanisms

Grounded in the fundamental cause hypothesis [14] and stress process model [15], socioeconomic status and various life stressors have been frequently used to explain disparities in mental health between Black/Hispanic and White populations [6, 7, 9, 31, 36]. Building upon this knowledge, our study aims to understand the mediating role of social isolation and physical health in explaining these disparities. Starting with social isolation, the Social Convey Model suggests that individuals are influenced by their social networks, which can impact their exposure to stress and their coping mechanisms [39]. Recent research is not consistent regarding gender differences in social isolation, with some

suggesting men are more isolated [17, 40] whereas others showing minimal differences [41]. Racial and ethnic differentials are even less discussed. Instead, empirical analyses investigate different aspects of social relationships and different life stages, which have yielded inconsistent findings. Some studies suggest greater familial relationships among Black and Hispanic Americans [42], while others indicate minimal racial/ethnic differences or advantages for Whites in friendship and non-religious social integration [43, 44]. Further research using comprehensive measures of social connectedness, such as social isolation, is needed to understand the existence of disparities in social connectedness and their potential mediating role in mental health disparities.

In addition, while social disparities in physical health and the association between physical and mental health have been well-documented, less attention has been given to the role of physical health as a mediator linking intersecting social disparities and mental health inequalities. Research indicates that individuals with multiple chronic conditions (MCC) experience higher levels of mental distress, and pre-existing chronic diseases can accelerate the development of psychological disorders over time [45, 46]. However, the prevalence of MCC and its impact on mental health vary significantly among different racial/ethnic and nativity-immigrant groups. For instance, recent studies have found that, compared to their White and men counterparts, US-born Black women and foreign-born Hispanic women have the highest prevalence of MCC and depression, respectively, and also experience a steeper decline in depressive symptoms in later life [4]. These findings highlight the importance of considering the mediating effect of physical health on the associations between intersecting social identities and mental health outcomes.

In summary, this study takes a comprehensive approach by adopting a life course-intersectional lens [12, 13], considering the interplay of race/ethnicity, nativity, and gender, to provide a holistic understanding of social disparities in mental health across the lifespan. By analyzing data from a nationally representative sample of adults during their middle and late adulthood, we aim to shed light on how mental health inequalities unfold over time. Recognizing that individuals from marginalized groups often face higher exposure to negative life events and increased vulnerability to physical impairments and social isolation, we anticipate that the intersectionality of multiple marginalized identities will further disadvantage racial/ethnic minorities, particularly immigrants and women. Our study examines the unique challenges faced by these subgroups and their impact on mental health outcomes. Furthermore, we investigate the mediating role of social isolation and physical health indicators in the relationship between intersecting social identities and mental health disparities. We hypothesize that social isolation and physical health factors may serve as pathways

through which these disparities manifest, shedding light on the underlying mechanisms that contribute to mental health inequalities.

Methods

Data

The present study uses data from the 2006–2018 waves of the Health and Retirement Study (HRS https://hrs.isr.umich.edu/welcome-health-and-retirement-study). HRS is an ongoing, biannual survey initiated in 1992 that adds new cohorts every six years with younger cohorts not previously represented. As one of the largest and earliest longitudinal datasets, HRS provides a nationally-representative sample of the community-dwelling American population aged 50 and above [47]. It is worth mentioning that HRS oversampled Black and Hispanic minorities, which ensures that we can treat men and women, as well as US-born and foreign-born populations, as diverse groups while still maintaining representative information for subsamples [4, 12].

We applied the following selection criteria to establish the final sample for statistical analyses (see Appendix Fig. S1 in Supplementary materials). First, we retained the HRS 2006–2018 waves ($N = 135,079$ person-years) while excluding the 1992–2004 waves, because some variables of interest, such as social support, were only available in the Psychosocial and Lifestyle Questionnaires since 2006. Second, to ensure the representativeness of our sample, we excluded respondents who did not fall within the HRS target population, including respondents below the age of 50, those from racial/ethnic groups other than Non-Hispanic White, Non-Hispanic Black, and Hispanics, as well as individuals residing in nursing homes. After this exclusion, the sample size reduced to 122,859 person-years. Next, approximately two-thirds of observations ($N = 82,457$ person-years) were further deleted as the respondents did not participate in the Psychosocial and Lifestyle Questionnaires from which we obtained some variables of interest. The significant proportion of exclusion in this step is because the Psychosocial and Lifestyle Questionnaires were only assigned to a rotating random 50% of respondents who completed in-person core interviews in each wave. Additionally, the self-administered nature of the Psychosocial and Lifestyle Questionnaires led to relatively lower response rates compared to core interviews (e.g., 68.3% versus 88.9% in 2004). Nevertheless, sensitivity analyses revealed that the retained sample still maintained good representativeness of the full sample [48]. Finally, around 5.8% (2,353 person-years) with missing data were excluded. Consequently, our final sample consist of 17,235 community-dwelling respondents aged 50 or older (5,209 Non-Hispanic White men, 1,029 Non-Hispanic Black

men, 807 Hispanic men, 7,136 Non-Hispanic White women, 1,912 Non-Hispanic Black women, and 1,142 Hispanic women) contributing to 38,049 person-year observations. It is important to note that our sample included respondents who completed at least one wave of survey, as growth curve models employed are capable of handling unbalanced data structures. As a result, our final sample consisted of 4,915 respondents who attended one wave, 5,692 who attended two, 4,762 who attended three, and 1,866 individuals who attended four waves of the survey between 2006 and 2018.

Measures

Our *dependent variable*, mental health, is indexed using the revised version of the Center for Epidemiological Studies-Depression (CES-D) scale that assessed whether respondents felt depressed, felt that everything they did was an effort, felt that sleep was restless, could not get going, enjoyed life, felt sad, and was happy much of the time during the past week. We reverse-coded positive items so that higher scores indicated higher levels of depressive symptoms (ranging from 0 to 7). The *predictor* variable is a social status measure that combines self-reported race/ethnicity and nativity. Respondents are divided into six groups: 1) U.S.-born Non-Hispanic White, 2) foreign-born Non-Hispanic White, 3) U.S.-born Non-Hispanic Black, 4) foreign-born Non-Hispanic Black, 5) U.S.-born Hispanic, and 6) foreign-born Hispanic. To examine the intersectional effects of race/ethnicity, nativity, and gender, we analyze the data separately for men and women, considering the inclusion of various social statuses.

We have two sets of *mediators*. The first set assesses objective and subjective social isolation. Objective social isolation is coded as a binary variable (1 = *isolated*, 0 = *not isolated*). A respondent is considered socially isolated if they have less than monthly contact with children, other family members, or friends, and did not participate in any religious or non-religious groups (e.g., social clubs, interest groups, volunteering) [49]. Subjective social isolation measures the perceived lack of social support from children, extended family, and friends [50]. The index ranges from 1 to 4, with higher scores indicating higher levels of subjective social isolation. For individuals who do not have any living children, extended family members, or friends, the score is coded as 4. The second set of mediators consists of four health-related factors, including self-rated health (0 = *excellent/very good*, 1 = *good*, 2 = *fair/poor*), the count of chronic conditions (i.e., including hypertension, diabetes, heart attack, and stroke; final index 0–4), the count of activities of daily living (ADLs) difficulty (bathing, dressing, eating, getting in and out of bed, and walking across a room; final index 0–5), and instrumental activities of daily living (IADLs) difficulty (using telephone, managing money, and taking medication; final index 0–3).

Finally, we include multiple sets of *covariates* to minimize potential confounding effects. Along with age (linear and quadratic terms, centered at the grand mean), we consider educational attainment (0 = *less than upper secondary*, 1 = *upper secondary and vocational training*, 2 = *tertiary*), log-adjusted household income, and government health insurance coverage (0 = *not covered*, 1 = *covered*) as indicators of socioeconomic status. We also introduce two variables to account for attrition: 1) whether the respondent passed away between 2006 and 2018 (0 = *no*, 1 = *yes*) and 2) the number of survey waves the respondent was absent from (0–6) [12].

Analytic Strategy

We begin by examining gender-specific racial/ethnic and immigrant/native disparities in depressive symptoms and other covariates using descriptive statistics. T-tests and chi-square statistics are used to formally assess differences in measures across subpopulations. Following this, we employed mixed-effects growth curve models to predict age trajectories of depressive symptoms based on race/ethnicity and nativity. We also adopt Chow tests [51] to examine gender differences in these age trajectories. Mixed-effects models offer several distinct advantages over conventional methods such as fixed-effects models. They can handle unbalanced data structures and include both time-varying and time-invariant variables in the analysis [52–54]. Additionally, they allow for the incorporation of potentially unobserved or unmeasurable person-specific, time-constant error components, which can significantly improve the reliability of coefficient estimates [52]. This paper demonstrates hierarchical growth curve modeling using the following equations:

- Wave-level (Level 1):

$$CESD_{ti} = \beta_{0i} + \beta_{1i}AgeC_{ti} + \beta_{2}AgeC_{ti}^2 + \beta_{3}Z_{ti} + R_{ti} \quad (1)$$

- Individual-level (Level 2):

  – Model for the intercept:

  $$\beta_{0i} = \gamma_{00} + \gamma_{01}X_i + \gamma_{02}Z_i + U_{0i} \quad (2)$$

  – Model for the linear growth rate (age):

  $$\beta_{1i} = \gamma_{10} + \gamma_{11}X_i + U_{1i} \quad (3)$$

The Level 1 model characterizes the individual growth trajectories of depressive symptoms with age, capturing *within-individual* changes over time. Our dependent variable, $CESD_{ti}$, is modeled as a function of the linear and quadratic terms of age for the person i at wave t. We used the age ($AgeC_{ti}$) centered by the grand mean (68) to facilitate

interpretation. Two age trajectory parameters, β_{0i} and β_{1i}, represent the intercept and the linear growth rate of change, respectively. In contrast to previous studies that estimated the depressive trajectories as a linear decline [4] or a random-intercept model with fixed slopes [9], we employed mixed-effects growth curve models with random coefficients across age.

At Level 2 of the hierarchical model, we employ two equations to represent the respondent-specific random intercepts (Eq. 2) and the linear rate of change for age (Eq. 3). Through these equations, we aim to capture *interindividual* heterogeneity in change and examine the association between our variable of interest and the shape of each respondent's mental health trajectory. Two Level-1 parameters, β_{0i} and β_{1i}, are further modeled as functions of the individual-level attributes, with γ_{00} representing the grand mean of depressive symptoms and γ_{01} representing the main effect of our predictor X_i (race/ethnicity and nativity) in for the intercept model. For the linear growth rate model (Eq. 3), γ_{10} stands for the main effect of age, whereas γ_{11} denotes the interacting effects between age and X_i.

Finally, we conducted analyses to test whether social isolation and physical health accounted for disparities in mental health trajectories. There are methodological challenges when testing mediation mechanisms in health disparities research, especially in longitudinal studies. In Fig. 1, we use race/ethnicity and mental health as an example to highlight

several potential issues in previous studies and propose our solutions to address these challenges. Panel A shows the mediation effect of physical health and social isolation in the influence of race/ethnicity on mental health. Panels B and C illustrate a commonly used method in previous longitudinal studies, wherein the coefficients of social identity variables are assessed for variations when social isolation or physical health variables are either included or omitted. In our study, we will also integrate mediators in our growth curve models to compare coefficients with and without their inclusion. However, it is important to acknowledge that this approach assumes the absence of unmeasured confounders (I, II, and III) as depicted in Panel D of Fig. 1. Notably, these assumptions can be challenged in practice. For example, individuals' temperament, which can influence both social isolation status and depression levels [55, 56], is often overlooked in empirical studies, potentially leading to an overestimation of the social isolation effect. While it is impossible to completely eliminate all confounding effects, our study will use generalized structural equation modeling (GSEM) [57] to estimate the magnitude and statistical significance of the direct effect (c') and indirect effect (a*b) of our predictor more accurately through pathway analysis [58, 59]. Specifically, we performed moderated mediation analyses to examine to what extent gender influences the mediating effects of social isolation and physical health.

Fig. 1 Potential direct and indirect paths linking race/ethnicity and mental health
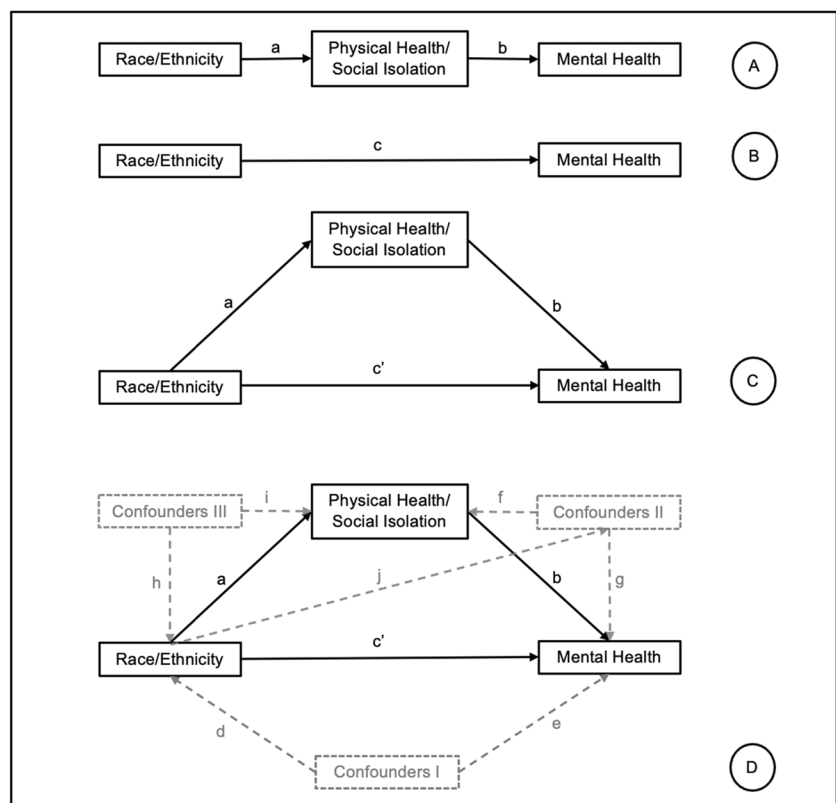
Results

Descriptive Statistics

Table 1 presents gender-specific descriptive statistics for all variables categorized by race/ethnicity, and nativity subgroups. In Panel A, among men, White adults show lower levels of depressive symptoms compared to their Black and Hispanic counterparts, regardless of nativity status. Significant differences in social isolation and physical health mediators are also observed across racial/ethnic and nativity subgroups. White men, particularly US-born White men, tend to report lower levels of social isolation and better physical health compared to Black and Hispanic men. Panel B presents results for women. Not surprisingly, women across racial/ethnic and nativity groups exhibit statistically significantly higher levels of depressive symptoms compared to men with the same social status, except among foreign-born Black individuals. Nevertheless, women display lower objective social isolation and subjective social isolation, with statistically significant gender differences within US-born White, US-born Black, and Hispanic respondents. Similar to the findings for men, White women have a more advantaged status in terms of both the dependent variable (depressive symptoms) and mediators (social isolation and physical health) compared to women of color. The differences in control variables align with previous studies.

Mental Health Trajectories at the Intersection of Race/Ethnicity, Nativity, and Gender

Table 2 presents estimates from the growth curve models predicting depressive symptoms of older men and women. In Models 1 and 5, we include the predictor variable (race/ethnicity and nativity), age, age squared, and all covariates to assess the independent effect of the predictor variable. Model 1 of Table 2 demonstrates significant curvilinear age effects among older men. When accounting for the predictor variable and other covariates, the average overall trajectory of depressive symptoms has a mean of 3.014 ($p < 0.001$) which decreases at a rate of 0.023 per year of age ($p < 0.001$), but the decline slows down at a rate of 0.001 as age increases ($p < 0.001$). Regarding racial/ethnic-nativity disparities, foreign-born and US-born White men exhibit the lowest levels of depressive symptoms, followed by foreign-born Hispanic ($b = 0.184$, $p < 0.05$), US-born Black ($b = 0.250$, $p < 0.001$), and US-born Hispanic men ($b = 0.360$, $p < 0.001$), while foreign-born Black men display the highest levels of depressive symptoms ($b = 0.463$, $p < 0.01$). Similar patterns are

observed among women, with a notably higher initial level (intercept $= 4.291$, $p < 0.001$) and comparable growth rates (linear growth rate $= -0.026$, $p < 0.001$; quadratic growth rate $= 0.001$, $p < 0.001$). However, disparities among women show slight variations compared to men. While White women remain the most advantaged group, the differences between Black and White women are minor, and Hispanic women exhibit the highest levels of depressive symptoms ($b = 0.350$, $p < 0.001$ for foreign-born; $b = 0.439$, $p < 0.001$ for US-born).

Models 2 and 6 in Table 2 expand the analysis by incorporating interactions between our social status predictor and age to capture the shape of depressive symptoms across the life course. To facilitate interpretation, we have created Figs. 2 (for men) and 3 (for women) to visualize the estimated age trajectories of depressive symptoms among US-born and foreign-born Black and Hispanic adults, compared to their US-born White counterparts. The growth curves displayed in Figs. 2 and 3 exhibit U-shaped patterns overall, with variations in mean levels and growth rates depending on race/ethnicity, nativity, and gender. Starting with the results for men, Fig. 2c indicates that US-born Hispanic men start with notably higher levels of depression than their White counterparts at age 50 (2.64 compared to 1.76). However, their depression level decreases at a significantly faster rate, leading to a significant narrowing of the disparity, even a reversal, in later adulthood (age 80 and above). At age 100, the depression level of US-born Hispanic men is 0.68 lower than that of White counterparts (0.97 versus 1.65). On the other hand, Fig. 2d illustrates cumulative disadvantages for foreign-born Hispanic men due to a faster increase rate in depressive symptoms relative to US-born White men. Although foreign-born Hispanic men start with slightly fewer depressive symptoms than US-born White men at age 50 (1.67 versus 1.76), their growth curves cross over quickly in the mid-50 s and continue to diverge afterward. By age 100, foreign-born Hispanic men have 0.77 ($= 2.42–1.65$) higher depressive symptoms compared to their US-born White counterparts. No significant interaction effects were found for Black-White differences in depression trajectories, as displayed in Fig. 2a and b.

Turning to women, Fig. 3a demonstrates that US-born Black women start with higher levels of depressive symptoms compared to their White counterparts at the beginning (2.40 versus 2.06). However, due to the faster decline in depression levels among US-born Black women, this gap diminishes with age and even reverses at around age 75. By age 100, US-born Black women have 0.34 lower depressive symptoms than their US-born White counterparts (1.14 versus 1.48). In contrast, Fig. 3d shows that foreign-born Hispanic women only exhibit slightly higher depressive symptoms at age 50 (2.06 versus 2.15), but their disadvantages

Table 1 Descriptive statistics of all variables by race/ethnicity/nativity and gender

	USB White		FB White		USB Black		FB Black		USB Hispanic		FB Hispanic		Diff.
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Panel A. Men (N = 15,186)													
Dependent Variable													
Depressive Symptoms	0.95†	1.57	0.86†	1.47	1.45†	1.79	1.55	1.95	1.56†	2.04	1.54†	2.04	bcde
Social Isolation Mediators													
Objective social isolation	0.53†	0.50	0.46	0.50	0.63†	0.48	0.61	0.49	0.65†	0.48	0.68†	0.47	abde
Subjective social isolation	1.90†	0.53	1.98	0.55	2.00†	0.59	1.96	0.53	1.96†	0.54	1.95	0.60	abde
Physical health Mediators													
Self-rated health	†				†						†		bde
Excellent/Very good	0.45		0.50		0.30		0.41		0.31		0.21		
Good	0.34		0.31		0.37		0.38		0.35		0.34		
Fair/Poor	0.21		0.18		0.33		0.21		0.34		0.45		
No. of chronic conditions	1.20†	1.01	1.04†	0.96	1.35	1.00	1.24	1.00	1.33†	1.03	1.10	1.00	abde
ADL	0.21	0.65	0.13	0.48	0.31†	0.81	0.30	0.91	0.36	0.92	0.34†	0.88	abde
IADL	0.08†	0.34	0.07	0.32	0.11	0.41	0.14	0.43	0.16	0.48	0.15	0.51	cde
Demographic and SES Characteristics													
Age	69.56†	9.83	70.24†	9.97	66.05	8.95	64.44	8.80	65.96	8.34	65.47	9.24	bcde
Educational attainment	†		†		†		†		†				abcde
Less than upper secondary	0.09		0.13		0.26		0.25		0.26		0.55		
Upper secondary and vocational training	0.57		0.37		0.61		0.39		0.60		0.37		
Tertiary	0.33		0.50		0.13		0.36		0.14		0.08		
Logged household income	10.98†	0.90	11.10†	0.95	10.41†	1.06	10.68†	1.10	10.43†	1.08	10.18†	0.95	abcde
Government health insurance	0.70	0.46	0.69	0.46	0.68†	0.46	0.50	0.50	0.65†	0.48	0.54	0.50	cde
Attrition Status													
Died 2006–2018	0.22†	0.41	0.18	0.39	0.18†	0.38	0.16†	0.37	0.14†	0.35	0.09	0.29	bde
No. of missing waves	1.13†	1.46	1.04	1.39	1.44†	1.44	1.87†	1.35	1.32†	1.51	1.44†	1.35	bcde
N	11,304		490		1,784		135		641		832		
Panel B. Women (N = 22,863)													
Dependent Variable													
Depressive Symptoms	1.28	1.85	1.36	1.93	1.76	2.10	1.63	2.11	2.04	2.28	2.16	2.48	bcde
Social Isolation Mediators													
Objective social isolation	0.45	0.50	0.43	0.50	0.54	0.50	0.51	0.50	0.53	0.50	0.58	0.49	bde
Subjective social isolation	1.84	0.55	1.92	0.61	1.95	0.61	1.89	0.54	1.90	0.55	1.96	0.65	abde
Physical health Mediators													
Self-rated health													bde
Excellent/Very good	0.48		0.45		0.27		0.37		0.30		0.22		
Good	0.32		0.34		0.38		0.32		0.32		0.28		
Fair/Poor	0.20		0.21		0.35		0.31		0.38		0.50		
No. of chronic conditions	1.00	0.94	0.91	0.91	1.39	0.96	1.22	0.99	1.09	0.99	1.07	0.98	abcde
ADL	0.22	0.70	0.18	0.64	0.44	1.01	0.37	0.93	0.39	0.97	0.50	1.08	bcde
IADL	0.07	0.32	0.07	0.33	0.11	0.40	0.19	0.58	0.17	0.49	0.18	0.56	bcde
Demographic and SES Characteristics													
Age	69.23	10.17	70.10	9.50	65.32	9.23	64.80	8.99	64.93	8.86	64.48	9.30	abcde
Educational attainment													abcde
Less than upper secondary	0.10		0.16		0.22		0.23		0.32		0.54		
Upper secondary and vocational training	0.67		0.55		0.62		0.57		0.59		0.37		
Tertiary	0.24		0.29		0.15		0.19		0.09		0.10		
Logged household income	10.71	0.96	10.81	0.94	10.06	1.08	10.35	1.06	10.28	1.05	9.97	1.04	abcde
Government health insurance covered	0.69	0.46	0.71	0.45	0.64	0.48	0.57	0.50	0.59	0.49	0.55	0.50	bcde

Table 1 (continued)

	USB White		FB White		USB Black		FB Black		USB Hispanic		FB Hispanic		Diff.
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Attrition Status													
Died 2006–2018	0.16	0.37	0.15	0.36	0.13	0.34	0.05	0.22	0.09	0.28	0.07	0.26	bcde
No. of missing waves	0.93	1.36	0.94	1.33	1.29	1.40	1.22	1.29	1.13	1.33	1.25	1.34	bcde
N	16,183		681		3,580		223		936		1,260		

Data come from the Health and Retirement Study, 2006–2018 ($N = 38,049$). USB and FB refer to respondents who are US-born and foreign-born. Self-rated health and educational attainment are categorical variables with proportions displayed, while all others are continuous or dummy variables

a, b, c, d, and e stand for the FB White, USB Black, FB Black, USB Hispanic, and FB Hispanic have a significant difference ($p < 0.05$) in corresponding variables relative to their USB White counterparts, respectively.

[†]in Panel A indicates statistically significant differences ($p < 0.05$) in corresponding variables between men (Panel A) and women (Panel B) within each racial/ethnic group

accumulate significantly with age. By age 100, foreign-born Hispanic women have 2.47 depressive symptoms, which is considerably higher than the 1.48 observed among their US-born White counterparts. Figure 3b and c do not show statistically significant differences in mental health age trajectories between US-born White women and their foreign-born Black and US-born Hispanic women counterparts. In summary, while most Black and Hispanic Americans, regardless of their gender and nativity status, experience higher levels of depressive symptoms compared to their White counterparts in their mid- to early late-life, this disadvantage diminishes for the US-born Hispanic men and US-born Black women but intensifies for Hispanic immigrants at advanced ages.

In addition, we conducted Chow tests by introducing interactions between gender and all variables or interaction terms (fully interacted models) into analyses of the full sample. This allows us to compare gender differences between Models 2 and 6 (without covariates and mediators), as well as between Models 4 and 8 (with all covariates and mediators), respectively. Chow test results for the model intercepts indicate that, on average, at the age of 68, men exhibit statistically significantly lower levels of depression (3.012, $p < 0.001$ in Model 2; 1.159, $p < 0.001$ in Model 4) compared to women (4.280, $p < 0.001$ in Model 6; 1.709, $p < 0.001$ in Model 8). Chow tests for the coefficients of the independent variable on the intercepts also suggest that, at the average age of 68, US-born Black men and foreign-born Black men exhibit statistically higher levels of depressive symptoms compared to their US-born White counterparts, relative to women (for instance, 0.102 vs. -0.185 and 0.354 vs. -0.131 in Models 4 and 8, respectively). Furthermore, US-born Hispanic men and women display substantially distinct growth rates with age, where men experience a faster decline with age (-0.031 in Model 2 vs. -0.002 in Model 6), as evident in Figs. 2c and 3c. However, these gender differences in growth

rates disappear after accounting for covariates and mediators, suggesting the potential of the trajectory variations to be explained by these factors.

Mediation Effects of Social Isolation and Physical Health

To examine potential mediation effects, Models 3 and 4 (for men), and Models 7 and 8 (for women) in Table 2 incorporate social isolation and physical health indicators, respectively. These models offer initial insights into mediation effects. With the inclusion of these mediators, the magnitudes of coefficients for all race/ethnicity-nativity disparities in the intercept substantially decrease. This suggests that social isolation and physical health partially account for mental health disparities between US-born Whites and other racial/ethnic and nativity-immigrant groups, even after controlling for socioeconomic and demographic characteristics. The mediating effect of physical health is particularly notable among Hispanic immigrants. For instance, when physical health indicators are included in Models 4 and 8, the coefficients decrease from 0.212 and 0.347 to 0.034 and -0.034 for foreign-born Hispanics, respectively, and the statistical significance also disappears.

Table 3 presents the results of generalized structural equation modeling [57] predicting the mediating effects of social isolation and physical health, along with the moderating effect of gender on these mediating effects. As expected, the mediating effects of social isolation and physical health vary across different racial/ethnic and native-immigrant groups. Both objective and subjective social isolation significantly contribute to explaining the disadvantages experienced by US-born Black and foreign-born Hispanic women. However, only subjective isolation explains the disadvantages observed among US-born Black men. Subjective social isolation appears to have a greater impact on increased

Table 2 Mixed-Effects Growth Curve Models Predicting Depressive Symptoms Among Adults from Mid- to Later-Life

Fixed Effects	Men ($N=15,186$)				Women ($N=22,863$)				M≠W
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	
For Intercept									
Intercept	3.014***	3.012***	1.888***	1.159***	4.291***	4.280***	2.872***	1.709***	ab
	(0.176)	(0.176)	(0.186)	(0.177)	(0.161)	(0.161)	(0.169)	(0.160)	
Racial/ethnic-nativity disparity (ref. USB White)									
FB White	−0.024	−0.016	−0.049	−0.003	0.102	0.058	0.017	0.032	
	(0.097)	(0.100)	(0.097)	(0.087)	(0.097)	(0.100)	(0.096)	(0.086)	
USB Black	0.250***	0.244***	0.209***	0.102*	0.117*	0.090	0.041	−0.185***	ab
	(0.054)	(0.054)	(0.052)	(0.047)	(0.047)	(0.047)	(0.046)	(0.041)	
FB Black	0.463**	0.476**	0.422*	0.354*	0.127	0.149	0.136	−0.131	b
	(0.171)	(0.177)	(0.172)	(0.156)	(0.162)	(0.169)	(0.163)	(0.146)	
USB Hispanic	0.360***	0.319***	0.296***	0.153*	0.439***	0.437***	0.414***	0.161*	
	(0.084)	(0.084)	(0.082)	(0.074)	(0.083)	(0.085)	(0.083)	(0.074)	
FB Hispanic	0.184*	0.218**	0.212**	0.034	0.350***	0.410***	0.347***	−0.034	
	(0.077)	(0.077)	(0.075)	(0.068)	(0.073)	(0.076)	(0.073)	(0.066)	
For Linear Growth Rate (Age)									
Intercept	−0.023***	−0.022***	−0.020***	−0.020***	−0.026***	−0.025***	−0.022***	−0.020***	
	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	
Racial/ethnicity-nativity disparity (ref. USB White)									
FB White		−0.003	−0.003	−0.006		0.015	0.012	0.011	
		(0.009)	(0.009)	(0.008)		(0.009)	(0.009)	(0.008)	
USB Black		−0.007	−0.005	−0.007		−0.014**	−0.012**	−0.016***	
		(0.005)	(0.005)	(0.005)		(0.004)	(0.004)	(0.004)	
FB Black		0.003	−0.004	−0.008		0.006	0.008	−0.006	
		(0.018)	(0.018)	(0.016)		(0.016)	(0.015)	(0.014)	
USB Hispanic		−0.031***	−0.030***	−0.022**		−0.002	−0.002	−0.004	a
		(0.009)	(0.009)	(0.008)		(0.008)	(0.008)	(0.007)	
FB Hispanic		0.017*	0.017*	0.015*		0.018**	0.016*	0.005	
		(0.007)	(0.007)	(0.006)		(0.007)	(0.007)	(0.006)	
For Quadratic Rate of Change (Age^2)									
Intercept	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***	0.000***	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Mediators									
Objective social isolation			0.208***	0.129***			0.245***	0.137***	
			(0.026)	(0.025)			(0.025)	(0.024)	
Subjective social isolation			0.433***	0.357***			0.563***	0.462***	b
			(0.025)	(0.024)			(0.023)	(0.022)	
Self-rated health (ref. excellent/very good)									
Good				0.225***				0.351***	b
				(0.028)				(0.027)	
Fair/Poor				0.888***				1.286***	b
				(0.035)				(0.035)	
No. of chronic conditions				0.031*				0.038**	
				(0.014)				(0.015)	
ADL				0.349***				0.347***	
				(0.019)				(0.016)	
IADL				0.512***				0.353***	b
				(0.034)				(0.033)	

Table 2 (continued)

Fixed Effects	Men (N=15,186)				Women (N=22,863)				M≠W
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	
Random-Effects Parameters-Variance Components									
Level 1: within-person	0.003***	0.003***	0.003***	0.002***	0.001***	0.001***	0.001***	0.001***	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	
Level 2: in intercept	1.186***	1.187***	1.072	0.797***	1.696***	1.692***	1.516***	1.044	
	(0.042)	(0.042)	(0.040)	(0.033)	(0.047)	(0.047)	(0.044)	(0.036)	
in linear growth rate	1.181***	1.181***	1.196***	1.167***	1.797***	1.798***	1.814***	1.751***	
	(0.020)	(0.020)	(0.021)	(0.020)	(0.024)	(0.024)	(0.024)	(0.023)	
Goodness-of-fit									
AIC	54,564	54,553	54,238	54,465	90,030	90,017	89,397	86,660	
BIC	54,702	54,692	54,429	52,693	90,175	90,151	89,598	86,902	

Health and Retirement Study, 2006–2018 (N=38,049). USB and FB refer to respondents who are US-born and foreign-born. All models adjust for both time-varying and time-constant demographic and socioeconomic characteristics. Age is centered at its grand mean (68) to facilitate interpretation. a and b denote any statistically significant gender differences ($p<0.05$) in the corresponding coefficients between Model 2 and Model 6 (without covariates and mediators), as well as between Model 4 and Model 8 (with covariates and mediators), respectively. These comparisons are predicted by Chow tests that include the interaction between gender and all variables or interaction terms in the full sample

$*p<0.05$, $**p<0.01$, $***p<0.001$. Standard errors in parentheses

Fig. 2 Age trajectories of depressive symptoms for Black and Hispanic men relative to US-born White men. Data come from the Health and Retirement Study, 2006–2018 (N=15,186). USB and FB refer to respondents who are US-born and foreign-born. Numbers within each graph indicate predicted values of depressive symptoms at age 50 or 100. Estimated based on Model 2 of Table 2
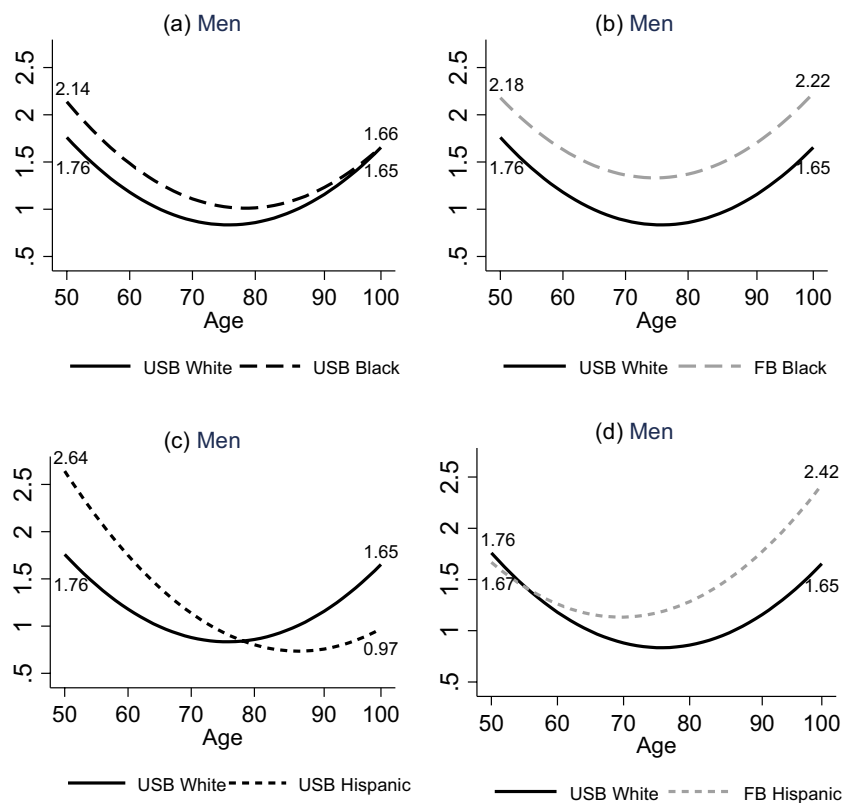
depression levels compared to objective isolation. For US-born Black women and foreign-born Hispanic women, subjective social isolation explains 26.3% (=0.055/0.209) and 12.8% (=0.057/0.446) of the disparities, respectively, while objective isolation explains only 3.4% (=0.007/0.208) and 1.6% (=0.007/0.445), respectively. However, physical

health indicators exhibit stronger mediating effects than both forms of social isolation. For instance, self-rated health and ADL account for 70.2% (=0.311/0.443) and 26.2% (=0.116/0.442), respectively, of the disparities between foreign-born Hispanic women and US-born White counterparts. Gender significantly moderates the mediating effects

Fig. 3 Age trajectories of depressive symptoms for Black and Hispanic women relative to US-born White women. Data come from Health and Retirement Study, 2006–2018 (*N* = 22,863). USB and FB refer to respondents who are US-born and foreign-born. Numbers within each graph indicate predicted values of depressive symptoms at age 50 or 100. Estimated based on Model 6 of Table 2
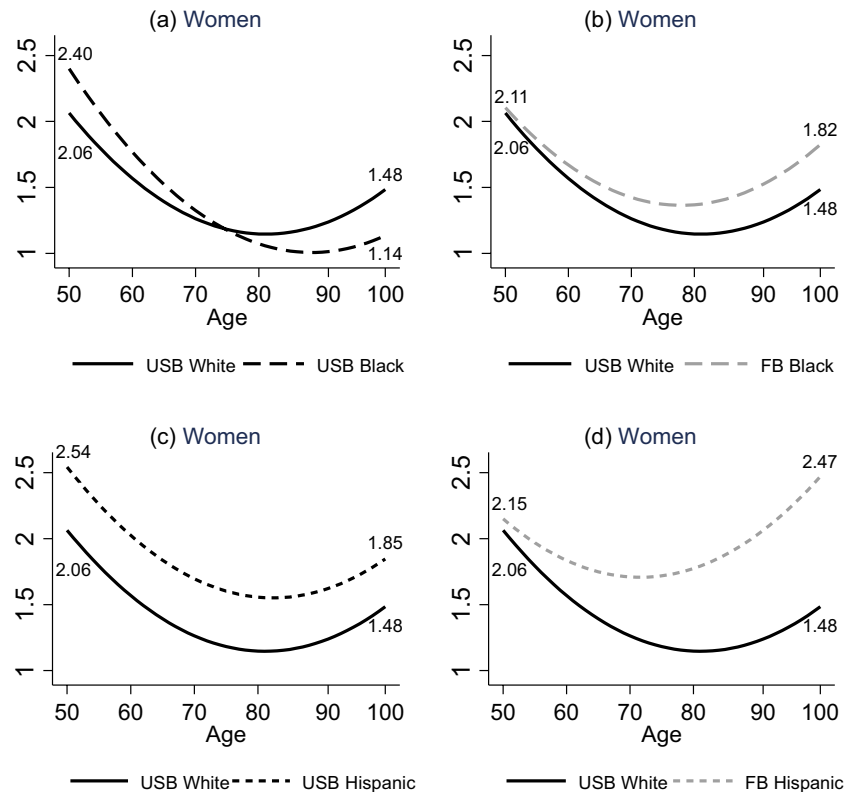
of physical health variables among US-born Black or foreign-born Hispanic individuals and their US-born White counterparts. However, the mediating effect of subjective social isolation is statistically significantly different only between immigrant Hispanic men and women. Specifically, the indirect effect of subjective social isolation is notably stronger among foreign-born Hispanic women (indirect effect = 0.057, $p < 0.001$) in comparison to foreign-born Hispanic men (indirect effect = -0.005, $p \geq 0.05$).

Discussion

Applying a life course-intersectional framework, the current paper seeks to enhance our understanding of the complex interplay between race/ethnicity, nativity, and gender in shaping mental health trajectories. We contribute to the existing literature by expanding the focus beyond early adulthood to encompass middle and later years, with a specific emphasis on distinguishing between US-born and foreign-born Black and Hispanic older adults who have been underrepresented in previous studies. Throughout the formal examination of the mediating effects of physical health and social isolation, our research also contributes to a more comprehensive understanding of the underlying processes liking social identities to unequal mental health outcomes.

Our research provides mixed evidence for the aging-as-leveler hypothesis and cumulative (dis)advantage hypothesis. On the one hand, consistent with previous studies [4, 9, 21, 43], we find that during mid- to early late-life, most Black and Hispanic Americans experience higher levels of depressive symptoms compared to their White counterparts. However, our findings reveal important nuances within these groups. US-born Hispanic men and US-born Black women show a reduction in depressive symptoms, aligning with the aging-as-leveler hypothesis. This suggests that as individuals age, the mental health disparities between these US-born racial/ethnic minority groups and their White counterparts diminish. On the other hand, it is noteworthy that the mental health disadvantage intensifies for Hispanic immigrants at advanced ages. Nuanced racial/ethnic/nativity variations also exist that contribute to gender-specific disparities across the life course. While US-born Hispanic women consistently exhibit elevated depressive symptoms, their US-born Hispanic men counterparts experience a substantial decrease, even faring better than US-born White men in oldest-old ages.

These findings support the notion that the aging-as-leveler mechanism applies primarily to US-born Americans, especially US-born men, while the experiences of immigrant populations and women are shaped by additional factors related to their gender, immigration status, and the

Table 3 Generalized Structural Equation Modeling Estimating Moderated Mediation Effects

		Men (N = 15,186)					Women (N = 22,863)					M≠W
		(Ref., USB White Men)					(Ref., USB White Women)					
		FB White	USB Black	FB Black	USB Hispanic	FB Hispanic	FB White	USB Black	FB Black	USB Hispanic	FB Hispanic	
Social Isolation Mediators												
Objective social isolation	Direct effect	−0.013	0.299***	0.478**	0.430***	0.207**	0.087	0.202***	0.194	0.507***	0.438***	e
	Indirect effect	−0.006	0.003	0.009	0.007*	0.004	−0.002	0.007**	0.006	0.005	0.007*	
	Total effect	−0.018	0.302***	0.487**	0.437***	0.211**	0.085	0.208***	0.200	0.512***	0.445***	e
Subjective social isolation	Direct effect	−0.062	0.264***	0.483**	0.481***	0.216**	0.035	0.154*	0.178	0.486***	0.388***	e
	Indirect effect	0.045**	0.038***	0.004	0.017	−0.005	0.051**	0.055***	0.021	0.027	0.057***	e
	Total effect	−0.017	0.301***	0.487**	0.435***	0.211**	0.086	0.209***	0.199	0.513***	0.446***	e
Physical Health Mediators												
Self-rated health	Direct effect	−0.020	0.214***	0.468**	0.334***	0.034	0.069	0.010	0.050	0.311***	0.133*	b
	Indirect effect	0.003	0.084***	0.016	0.098***	0.176***	0.016	0.196***	0.145**	0.201***	0.311***	bcde
	Total effect	−0.017	0.297***	0.483**	0.432***	0.210**	0.085	0.205***	0.195	0.512***	0.443***	e
Chronic conditions	Direct effect	0.002	0.281***	0.464**	0.420***	0.222**	0.109	0.134**	0.142	0.493***	0.441***	be
	Indirect effect	−0.021*	0.021***	0.02	0.015	−0.011	−0.024*	0.075***	0.058**	0.202*	0.005	b
	Total effect	−0.019	0.303***	0.487**	0.435***	0.210**	0.085	0.210***	0.200	0.513***	0.446***	e
ADL	Direct effect	0.019	0.259***	0.441**	0.359***	0.169*	0.109	0.108*	0.115	0.425***	0.326***	b
	Indirect effect	−0.037	0.038**	0.042	0.073***	0.041*	−0.022	0.098***	0.081*	0.087***	0.116***	be
	Total effect	−0.018	0.298***	0.483***	0.431***	0.210**	0.087	0.207***	0.196	0.512***	0.442***	e
IADL	Direct effect	−0.019	0.293***	0.452***	0.386***	0.184*	0.080	0.192***	0.116	0.442***	0.382***	e
	Indirect effect	0.001	0.006	0.035	0.048**	0.027	0.006	0.015*	0.082***	0.069***	0.062***	
	Total effect	−0.018	0.299***	0.487**	0.434***	0.210**	0.086	0.207***	0.199	0.511***	0.445***	e

Health and Retirement Study, 2006–2018. USB and FB refer to respondents who are US-born and foreign-born. All models adjust for both time-varying and time-constant demographic and socioeconomic characteristics. a, b, c, d, and e stand for any statistically significant gender difference ($p < 0.05$) in corresponding mediation effects for FB White, USB Black, FB Black, USB Hispanic, and FB Hispanic relative to their USB White counterparts, respectively

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

challenges they encounter. Several factors may account for these results. According to the stress process model, racial/ethnic minorities might exhibit greater emotional flexibility and faster recovery in response to stress in later life, developed through earlier and more frequent exposures to adversities [60, 61]. Notably, similar stressful life events have more detrimental effects on the mental health of White and high-SES individuals compared to racial/ethnic minorities and low-SES groups [60, 61]. On the other hand, compared to their US-born counterparts, racial/ethnic minority immigrants and women, positioned at the interlocking axes of oppression, may encounter overwhelming stress and racism that accumulate during the racialized incorporation process. This parallels the impact on their physical health, as previously observed [12, 62]. Recent empirical evidence suggests that although Hispanic immigrants may enjoy longer lives than their White counterparts (the "Hispanic paradox"), their later lives are marked by more socioeconomic hardships and stress compared to White individuals, while sharing similar health risks with Black individuals [9, 63]. In a similar vein, despite their lower mortality rates, women suffer from higher levels of chronic conditions or functional limitations [64, 65]. With they age, women also experience steeper post-retirement income declines [66], are more likely to transition into widowhood [67], and possess significantly less wealth [68]. These factors may put Hispanic immigrants, especially women, to further disadvantages in later stages of life course.

Another significant finding of our study pertains to the substantial contribution of both social isolation and physical health to mental health disparities. Specifically, we observe that physical health explains a larger portion of the disparities, particularly in the differences between Hispanic immigrants and US-born Whites. Our comprehensive assessment of social isolation indicators captures the multidimensional nature of social connectedness, encompassing kinships, non-kin relations, social integration, and the quantity and quality of social support. Consistent with recent empirical evidence [17, 69], we find that White older adults and women hold overall advantages in both subjective and objective social isolation indicators in middle and later life. Although Black and Hispanic Americans have denser and more extended familial relationships [70, 71], higher religious involvement, and fictive kin ties extending beyond marginalized communities, these relations did not bring about better social connectedness or perceived social support [72, 73].

Moreover, we validate the distinctive mediation effects of social isolation and physical health. Although both objective social isolation and subjective social isolation can significantly mediate disparities experienced by US-born Black individuals and foreign-born Hispanic individuals, subjective social isolation demonstrates a stronger mediation effect, particularly for foreign-born Hispanic women.

Notably, a significant proportion of Hispanic women migrate to the U.S. to unite with their husbands, a trend driven by immigration policies that prioritize family reunification [74]. Consequently, their social integration into new social contexts may face challenges posed by language or cultural barriers [28], potentially fostering social isolation that detrimentally influence their mental wellbeing. This finding also aligns with previous research indicating that emotional aspects of social isolation may have greater significance for individuals' physical and psychological wellbeing compared to objective characteristics [75–77]. Perceived social isolation can better capture the dynamic and multifaceted nature of social networks, incorporating both positive and negative aspects to more accurately reflect simultaneous and ambivalent emotions within social relationships [39].

Furthermore, physical health accounts for a larger extent of social disparities compared to both objective and subjective social isolation, and the gender disparities are especially prominent among US-born Blacks and Hispanic immigrants. Controlling for socioeconomic status, social isolation, and physical health eliminates statistically significant disparities between Hispanic immigrants and their US-born White counterparts. These findings provide further support for our previous conclusions about Hispanic immigrants, who initially demonstrate better physical health due to the highly selective migration process but encounter fast erosion of these advantages due to cumulative experiences of systematic discrimination throughout their lives [12, 62, 64, 78]. Notably, Hispanic immigrant women may suffer more in this process due to the intersection of multiple marginalized identities [79, 80].

Our research is not without limitations that warrant consideration. Firstly, it is important to acknowledge the potential left-censoring issue in our study due to the age restriction of the Health and Retirement Study (HRS) sample, which only includes respondents over the age of 50. While we have appropriately addressed the right-censoring issue through the use of mixed-effects growth curve models and the control for attrition status, it is important to interpret our findings with the understanding that they are conditional upon individuals reaching midlife. Future research that includes younger age cohorts would provide a more comprehensive understanding of mental health disparities across the life course. Secondly, although we argue that systemic racism contributes to the mental health disparities observed among Hispanic and Black immigrants in later life, we did not explicitly examine the racialized acculturation process. Future studies can enhance our understanding by incorporating measures of racial discrimination and residential segregation, allowing for a more nuanced exploration of the underlying mechanisms at play. Additionally, it is important to note that our study focused on mediating factors that explain the mean level differences in mental health (the intercept), rather than the age trajectories

(the growth rates). Future studies that can incorporate retrospective analyses and utilize a life course mediation framework [81] would provide valuable insights into the causal pathways and temporal dynamics of mental health disparities. Finally, we were unable to distinguish between documented or undocumented immigrants due to the data limitation [82, 83]. We acknowledge that treating them as an integral group may lead to an underestimation of the disadvantages and challenges faced by undocumented immigrant older adults, who often reported poorer health and wellbeing [84] and persistently encounter disparities within the U.S. healthcare system [85]. Considering that undocumented immigrants already accounted for around 23% of all U.S. immigrants in 2017 [86], we emphasize the importance of incorporating the distinction between documented and undocumented immigration status, along with its intersections with other social identities to future health and policy research.

In conclusion, the current study makes significant strides in enhancing our understanding of health disparities and informing policymaking across various dimensions. Addressing the research question, our investigation employs a life course-intersectional framework, shedding light on the dynamic interplay of race/ethnicity, nativity, and gender in shaping mental health trajectories. By doing so, we provide a comprehensive examination of the interconnectedness of these social identities and their profound implications for mental health outcomes. Building upon existing efforts to unravel mental health disparities, our study explicitly investigates the mediating roles of physical health and social isolation through the utilization of generalized structural equation modeling. This analytical approach refines our ability to capture intricate relationships between social identities and health outcomes, enabling more accurate pathway analyses [58, 59]. Furthermore, our study advances the field of health trajectory inequality by delving into the experiences of older Hispanic men and women. This population group is of particular importance due to their expected rise in proportion within the aging population in the U.S. [87]. In addressing the research question, our findings underscore the urgency of reframing interventions and policies to address social disparities in mental health. The combination of race/ethnicity, nativity, gender, and age as amplifiers of mental disorder risks underscores the imperative for interventions and policies grounded in an intersectional approach. These social identities are not separate dimensions of social stratification but rather simultaneously define risk factors that undermine mental health across the life course. In response, the application of a life course-intersectional approach empowers researchers and policymakers to identify the most vulnerable subpopulations, offering a foundation for designing effective strategies to alleviate social disparities in mental health.

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Declarations

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