Trends in education gradients of 'preventable' mortality: A test of fundamental cause theory[☆]

Ryan K. Masters [a, *], Bruce G. Link [b], Jo C. Phelan [b]

[a] University of Colorado Boulder, USA
[b] Columbia University, USA

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ABSTRACT

Fundamental cause theory explains persisting associations between socioeconomic status and mortality in terms of personal resources such as knowledge, money, power, prestige, and social connections, as well as disparate social contexts related to these resources. We review evidence concerning fundamental cause theory and test three central claims using the National Health Interview Survey Linked Mortality Files 1986–2004. We then examine cohort-based variation in the associations between a fundamental social cause of disease, educational attainment, and mortality rates from heart disease, other "preventable" causes of death, and less preventable causes of death. We further explore race/ethnic and gender variation in these associations. Overall, findings are consistent with nearly all features of fundamental cause theory. Results show, first, larger education gradients in mortality risk for causes of death that are under greater human control than for less preventable causes of death, and, second, that these gradients grew more rapidly across successive cohorts than gradients for less preventable causes. Results also show that relative sizes and cohort-based changes in the education gradients vary substantially by race/ethnicity and gender.

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1. Introduction

Fundamental cause theory (FCT) (Link and Phelan, 1995) is frequently used by researchers and policy-makers to inform analyses of U.S. health and mortality disparities. The theory explains persisting associations between socioeconomic status (SES) and mortality risk in terms of personal and flexible resources such as money, knowledge, power, prestige, and social connections. In addition, the theory also stresses the importance of broader social and environmental contexts related to SES (Freese and Lutfey, 2011; Link and Phelan, 2010; Phelan and Link, 2013). First proposed in the mid-1990s by Link and Phelan (1995), FCT has become a leading medical sociological theory of health disparities and has been cited thousands of times in sociological, public health, and population science journals. Yet despite the theory's popularity only a handful of analyses have directly tested its central claims.

In this paper we review the foundations of FCT and evaluate extant evidence concerning its validity with respect to education differences in US adult mortality risks. We also discuss the conditions under which we ought to expect educational attainment to become more strongly associated with survival, with particular attention to race/ethnic and gendered contexts of the education–mortality association, as well as cohort-based changes in these contexts. We then use data from the National Health Interview Survey Linked Mortality Files for years 1986–2004 to test the theory's central claims by analyzing cohort-based trends in education gradients of U.S. adult mortality risk from "preventable" and less preventable causes of death.

According to FCT, socioeconomic gradients ought to be larger for causes of death under greater human control (Phelan et al., 2010, 2004; Link and Phelan 2010). This is because personal resources such as education, income, and social connections can be used to attain health-related knowledge, access helpful and/or needed services, and/or purchase preventative and curative technologies. Furthermore, such resources embed individuals in social contexts (e.g., workplace, neighborhood, peer networks) that might also contribute to differential exposures to both health-related threats (e.g., hazardous working conditions, higher rates of smoking among friends/coworkers) and protections (e.g., safer neighborhoods, increased health-related knowledge among friends). Conversely, these resources and social contexts should garner only minimal protection against causes of death that are highly random

and/or less preventable or treatable. Consequently, according to FCT education differences in mortality rates should be greatest for causes of death that are more preventable and/or curable than deaths from causes under less human control (Phelan et al., 2004; Link and Phelan, 2010; Phelan et al., 2010).

We directly test this claim, but also extend our analyses to test two key factors we believe affect the association between educational attainment and U.S. adult mortality risk. First, for both theoretical and empirical reasons we argue that the size of the education gradient in U.S. adult mortality from heart disease and other "preventable" causes should be growing larger across cohorts. Consistent with this position, recent findings have shown some education gaps in U.S. adult mortality to have widened across the 1990s and 2000s (Cutler et al., 2010; Montez et al., 2011; Olshansky et al., 2012). Also, evidence suggests that changes in U.S. adult mortality rates exhibit strong cohort-based variation (Masters, 2012; Masters et al., 2014; Yang, 2008; Zheng, 2014). Second, we further argue that education gradients in US adult mortality and the rate at which they are changing across birth cohorts likely vary substantially by race/ethnicity and gender. On the one hand, cohort trends in educational attainment — and other SES dimensions related to educational attainment such as employment and income — differ significantly by race/ethnicity and gender in the United States (Lynch, 2003; Bee, 2012; Williams et al., 2010). On the other hand, the ability to transfer socioeconomic resources into better health and longer life has been shown to be significantly conditioned by race/ethnicity and gender (Montez et al., 2011; Williams et al., 2010; Colen, 2011; Crimmins et al., 2004; Everett et al., 2013; Masters et al., 2012). Indeed, research continues to document persisting race/ethnic and gender differences in educational attainment (Bureauistorical), health outcomes and longevity (Montez et al., 2011; Williams et al., 2010; Phelan and Link, 2014; Zarajova, 2013; Read and Gorman, 2010; Hummer and Chinn, 2011), and the mechanisms linking education and health and longevity (Crimmins et al., 2004; Zarajova, 2013; Hummer and Chinn, 2011; Hummer and Lariscy, 2011). Further, research has found evidence suggesting temporal changes in the education-mortality association differ by men and women and non-Hispanic blacks and non-Hispanic whites (Everett et al., 2013; Miech et al., 2011). For these reasons we believe FCT ought to be extended to explicitly incorporate how other fundamental social factors — such as gender and race — condition the effect of personal resources on health and mortality risk, and how these conditional effects might be changing across time and/or birth cohorts in the US population.

2. Background

2.1. Existing tests of fundamental cause theory

Fundamental cause theory makes specific claims regarding the persistence of socioeconomic disparities in health, which, surprisingly, are frequently left untested by researchers when citing the theory (Link and Phelan, 2010; Tehranifar et al., 2010; Phelan and Link, 2013). Specifically, FCT involves four central features, all of which are amenable to empirical testing. First, the theory asserts that socioeconomic gradients exist across multiple health outcomes. Supporting this point, education differences have been found in self-rated health (Lynch, 2003; Beck et al., 2014; Lynch, 2006; Willson et al., 2007), disability (Melzer et al., 2001), use of health technologies and services (Chang and Lauderdale, 2009; Frisbie et al., 2004), and all-cause and cause-specific mortality risk (Cutler et al., 2010; Montez et al., 2011; Everett et al., 2013; Meara et al., 2008; Rogers et al., 2010; Zajacova and Hummer, 2009). Second, fundamental causes of these health differences are hypothesized to operate through multiple risk-factor mechanisms,

including knowledge of health-related behaviors (e.g., diet, exercise, and use of tobacco), social support and psychosocial factors (Mirowsky and Ross, 2003, 1998; Ross and Wu, 1995), and access to preventative and curative services and technologies (Tehranifar et al, 2009; Phelan et al., 2010; Chang and Lauderdale, 2009). Third, fundamental causes of health are reliably reproduced through new intervening mechanisms (Freese and Lutfey, 2011; Miech et al., 2011; Link and Phelan, 2010). And lastly, the "essential" feature of fundamental social causes of health inequalities is that they involve access to flexible resources that can be used in different places and at different times to garner a health advantage. Consequently, fundamental causes affect health even when the profile of risk factors and diseases change radically (Link and Phelan, 2010).

These features of fundamental cause theory implicate dynamic social processes that are continuously shaping the relationship between socioeconomic status and multiple health outcomes, which should be observable and testable with respect to numerous conditions (Freese and Lutfey, 2011; Link and Phelan, 2010; Tehranifar et al., 2010; Phelan and Link, 2013). Indeed, a number of analyses have investigated specific components of FCT, primarily focusing on instances in which resources are used individually or collectively to garner and/or protect health advantages. For example, Chang and Lauderdale (2009) showed that the income gradient in US adult cholesterol levels was reversed in the post-statin era, a change the authors attribute to the income-dependence of the adoption of a new technology (i.e., statins used to control cholesterol levels) (Chang and Lauderdale, 2009). Link (2008) showed the emergence of an education gradient in understanding the smoking-lung cancer association among the US public as well as educational differences in US smoking rates between the 1950s and 2000s (Link, 2008). Lutfey and Freese (2005) highlighted multiple mechanisms behind socioeconomic differences in continuity of care at two diabetes clinics. Studies such as these show the significance of social processes shaping the effective deployment, dissemination, and adoption of health-relevant information, technologies, and behaviors (Lutfey and Freese, 2005). Collectively, Link and Phelan (2010) highlight three "facts" that studies have established supporting the tenets of FCT with respect to mortality risk (Link and Phelan, 2010). Admittedly, the first two sets of facts are not direct tests of the theory itself, but they do establish useful findings with which to gauge claims consistent or inconsistent with FCT. First, studies have repeatedly found that mortality rates from preventable causes of death have declined across time more rapidly than rates from less preventable causes (Masters et al., 2012; Yang, 2008; Jemal et al., 2005; Korda et al., 2007; Mackenbach et al., 1997). Second, and most commonly reported, evidence from multiple studies has demonstrated a strong and persistent SES gradient in mortality rates from preventable causes of death. Specifically, studies show an inverse association between socioeconomic resources and mortality risk from preventable causes of death (Masters et al., 2012; Phelan et al., 2004; Hummer and Lariscy, 2011; Dahl et al., 2006; Piers et al., 2007; Song and Byeon, 2000; Westerling et al., 1996). Third, evidence has also shown the association between SES and mortality risk to be stronger for more preventable causes of death than less preventable causes (Phelan et al., 2004; Hummer and Lariscy, 2011; Dahl et al., 2006; Song and Byeon, 2000).

In the present study, we explore the existence of a fourth "fact" concerning FCT by testing whether the education gradient in US adult mortality risk grew more rapidly for more preventable causes of death than did the gradient in mortality risk from less preventable causes during a time of significant reductions in US adult mortality. We first replicate findings to confirm all three sets of facts (Phelan et al., 2004; Link and Phelan, 2010), but then move