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Racial/Ethnic Differences in Early Life Mortality in the United States

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Abstract

U.S. early life (ages 1–24) deaths are tragic, far too common, and largely preventable. Yet demographers have focused scant attention on U.S. early life mortality patterns, particularly as they vary across racial and ethnic groups. We employ the restricted-use 1999–2011 National Health Interview Survey-Linked Mortality Files and hazard models to examine racial/ethnic differences in early life mortality. Our results reveal that these disparities are large, strongly related to differences in parental socioeconomic status, and expressed through different causes of death. Compared to non-Hispanic whites, non-Hispanic blacks experience 60%, and Mexican Americans 32% higher risk of death over the follow-up period, with demographic controls. Our finding that Mexican Americans experience higher early life mortality risk than non-Hispanic whites differs from much of the literature on adult mortality. We also show that these racial/ethnic differences attenuate with controls for family structure and especially with measures of socioeconomic status. For example, higher mortality risk among Mexican-Americans relative to non-Hispanic whites is no longer significant once we control for mother's education or family income. Our results strongly suggest that eliminating socioeconomic gaps across groups is the key to enhanced survival for children and adolescents in racial/ethnic minority groups.

Keywords

Race/ethnicity; early life mortality; NHIS; United States

Introduction

U.S. early life (ages 1–24) deaths are tragic, far too common, and largely preventable, but seriously understudied. They have devastating long-term socioeconomic and mental and physical health impacts on parents, surviving siblings, and the larger community (Fletcher et

al. 2013; Rogers et al. 2008; Song et al. 2010). One of the major findings of a recent National Research Council and Institute of Medicine report was “the alarming scale of health disadvantage among children and adolescents in the United States compared with their peers in other high-income countries” (NRC/IoM 2013, p. 232). While U.S. early life mortality rates are magnitudes lower than adult mortality rates and have continued to decline (Xu et al. 2016), they are unacceptably high and particularly so for some population subgroups. Furthermore, racial/ethnic diversity has increased over time in the United States, especially among children and adolescents. Yet even in the face of tragic and preventable deaths, large societal impacts, growing racial/ethnic diversity, and wide international disparities, exceptionally few studies have conducted multivariate analyses of early life mortality in the United States. This paper addresses this gap in the literature by producing some of the first contemporary multivariate estimates of racial/ethnic differences in early life mortality in the United States.

Over the last several decades, research on racial/ethnic differences in early life mortality has been scant, with the important exception of yearly descriptive reports from the National Center for Health Statistics (NCHS). Such reports consistently show that compared to non-Hispanic white children and youth, African Americans experience higher and Hispanics (or Mexican American, when separately specified) experience modestly lower age-specific mortality rates (Xu et al. 2016). But such informative reports are limited to tabulations and do not analyze differences. Studies outside of these descriptive reports are few, but suggest that disparities are an important feature of racial/ethnic patterns in early life mortality (Howell et al. 2010).

Further, understanding recent racial/ethnic patterns in early life mortality is particularly important given demographic shifts. The racial/ethnic composition of the U.S. child and youth population has changed considerably over the last several decades, which underlines the importance of monitoring early life mortality patterns. Between 1990 and 2012, for example, “the percentage of white children declined from 69 to 53 percent, while the percentage of Latino children doubled, from 12 to 24 percent” (Annie E. Casey Foundation [AECF] 2014, p. 7). By 2020, minority children will outnumber non-Hispanic white children (Flores and Lesley 2014). Importantly, children born to African American and Hispanic parents continue to have access to far fewer health-enhancing resources than their non-Hispanic white counterparts (Hernandez and Napierala 2013). Mehta and associates (2013) recently documented little closure in racial/ethnic disparities on 17 indicators of child health between 1998 and 2009; in general, health problems were most common among non-Hispanic black children, followed by Hispanic children,[1] while non-Hispanic white children tended to have the most favorable health on most indicators. Yet these health disparities may differ from early life mortality, since the latter is an extreme, rare event that may precipitate from different risk factors compared to health outcomes.

[1]We use the term Hispanic to refer to Mexican-Americans, Cuban Americans, Puerto Rican Americans, and Other Hispanics. Much research examines Hispanics without disaggregating by country of origin. When data permit, we separately examine Mexican-Americans and Other Hispanics.

The overarching goal of this paper is to develop an in-depth understanding of racial/ethnic differences in early life mortality in the United States. We first document racial/ethnic disparities in early life all-cause mortality in the United States and then assess the extent to which these disparities are due to differences in family structure and socioeconomic resources across the groups. We follow-up the analysis of all-cause mortality with an analysis of racial/ethnic differences in cause-specific mortality.

Factors that Contribute to Racial/Ethnic Differences in Early Life Mortality

The core hypothesis underlying our paper is that racial/ethnic differences in early life mortality patterns may depend largely on group differences in access to socioeconomic resources that provide healthy and safe environments for children. Of prime importance to our study is the set of *socioeconomic resources*—parental education, family income, parental wealth, and possession of health insurance—that parents can deploy to help ensure the health, safety, and survival of their children. Groups with more resources use them to avert behavioral and environmental risks, take advantage of new health-related information and technologies, and interact with other high-SES individuals to minimize the risk of premature death. Groups with lower socioeconomic status (SES) have fewer of these powerful flexible resources to insure health and avert early death (Link and Phelan 1995; Phelan et al. 2010; Phelan and Link 2015). For example, African and Mexican Americans have had far less opportunity to purchase homes throughout American history. Homes that are owned are generally safer than those that are rented (e.g., more likely to have working smoke detectors and to be in safe neighborhoods), which protects against fire-related and accidental deaths (Grossman 2000).

We expect that differences in parental socioeconomic resources will explain a substantial portion of racial/ethnic disparities in early life mortality. In 2013, for example, 39% of African American children and 33% of Hispanic children lived in poverty, compared to 14% of non-Hispanic white children (AECF 2015). Other valuable children's resources (e.g., parental education, housing in safe and resource-rich neighborhoods, possession of health insurance) also continue to exhibit wide variation across groups, with African American and Hispanic children having access to far fewer of these health-enhancing resources than their white counterparts (Hernandez and Napierala 2013; Lareau 2003). Compared to non-Hispanic whites, Hispanics have low rates of health insurance coverage in part because of low incomes, but also because of higher levels of employment in companies that do not pay for employee health insurance, greater residence in states that have not expanded Medicaid coverage, and a much higher level of undocumented status (Pastor, Reuben, and Duran 2015). Lower levels of insurance coverage can limit access to healthcare providers and delay diagnosis, detection, treatment, and follow-up of health conditions (Pastor, Reuben, and Duran 2015; Riosmena et al. 2015).

There are also wide racial/ethnic differences in *family structure* that may also be associated with differences in early life mortality risk. In 2011, the percentage of births to unmarried women was 72.1 among non-Hispanic blacks, 53.5 among Hispanics, and 29.3 among non-Hispanic whites (Martin et al. 2013). In 2013, 67% of African American, 42% of Hispanic, and 25% of non-Hispanic white children lived in single-parent families (AECF 2015).

Family structure differences across groups is strongly influenced by racial/ethnic inequalities in education, employment, income, and incarceration (Hummer and Hamilton 2010; McLanahan and Percheski 2008; Western and Pettit 2010).

Two-parent families may have more available time and, by definition, more supervisory eyes to protect their children in comparison to single-parent families (Jones and Mosher 2013), perhaps especially from unintentional injuries. Family structure is associated with early life mortality risk in large part because it is so highly correlated with parental SES. Parental SES is both a cause and consequence of family structure (McLanahan and Percheski 2008). In 2013, poverty was three times higher in single-parent families (34%) than in families with a married couple and children (11%) (AECF 2015). Compared to children living in two-parent families, those in single-parent families experience greater food insecurity and are more likely to live in substandard housing (Blackwell 2010; McLanahan 2004). Parents with high levels of education are also more likely to get and stay married than their less educated counterparts (Cherlin 2010; McLanahan and Percheski 2008). Thus, while family structure may exhibit a strong association with early life mortality risk and may help explain racial/ethnic differences in early life mortality, we expect that the inclusion of SES measures in our models will largely diminish the influence of family structure.

Adult mortality disparities are largest for preventable causes of death—those which flexible resources are most important in thwarting (Masters et al. 2014; Phelan et al. 2004). And the overwhelming majority of U.S. deaths in early life are preventable. Compared to children and youth in other high-income countries, American children and youth experience remarkably high mortality from motor vehicle accidents, non-transport-related injuries (e.g., drowning, fires, poisonings), and homicides (NRC/IoM 2013). In the United States in 2012, nearly two-thirds of early life deaths (ages 1–24) were due to unintentional injuries (38.4%), homicide (13.6%), and suicide (13.4%)—all preventable causes (CDC 2015). Adolescent and young adult suicide and motor vehicle mortality risk may both be higher among non-Hispanic whites than non-Hispanic blacks or Hispanics (Xu et al. 2016). But other common causes of preventable early life death are documented to be much higher among minority groups.

Exceptionally troubling and worthy of substantial attention are the high rates of U.S. death from homicide, which is the second leading cause of death among ages 1–24 (CDC 2015). Given tabulations from recent NCHS reports (Xu et al. 2016), we expect to find large racial/ethnic disparities in early life mortality risk from homicide because it is a preventable cause that is strongly dependent on socioeconomic resources (Rogers et al. 2001). In 2012, homicide was the leading cause of early life mortality among non-Hispanic black males (contributing to 43.3% of all deaths), the second leading cause among Hispanic males (contributing to 18.3% of all deaths), and the fourth leading cause among non-Hispanic white males (contributing to 4.5% of all deaths; derived from NCHS). At the same time, we expect to find smaller disparities among less preventable causes, such as childhood cancers, heart disease, and stroke, which respectively account for 7.5%, 3.3%, and 0.8% of deaths in early life (derived from CDC 2015).

Hispanic Paradox?

Our documentation and examination of early life mortality patterns also provides insight into the Hispanic Paradox (HP), a concept based on the counterintuitive finding that Hispanics have an equal or lower risk of death than non-Hispanic whites in spite of their lower SES (Markides and Coreil 1986). The HP is most pronounced among Hispanic immigrants and is less pronounced among US-born Hispanics (Lariscy et al. 2015). Given their overall low SES, the HP is also especially striking among Mexican Americans (Hummer et al. 2000; Markides and Eschbach 2011). A central factor related to the HP is selective immigration of healthy adult Mexicans and, to a lesser extent, emigration of unhealthy older Mexican Americans (termed the salmon bias) (Markides and Eschbach 2011; Riosmena et al. 2015). Although the HP has also been attributed to issues surrounding data quality (Palloni and Arias 2004), most studies report that the mortality advantage of Hispanics is robust to data quality issues (Hummer et al. 2007; Turra and Elo 2008).

Despite the large body of work on the HP among U.S. adults, mounting evidence suggests that the HP may not apply to children. Compared to non-Hispanic white children, non-Hispanic black and Hispanic children fare worse on most health-related behaviors and outcomes (Mehta et al. 2013). Similarly, Schuster and colleagues (2012) showed that, compared to non-Hispanic whites, Hispanic and non-Hispanic black children were more likely to witness violence in the past year, be obese, and have parental reports of fair or poor health; and they were less likely to engage in vigorous exercise in the past week or injury prevention (by wearing a seat belt when in the car and a helmet when on a bike). Yet most of these racial/ethnic disparities attenuated or were no longer statistically significant, especially among Hispanics, with statistical adjustments for parental SES and characteristics of the child's school.

The most recently available vital statistics data for the year 2013 indicate that, compared to non-Hispanic whites, Hispanics have slightly lower mortality rates in each age group up through 25 and noticeably lower mortality rates at older adult ages (Xu et al. 2016). But these results are based on data that come from death certificates in the numerator and census estimates in the denominator, which are known to be biased because numerator data are often based on race/ethnicity reports of a funeral director or informant, while denominator data are based on family or household reports (Arias et al. 2008). The data we use are based solely on family or household reports of child/youth race/ethnicity and thus are immune to this numerator-denominator bias.

Data and Methods

Data

We use the National Health Interview Survey-Linked Mortality Files (NHIS-LMF) for this analysis. Because of the relatively small number of deaths among certain population subgroups, NCHS restricted the use of these data for ages less than 18 to researchers who have received approval for their research proposals and who analyze the data at a Federal Statistical Research Data Center (NCHS nd). We analyze 11 years of cross-sectional NHIS records (1999–2009) linked to 13 years of subsequent mortality records (1999–2011). The

NHIS-LMF is a superb nationally representative data set that includes detailed information about race/ethnicity, other demographic characteristics, and parental SES, family structure, and geographic area of residence for each child and youth.

We use data from the Minnesota Population Center's (MPC's) Integrated Health Interview Series (IHIS), which NCHS then linked to the NHIS-LMF. The IHIS assembles data from the NHIS and harmonizes the codes across years (MPC 2012). Our analyses focus on individuals aged 1–17 at the time of the survey, who are then statistically followed for survival status until their 25th birthday, the end of the year 2011, or their death. The 1–17 baseline age range is when most individuals live at home with their parent(s), are still enrolled in school, and are unlikely to have started full-time work. We do not use the NHIS-LMF to analyze infant mortality because most infant deaths occur very early in the first year of life (Hummer et al. 2007), and infants who are hospitalized or die in the first few hours or days of life are unlikely to be included in the NHIS. Each of the 11 years of NHIS surveys we use include about 22,000 individuals aged 1–17 at the time of the survey, producing a pooled dataset of 246,452 individuals (excluding those who were marked ineligible for mortality follow-up by NCHS or did not have valid age at interview information). We omit children/youth who were reported to be Asian/Pacific Islander, American Indian/Alaska Native, and Other racial/ethnic background because the sample sizes are too small to examine, leaving 234,046 children/youth of non-Hispanic white, non-Hispanic black, Mexican-American, or other Hispanic race or ethnic origin. Among this sample, a total of 683 individuals (0.3%) died between the ages of 1 and 24 during the follow-up period.

Variables

Our analyses include demographic, socioeconomic, family structure, and geographic variables. For all respondents in the NHIS under age 18, a "knowledgeable adult member of the household" provides information on their behalf (CDC 2014). Demographic factors include the race/ethnicity, age, sex, nativity, and region of residence for each child or youth. We examined non-Hispanic whites (referent), non-Hispanic blacks, Mexican-Americans, and Other Hispanics. Other Hispanics includes Cuban Americans, Puerto Ricans, Central and South Americans, and others of Hispanic origin.

Sex is measured as female (referent) or male. We also control for nativity (U.S.- versus foreign-born children). Region of residence is classified by Census region (Northeast [referent], Midwest, South, or West). Individuals residing in the Southeast and Midwest typically experience higher mortality (Avendano and Kawachi 2014). Family structure includes two-parent households (referent) in comparison to all other family structures; the small number of deaths to children living in most types of family structures limits additional detail.

SES is based on the parents' characteristics and includes their income-to-needs ratio, home ownership (as an indicator of parental wealth), health insurance coverage, and mother's education. Education is a central measure of SES because it is established relatively early among adults, typically remains stable over time, and is regularly reported in the NHIS. We use mother's education because researchers underscore this measure as critically important for child wellbeing (McLanahan 2004). Mother's education is preferred to father's education

because it is more commonly and accurately reported, the mother being more often the primary caregiver and respondent. We classify mother's education as less than high school diploma, high school diploma or GED, some college or associate's degree, and college degree or higher (referent). The income-to-needs ratio is calculated as the ratio of household income to the poverty threshold for that year and household size. The income-to-needs ratio is preferred to income because it adjusts for income differences in different years and can thus be used for multiple survey years. We categorize the income-to-needs ratio as less than 100% of the federal poverty line, 100% to less than 200%, 200% to less than 300%, and 300% or more (referent). We code homeownership as owning or buying (referent) versus all other arrangements (including renting). And we code health insurance coverage as any coverage (referent) versus no coverage (0).

Mortality risk is our dependent variable and is measured by both overall and cause-specific mortality. Our cause-specific analysis includes external causes, which are the major causes of death in early life, and non-external causes (including, for example, cancer, heart disease, and cerebrovascular diseases). Small numbers of deaths prevent us from examining non-external causes in more detail. External causes are further subdivided into unintentional injuries (accidents), intentional self-harm (suicide), and assault (homicide). We code causes of death according to the World Health Organization's (2007) 10th revision of the *International Statistical Classification of Diseases, Injuries, and Causes of Death* (ICD-10).

Methods

We use Cox proportional hazard models to examine racial/ethnic differences in early life mortality (Allison 1982). We adjust for age through the time scale of the Cox models, using age at interview as the entry point and calculating duration as the age at censor (age at death, age 25, or age at the end of the follow-up period in December of 2011). This approach produces less bias than models that include age as a covariate (Thiébaut and Bénichou 2004). Tests of proportionality indicated that early life mortality risk is proportional by race/ethnicity.[2]

We begin with all children/youth aged 1–24; these inclusive models first estimate basic racial/ethnic differences in early life mortality net of demographic factors (adjusting for age and controlling for sex). We then sequentially add controls for nativity, region, family structure, and SES. Importantly, we estimate racial/ethnic differences in cause-specific mortality, albeit with a less comprehensive set of models, to provide the most precise patterns of differentiation possible.[3] We adjust our analyses for sample weighting and the complex sampling frame of the NHIS. We drop records of children/youth whose informants did not supply enough information in the NHIS to be linked to a death record and

[2]Mortality risk differs by sex at these ages, however, and we examined sex-stratified models. Because of the smaller number of deaths in these stratified models, standard errors were larger. But the estimates were generally similar, though Other Hispanic females (but not males) showed reduced mortality risk compared to their non-Hispanic counterparts, and other family structure was associated with higher mortality among males (but not females).

[3]Because Cox models adjust for no deaths within specific age groups, suicide mortality results are identical for analyses based on the full range of early life ages and on analyses restricted to ages 10 and above (when our dataset reports deaths due to suicide). For consistency, all cause-specific models include the full range of early life ages.

reweighted the “mortality eligible” records with NCHS-supplied weights to best account for their exclusion (NCHS 2009).

To retain the full sample in the analyses, and to produce efficient and unbiased estimates, we use multiple imputation to fill in missing values for our key covariates (Allison 2002). We use a multivariate normal Markov Chain Monte Carlo approach, creating five datasets (StataCorp 2011). All independent and dependent variables inform imputation. We impute less than 0.1% for family structure, 0.5% for health insurance, 1.0% for home ownership, 7.4% for mother’s education, and 19.7% for income-to-needs ratio. Among decedents, 75% had complete information, compared to 76% of surviving children. For individuals with complete information and for those with at least one missing value, the same percentage died (0.3%). Comparing results from models using complete cases and imputed values reveal no substantive differences. Because our sample includes a modest number of deaths, we present significance levels at $p<.10$, in addition to the more conventional significance levels.

We perform a number of statistical and methodological checks to ensure that our results are robust. Our analyses produce overall age- and sex-specific mortality rates very similar to those of vital statistics data. Compared to discrete-time models, Cox proportional hazards models have the advantages of allowing the underlying baseline hazard to differ at each age in the analytic sample, are more compatible with multiple imputation, and run more efficiently. Thus, we present results from the Cox models; discrete-time models produced very similar results.

Results

Table 1 presents the distribution of demographic and socioeconomic characteristics among children and youth in the United States between 1999 and 2009, both for the whole sample and by race/ethnicity. Compared to non-Hispanic white children, Mexican-American children are on average younger, and more likely to live in the West, live in single-parent or other family structures, lack health insurance, live with a mother who has obtained a lower level of education, live in a poor or near-poor family, and live in a family that does not own their home. Just 8.2% of non-Hispanic white children but over half of Mexican-American children live with a mother who has less than a high school education. Compared to non-Hispanic white children, non-Hispanic black children are more likely to live in the South, live in a single parent or other non-two parent family structure, and live in a lower SES family. For example, less than 10% of non-Hispanic white children/youth but over one-third of non-Hispanic black children/youth live in families with income-to-needs ratios of less than 100%. Additionally, 70.5% of non-Hispanic white but just one-third of African American children live in two-parent families. We expect that these socioeconomic and family structure differences will explain some of the racial/ethnic disparities in early life mortality.

Table 2 displays a series of Cox regression models of racial/ethnic differences in early life mortality. Compared to non-Hispanic whites, non-Hispanic black and Mexican-American children and youth have significantly higher risk of death over the follow-up period (with

hazard ratios [HRs] of 1.60 and 1.32, respectively), with demographic controls (Model 1). Other Hispanic children show no significant difference in mortality risk relative to non-Hispanic whites in any of the models. Because of low mortality among Hispanic immigrant children and youth (i.e., indicating either the healthy immigrant effect and/or the salmon bias effect), controlling for nativity increases the Mexican-American HR from 1.32 to 1.41 between Models 1 and 2. Higher mortality risk among non-Hispanic blacks and Mexican-Americans diminishes slightly but remains significant when controls for region of residence and family structure are added in Models 3 and 4, respectively. As indicated in Table 1, compared to non-Hispanic whites, Mexican-Americans have lower SES. Thus, controlling for any single measure of SES (see Models 5 through 8) attenuates the HRs for Mexican-Americans. Moreover, the controls for mother's education and income-to-needs ratio are so powerful that there is no significant difference in early life mortality between Mexican-Americans and non-Hispanic whites with the inclusion of either of them (see Models 5 and 8, respectively). Similarly, controlling for SES attenuates the significant HRs for non-Hispanic blacks, but only in the model with all SES controls (Model 9) does the main effect for non-Hispanic blacks lose significance. The largest attenuation in the black/white early life mortality gap occurs with control for the income-to-needs ratio. Indeed, the ln(HR) drops by 37.6% with control for income-to-needs ((ln[1.43] – ln[1.25])/ln[1.43] * 100) (compare Models 4 and 8). The final model (Model 9), with full controls for demographic characteristics, region, family structure, and SES, shows no significant differences in early life mortality between non-Hispanic whites and Mexican Americans, African Americans, or Other Hispanics.[4,5]

Table 3 reveals racial/ethnic differences in cause-specific mortality. Compared to non-Hispanic whites, non-Hispanic blacks have 48% higher risk, and Mexican-Americans have 32% higher risk of external cause mortality over the follow-up period with controls for basic demographic factors, but no significant differences in the full model. There are no significant racial/ethnic differences in mortality risk due to unintentional injuries, but very wide differences in homicide and suicide mortality. Compared to non-Hispanic whites, the HRs for homicide mortality are 9.68 for non-Hispanic blacks and 6.50 for Mexican-Americans, net of demographic characteristics. These exceptionally large mortality differentials attenuate somewhat but remain large and significant with controls for family structure and SES. Compared to non-Hispanic blacks, non-Hispanic whites are twice (1/.49) as likely to commit suicide over the follow-up period. Compared to non-Hispanic whites, non-Hispanic blacks and Mexican-Americans generally have higher mortality risk for non-external causes of death, with demographic controls. The higher risk of non-external causes of death persists for non-Hispanic blacks but is no longer significant for Mexican Americans once we control for family structure and SES.

[4]Auxiliary models that omitted health insurance and homeownership, and that omitted family structure produced marginally significant hazard ratios for non-Hispanic blacks, with a 23% increased risk of death compared to non-Hispanic whites. Other effects remained similar.

[5]We tested but did not find a significant interaction between age and race/ethnicity in discrete-time models. We also disaggregated our results by age group to determine whether different age patterns would emerge. We found no discernable patterns, although specific age variations might be obscured because of small cell sizes.

Auxiliary Analysis of Race/Ethnic Differences in Mortality by Age Group

To provide a more complete picture of how patterns of early life mortality compare with those of later life mortality using the same NHIS-LMF data source, Table 4 presents hazard ratios of racial/ethnic differences in mortality disaggregated by age group. Panel A indicates that compared to non-Hispanic whites, mortality over the follow-up period and among non-Hispanic blacks is quite high in early life (HR 1.60), highest among young and middle aged adults (HR of 1.74 and 1.72, respectively), and equivalent at the oldest ages (HR of 1.04 at ages 75 and above), controlling for age and sex. Additional controls for nativity do little to affect black-white gaps in mortality.

Compared to non-Hispanic whites, Mexican-Americans exhibit the highest relative mortality over the follow-up period in early life (HR 1.32), significantly higher mortality among young and middle-aged adults (HRs of 1.23 and 1.20, respectively), and significantly lower mortality at older ages (HRs of 0.87 and 0.79 among ages 65–74 and 75 and over, respectively), controlling for age and sex (Panel A). Adding a control for nativity increases the HRs for Mexican-Americans in each age group, but with the greatest impact among young and middle-aged adults. Controlling for nativity has an especially large suppressor effect for young adults (ages 18–44), where the HRs for Mexican-Americans increases from 1.23 to 1.53 from Panel A to B. Furthermore, among Mexican-Americans, early life displays the largest HR with basic controls for age and sex (Panel A), but young and middle-aged adults exhibit the highest HRs with additional controls for nativity (Panel B). Clearly, Mexican American mortality is much lower than non-Hispanic whites at older ages, but is significantly higher in early life.

Conclusions

This paper documents twenty-first-century U.S. racial/ethnic patterns of early life mortality based on individual-level data that allows for multivariate modeling of explanatory variables. We find substantial mortality disparities between non-Hispanic blacks and Mexican-Americans relative to non-Hispanic whites, due largely to socioeconomic differences between groups.

The results contribute to the understanding of the critical role of socioeconomic resources for children’s survival early in the life course. The attenuation of racial/ethnic differences in early life mortality with the inclusion of SES variables indicates that SES offers flexible resources to families that are used to mitigate risk and augment safety. However, SES may also be correlated with other important factors that we are unable to measure with our data. For example, given the salience of residential segregation by race/ethnicity and SES in the United States, family level SES may serve as a partial proxy for neighborhood level SES. We are unable to make causal conclusions as to the role of SES in mediating race/ethnic differences in early life mortality, but because of the strong associations shown in our results, we highlight the importance of reducing SES disparities to reduce health disparities.

African-Americans exhibited the highest early life all-cause mortality of the racial/ethnic groups we examined. These differences fully close once we control for SES. Factors that are strongly related to relatively high levels of African-American early life mortality relative to

whites include much high levels of poverty and near poverty; lower levels of homeownership (as an indicator of wealth); lower levels of maternal education; and a modestly lower level of health insurance coverage. Indeed, U.S. child and youth poverty rates are substantially higher among African Americans and Hispanics than among non-Hispanic whites. Policies and programs are needed that lift all parents, but especially African Americans, out of poverty, increase homeownership, and elevate levels of adult educational attainment.

Compared to non-Hispanic whites, Mexican American children exhibited higher early life mortality over the follow-up period and with demographic controls, a finding that is generally inconsistent with recent NCHS estimates (see Arias 2014; Xu et al. 2016). While this finding does not comport with the HP, it is consistent with some previous research emphasizing the relatively high mortality among Mexican American children, youth, and young adults (see Eschbach et al. 2007; Hummer et al. 2000; Markides and Eschbach 2011). This is an especially important finding for three reasons. First, if too much attention is focused on the HP of relatively low mortality of older aged Hispanics, the disadvantages faced by children and youth may not come to the forefront of policymakers. Here, however, we highlight the significantly higher early life mortality of Mexican-American children relative to white children, which is especially troubling given the large size of the young Mexican origin population. Second, related recent work has shown significant Mexican-American children's health disadvantages relative to non-Hispanic white children (Mehta et al. 2013; Schuster et al. 2012). Together, then, our findings on mortality and this related body of work on child health shows that social disadvantages among Mexican-American children and youth result in both worse health and higher mortality relative to non-Hispanic whites. Third, some literature on the HP in adulthood suggests that low mortality may be a data artifact, given outmigration of unhealthy older adults to Mexico (Palloni and Arias 2004). But such data artifacts are less likely in early than later life because there is greater probability of accurate age reporting among children and youth, because there is much less chance that immigrant children/youth will return to their native country given the low percentage of foreign-born children/youth, and because the low risk of early life mortality means that any deaths are more likely to stand out as potential matches in the linked data set we are using. Overall, then, the higher Mexican-American early life mortality we show in this paper is a troubling pattern that, combined with recent related work on child health, is cause for much concern.

Mexican-American children and youth may experience higher mortality risk than non-Hispanic whites because of substantially lower family SES, less access to healthcare, and low immigration rates among children. Our findings strongly suggest that Mexican-American children are disadvantaged due to lower family SES; similar to the comparison between non-Hispanic blacks and whites, the mortality disparity between Mexican-American and white children/youth was fully eliminated with controls for SES. Strong social policies and programs will be needed to address the substantial socioeconomic disadvantages that Mexican-American children and their parents face in contemporary American society (National Research Council 2006).

Our results show that wide racial/ethnic disparities in early life mortality is due in part to external causes of death. The high risk of suicide mortality among non-Hispanic white

adolescents and young adults is especially disconcerting because U.S. suicide mortality rates among these age groups rose between 1990 and 2014 (Curtin, Warner, and Hedegaard 2016). This is a major area of concern for the nation as a whole and, given our findings, for white youth in particular. We also found strikingly high relative differences in homicide mortality when comparing Hispanics to whites (see also Eschbach et al. 2007) and especially when comparing non-Hispanic blacks to whites. We showed that the exceptionally high African American homicide risk is due in part to lower levels of SES among blacks, but remains much higher than whites net of SES and other factors. Compared to non-Hispanic whites, non-Hispanic blacks have a 5.3-fold higher risk of homicide mortality over the follow-up period, even net of demographic factors, family structure, and SES. Social programs and prevention efforts—including policies that improve socioeconomic conditions among parents—should be committed to reducing the deplorably high homicide mortality of our children and youth, a dreadful cause of death that sets the United States apart from all other high income countries.

Children and adolescents generally experience higher mortality risk in the United States than in other high-income countries (NRC/IoM 2013). For instance, the annual mortality rate per 100,000 children aged 1–19 is about 32 in the United States compared to between 15 and 25 in other OECD countries (NRC/IoM 2013). Relatively high U.S. early life mortality increases variations in lifespans and shortens life expectancies (Vaupel, Zhang, and van Raalte 2011). Moreover, the U.S. relative mortality disadvantage is increasing: the other 16 high-income countries included in the report outpaced the United States in reducing their early life mortality rates over the past 25 years (NRC/IoM 2013). Given the progress that has been made in other high income countries (see Ho 2013; NRC/IoM 2013), the United States should be able to reduce substantially the 37,894 yearly early life U.S. deaths (Xu et al. 2016), increase the pace of mortality reductions over time, reduce variations in life span, and close the widening gap between the United States and peer countries, which would in turn contribute to a brighter future for our children, youth, family and community members, and the nation at large (Fletcher et al. 2013; Rogers et al. 2008; Song et al. 2010).

Our findings shed light on a critical U.S. social/health problem and strongly suggest that eliminating socioeconomic gaps across racial/ethnic subpopulations is crucial to enhancing survival for children and adolescents in our largest minority groups. Major reductions in early life mortality among African Americans and Mexican Americans may not be realized, though, without aggressive policy efforts to equalize SES across groups. Investing in our children and youth is a wise investment in the country’s future productivity and prosperity, and in their health and longevity.

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Table 1

Early Life Descriptive Statistics, with a Focus on Race/Ethnic Differences, United States, 1999–2011

	Total Population	Non-Hispanic White	Non-Hispanic Black	Mexican-American	Other Hispanic	Died During Follow-up
Population		63.7 %	16.0 %	13.9 %	6.3 %	0.3 %
Demographic Characteristics						
Sex (female)						
Male	51.2	51.3	50.6	50.9	51.3	68.7
Mean age at interview (in years)	9.1	9.2	9.1	8.4	8.7	11.9
Foreign born	3.8	1.7	2.3	11.8	12.0	3.3
Region						
Northeast	17.6	19.4	16.0	1.9	38.3	13.3
Midwest	24.3	29.8	20.2	11.2	7.7	24.8
South	37.3	33.6	56.1	33.5	34.4	41.5
West	20.8	17.1	7.6	53.4	19.7	20.4
Family structure						
Two parents	61.0	70.5	33.7	53.7	49.6	48.7
Other	39.0	29.5	66.3	46.3	50.4	51.3
Socioeconomic Status						
Mother's education						
Less than high school	17.2	8.2	17.9	51.2	31.1	22.9
High school	27.1	26.6	32.4	24.1	26.0	32.6
Associate's/Some college	31.8	33.9	36.2	19.1	27.4	32.0
College degree or more	23.9	31.3	13.5	5.6	15.5	12.5
No health insurance	9.6	6.2	8.8	23.8	14.4	13.7
Not a homeowner	33.1	21.3	57.2	49.2	55.4	38.6
Income-to-needs ratio						
<100%	18.4	9.9	34.4	34.6	27.9	23.2
100–<200%	23.0	18.3	27.4	35.9	29.8	27.1
200–<300%	32.2	36.4	26.2	22.1	27.4	32.9
300%+	26.4	35.4	12.0	7.4	14.9	16.8

Notes: Adjusts for complex sampling design and accounts for missingness using multiple imputation. N=234,046.

Source: 1999–2011 NHIS-LMFs.

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Table 2

Hazard Ratios of Racial/Ethnic Differences in Early Life Mortality, United States, 1999–2011

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Race/ethnicity (NH white)									
NH black	1.60 ***	1.61 ***	1.57 ***	1.43 **	1.32 **	1.42 **	1.29 *	1.25 *	1.19
Mexican-American	1.32 **	1.41 **	1.35 **	1.29 *	1.03	1.22 +	1.21 +	1.07	0.95
Other Hispanic	0.90	0.97	1.03	0.97	0.86	0.95	0.89	0.85	0.79
Sex (female)									
Male	2.11 ***	2.11 ***	2.10 ***	2.11 ***	2.11 ***	2.11 ***	2.11 ***	2.11 ***	2.11 ***
Foreign born		0.60 *	0.60 *	0.60 *	0.58 **	0.55 **	0.57 **	0.56 **	0.53 **
Region (Northeast)									
Midwest			1.37 *	1.38 *	1.36 +	1.37 *	1.40 *	1.34 +	1.34 +
South			1.41 *	1.42 *	1.38 *	1.38 *	1.44 **	1.36 *	1.35 *
West			1.33 +	1.34 +	1.33 +	1.32 +	1.32 +	1.32 +	1.31 +
Other family structure (two parents)				1.31 **	1.23 *	1.30 **	1.25 *	1.16 +	1.14
Socioeconomic status									
Mother's education (college degree or more)									
Less than high school					2.21 ***				1.68 *
High school					1.80 ***				1.48 *
Associate's/some college					1.60 **				1.39 *
No health insurance						1.38 *			1.18
Not homeowner							1.40 ***		1.17
Income-to-needs ratio (300%+)									
<100%								2.09 ***	1.55 *
100–<200%								1.93 ***	1.53 *
200–<300%								1.55 **	1.36 +

*** p ≤ .001;

** p ≤ .01;

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* $p \leq .05$;

† $p \leq .10$.

Notes: All models adjust for age (through the time scale) and the complex sampling design, and account for missingness (using multiple imputation). N=234,046.

Source: 1999–2011 NHIS-LMFs

Table 3

Hazard Ratios of Race/Ethnic Differences in Early Life Cause-Specific Mortality, United States, 1999–2011

	External Causes									
	All External		Unintentional injuries		Homicide		Suicide		Non-external deaths	
Race/ethnicity (NH white)										
NH black	1.48 **	1.11	0.98	0.79	9.68 ***	5.30 ***	0.66	0.49 +	1.80 **	1.42 +
Mexican-American	1.32 *	0.89	1.08	0.77	6.50 ***	2.97 *	0.61	0.54	1.45 +	1.11
Other Hispanic	0.97	0.73	0.91	0.73	3.11 *	1.66	0.42	0.33 +	1.17	0.94
Sex (female)										
Male	2.70 ***	2.71 ***	2.19 ***	2.20 ***	3.89 ***	3.90 ***	5.69 ***	5.69 ***	1.24	1.25
Foreign born	0.64 +	0.55 *	0.76	0.67	0.36 *	0.23 **	0.67	0.68	0.51	0.48
Region (Northeast)										
West	1.25	1.24	1.19	1.16	1.29	1.29	1.18	1.25	1.58 +	1.53
Midwest	1.45 *	1.39 +	1.61 *	1.52 *	1.21	1.16	0.98	1.04	1.31	1.27
South	1.35 +	1.34	1.48 +	1.47	1.04	1.01	1.15	1.17	1.26	1.21
Other family structure (two parents)		1.27 *		1.10		1.56 +		1.97 *		0.88
Socioeconomic status										
Mother's education (college degree or more)										
Less than high school		1.65 *		1.98 *		1.61		0.88		1.78 +
High school		1.41		2.00 **		0.65		0.80		1.65 +
Associate's/some college		1.20		1.52 +		1.07		0.60		1.87 *
No health insurance		1.28		1.36		1.67 +		0.55		0.96
Not home owner		1.12		1.05		1.34		1.43		1.28
Income-to-needs ratio (300%+)										
<100%		1.56 *		1.40		3.91 +		0.98		1.57
100–<200%		1.53 *		1.40		3.71 +		1.23		1.53
200–<300%		1.43 *		1.40 +		2.74 +		1.15		1.24 +

*** p ≤ .001;

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** $p \leq .01$;

* $p \leq .05$;

+ $p \leq .10$.

Notes: All models adjust for age (through the time scale) and the complex sampling design, and account for missingness (using multiple imputation). N=234,046.

Source: 1999–2011 NHIS-LMFs

Table 4

Hazard Ratios of Racial/Ethnic Differences in Mortality by Early Life and Adult Age Group, United States, 1999–2011

	Early Life	Adult Age Groups				
Race/ethnicity (NH white)	**1–17 (25)**	**18–44 (50)**	**45–64 (70)**	**65–74 (80)**	**75+**	**18+**
A. Controlling for Sex						
Non-Hispanic black	1.60 ***	1.74 ***	1.72 ***	1.32 ***	1.04	1.34 ***
Mexican-American	1.32 **	1.23 ***	1.20 ***	0.87 **	0.79 ***	0.99
Other Hispanic	0.90	0.89	0.87 **	0.71 ***	0.76 ***	0.79 ***
B. Controlling for Sex and Nativity						
Non-Hispanic black	1.61 ***	1.78 ***	1.75 ***	1.33 ***	1.03	1.35 ***
Mexican-American	1.41 **	1.53 ***	1.43 ***	0.98	0.87 ***	1.12 ***
Other Hispanic	0.97	1.11	1.11 +	0.86 *	0.90 *	0.96
C. Controlling for Sex, Nativity, and Income-to-Needs Ratio						
Non-Hispanic black	1.25 *	1.45 ***	1.32 ***	1.08 *	0.93 **	1.11 ***
Mexican-American	1.07	1.20 ***	1.04	0.79 ***	0.78 ***	0.90 ***
Other Hispanic	0.85	0.96	0.86 **	0.73 ***	0.83 ***	0.82 ***
D. Controlling for Sex, Nativity, Income-to-Needs Ratio, Health Insurance Status, and Homeownership Status						
Non-Hispanic black	1.19	1.43 ***	1.24 ***	1.05	0.93 **	1.09 ***
Mexican-American	0.95	1.18 **	1.04	0.80 ***	0.79 ***	0.92 ***
Other Hispanic	0.79	0.94	0.81 ***	0.70 ***	0.83 ***	0.80 ***

*** $p \leq .001$;

** $p \leq .01$;

* $p \leq .05$;

+ $p \leq .10$.

Notes: Number in parentheses for each specific age group is the follow-up age. All models adjust for age (through the time scale) and the complex sampling design, and account for missingness (using multiple imputation). N=234,046.

Source: 1999–2011 NHIS-LMFs