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Explaining inequalities in women's mortality between U.S. States

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ABSTRACT

Inequalities in women's mortality between U.S. states are large and growing. It is unknown whether they reflect differences between states in their population characteristics, contextual characteristics, or both. This study systematically examines the large inequalities in women's mortality between U.S. states using a multilevel approach. It focuses on "fundamental" social determinants of mortality at the individual and state levels as potential explanations. We analyze data from the 2013 public-use National Longitudinal Mortality Study on women aged 45–89 years and estimate multilevel logistic regression models. The models include women's personal characteristics (age, race/ethnicity, education, employment, income, and marriage) and states' contextual characteristics (economic environment, social cohesion, socio-political orientation, physical infrastructure, and tobacco environment). We found that variation in women's mortality across states was significant ($p < 0.001$). Adjusting for women's personal characteristics explained 30% of the variation. Additionally adjusting for states' contextual characteristics explained 62% of the variation; the most important characteristics were social cohesion and economic conditions. No significant mortality differences between any two states remained after accounting for individual and contextual characteristics. Supplementary analyses of men indicate that state contexts have stronger and more pernicious consequences for women than men. Taken together, the findings underscore the importance of 'bringing context back in' and taking a multilevel approach when investigating geographic inequalities in U.S. mortality.

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1. Introduction

Life expectancy differs markedly across geographic areas of the United States. These differences have been growing since the 1980s—particularly among women—across regions (Montez & Berkman, 2014), divisions (Fenelon, 2013), states (Wilmoth, Boe, & Barbieri, 2011), and counties (Ezzati, Friedman, Kulkarni, & Murray, 2008). The differences between U.S. states are especially striking when put in international context. In 2000 the range in life expectancy at birth across U.S. states was 7.4 years compared to a range of only 4.7 years across similar high-income countries including Canada, Australia, New Zealand, Japan, and non-Eastern European countries (Wilmoth et al., 2011). The reasons for the differences across U.S. states are poorly understood and a growing area of research (Wilmoth et al., 2011; Patel, Narayan, Ali, & Mehta, 2014; Tencza, Stokes, & Preston, 2014). The present study adds to the research on adult mortality differences across states using a

powerful-yet-underutilized dataset, a multilevel perspective, and an extensive array of states' characteristics.

1.1. Prior research

Prior studies aiming to explain geographic inequalities in U.S. adult mortality generally share two characteristics: (1) they focus on spatially-patterned characteristics of the population and (2) they use an ecological approach (i.e., data aggregated at the county level). For instance, an analysis of U.S. counties found that gains in longevity after the early 1980s were associated with county income and proportion of non-black residents, but unrelated to income inequality and the proportion graduating high school (Ezzati et al., 2008). Another county-level study of mortality trends examined population characteristics such as county-level estimates of race, education, single-parent households, and access to medical care (Kindig & Cheng, 2013). The characteristics most predictive of mortality trends during the 1990s were Hispanic ethnicity, education, population density, median household income, and percent smokers (for women), while access to medical care was not a significant predictor. Another study examined eight empirically-derived areas of the United States. It concluded that

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disparities in longevity among them were not explained by aggregate measures of race, income, or health-care access and utilization (Murray et al., 2006).

In addition to focusing on population characteristics, prior studies are largely ecological analyses of aggregate measures. This partly reflects data limitations, as researchers have had to rely on vital statistics data to investigate subnational mortality. However, as Subramanian, Kawachi, and Kennedy (2001) point out, geographic inequalities in health and mortality reflect an intrinsically multilevel phenomenon. They are influenced by individual and contextual characteristics, and thus "...when we restrict our focus only on one level of analysis (be it individual or ecological [contextual]), rather than use both levels, we obtain a distorted picture of the potential multilevel processes at play" (Subramanian, Jones, Kaddour, & Krieger, 2009: p. 348). The 2013 release of the public-use National Longitudinal Mortality Study has made multilevel analyses possible by unmasking respondents' state of residence. The current study uses this data.

1.2. Geography and gender

Although there is no ideal geographic level for examining health inequalities, there is a long and prominent tradition of focusing on states (e.g., Wilmoth et al., 2011; Patel et al., 2014; Tencza et al., 2014). States are semi-sovereign areas that construct many of their own laws, policies, and programs. These structures filter down and shape mortality through myriad pathways, such as income tax, tobacco tax, and Medicaid generosity. Many studies find that states shape population health (see review in Borrell, Palència, Muntaner, Urquía, and Maimusi (2014)). For instance, Kawachi and colleagues (1999) found that state indices of women's status had "detrimental consequences" for women's and men's mortality and morbidity. Similarly, state-level income inequality can have pernicious consequences for morbidity and mortality (Wilkinson, 1996), while state-level social capital can have salubrious consequences (e.g., Herian, Tay, Hamm, & Diener, 2014; Kawachi, Kennedy, Lochner, & Prothro-Stith 1997). The importance of states is also underscored by a spatial analysis of U.S. life expectancy in 1999 that found roughly one-half of the variation in longevity across counties was attributable to the state within which they are located (Arcaya, Brewster, Zigler, & Subramanian, 2012).

We focus on state differences in women's mortality for two reasons. First, although geographic variation in U.S. mortality has historically been larger among men, women are rapidly catching up (Wilmoth et al., 2011). Since the early 1980s—a time of social and economic change, growing income inequality, and devolution to the states—the variation has grown more among women (Wilmoth et al., 2011; Ezzati et al., 2008; Kindig & Cheng, 2013). The growing geographic inequality in women's mortality is especially alarming because it reflects mortality increases in some areas alongside declines in others (Kindig & Cheng, 2013).

A second reason why we focus on women is that their mortality may be more strongly affected than men's mortality by state laws, policies, and programs. These contextual factors (for example, Medicaid generosity, abortion regulations that impact a broad array of health care services targeting women, and availability of affordable housing) may be more salient to women's lives in part because women are more likely than men to be economically disadvantaged and raising children. The few prior studies that have examined gender differences in contextual effects on health have found some support for this conjecture. A multilevel study of body mass index (BMI) across U.S. census tracts found that tract-level socioeconomic conditions predicted women's BMI, net of individual characteristics, but not men's BMI (Robert & Reither, 2004). A multilevel study of U.K. neighborhoods found that several

neighborhood characteristics—trust, integration, political climate, unemployment rate, and the quality of the physical environment—were more strongly related to women's than men's health (Stafford, Cummins, Macintyre, Ellaway, & Marmot, 2005). We replicate our main analysis for men to glean insights into the extent to which state contexts may have unique consequences for women.

1.3. Hypothesized explanations for inequalities in women's mortality between U.S. States

We focus on "fundamental" social determinants of mortality (Link & Phelan, 1995) at the individual and state levels. Our approach reflects both the social determinants framework proposed by the World Health Organization (Solar & Irwin, 2010) and the socio-ecological framework developed by Macintyre and colleagues (Macintyre, Ellaway, & Cummins, 2002). The WHO framework posits that socioeconomic and demographic characteristics are the most important structural determinants of health and mortality, and that they are causally prior to downstream behavioral and biological risk factors.

1.3.1. Individual explanations

The personal characteristics that we examine reflect women's socioeconomic resources. These resources are considered "fundamental causes" of health and mortality disparities (Link & Phelan, 1995). They provide access to safe neighborhoods, fulfilling jobs, social ties, healthy lifestyles, et cetera—intervening mechanisms on the pathway between socioeconomic resources and health. Consistent with other studies, we focus on socioeconomic resources rather than intervening mechanisms because including the latter "stacks the deck" in favor of individual sources of inequality by over-specifying the individual portion of the multilevel model (Macintyre et al., 2002).

1.3.2. Contextual explanations

Macintyre and colleagues (Macintyre et al., 2002) offer a useful conceptual framework that allows us to develop hypotheses about the ways in which U.S. states shape their population's mortality. The framework was originally developed to categorize characteristics of small geographic areas, but can be easily adapted to larger areas. It rests on two primary contextual features—material and infrastructural resources, and collective social functioning. Material and infrastructural resources refer to socially patterned features of the physical and social environment which can shape health, such as education spending, transportation, and social services (Macintyre et al., 2002). Collective social functioning refers to social capital and cohesion, and speaks to how shared norms and values may shape health. Macintyre and colleagues (Macintyre et al., 2002) also posit that contextual factors may differ in importance across population groups.

These contextual features can be assessed using integral or derived measures (Diez Roux, 2003). Integral measures capture the characteristics of areas, such as public transportation, that persist even if the residents change. Derived measures capture aggregate characteristics of individuals that shape everyone's health. For example, median household income corresponds with school quality, recreational facilities, environmental conditions, and safe public spaces that affect everyone's health (Diez Roux, 2003). Adapting the Macintyre and colleagues (Macintyre et al., 2002) framework to U.S. states, we hypothesize that the following five features of states contribute to the degree to which their populations are able to lead a healthy life: the economic environment, social cohesion, sociopolitical orientation, physical infrastructure, and the tobacco environment.

The importance of the economic environment is illustrated by

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