Social Science & Medicine 213 (2018) 123–133

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

The developmental origins of health and disease in international perspective

Steven A. Haas[a,*], Katsuya Oi[b]

[a] Department of Sociology & Criminology, Population Research Institute, Pennsylvania State University, 211 Oswald Tower, University Park, PA 16802, USA
[b] Department of Sociology, Northern Arizona University, USA

ARTICLE INFO

Keywords:
Europe
SHARE
ELSA
TILDA
Life course
Co-morbidity
ADL
Mobility limitations

ABSTRACT

The developmental origins of health and disease and the comparative international approach are two important strands of research exploring population health. Despite the potential insights to be gained from integrating the two approaches, their nexus remains an underexplored frontier. The current study investigates international variation in the early life origins of health among aging cohorts in 13 countries. We examine cross-national differences in exposure to poor childhood health and socioeconomic disadvantage, whether the long-term health associations with those exposures vary across contexts, and whether they persist in the face of subsequent accumulation of socioeconomic and behavioral risk. Finally, we investigate whether childhood health and socioeconomic circumstances help explain between-country differences in later life health. The findings suggest substantial international variation in the exposure to early life health and socioeconomic insults. We also find variation in their association with later life health. However, early life factors appear to play a modest role in explaining international differences in later life health in the contexts examined here.

1. Introduction

The *developmental origins of health and disease* (DOHD) approach to population health has documented the indelible impacts that childhood health and social conditions have on adult health. While the DOHD literature has yielded valuable insights into the processes that generate variation in health, the vast majority of this work has focused on single populations. Scant research has sought to explicitly integrate DOHD and international-comparative approaches to population health. However, there is reason to believe that the nexus of these approaches may yield important insights. For example, very little is known about whether the association between early life exposures and adult health varies across contexts. Nor do we know the extent to which international variation in population health may result from differential exposure to early life insults or to variation in their long-term sequela. The current study begins to bridge this gap by examining the DOHD in international perspective.

2. Background

2.1. The life course and developmental origins of health and disease

Over the past two decades the life course perspective has become a central orienting framework with which to understand population health. The key value of the life course approach is that it provides the theoretical basis with which to understand the 'social-biological interface' (Bartley, 2017 pp.169). It provides a framework with which to describe the etiological implications of socially embedded developmental and biological transitions as individuals grow, develop, and exercise agency bounded by the socio-historical context in which they live (Hertzman, 1999). Specifically, DOHD research offers three processes (critical periods, cumulative disadvantage, and chains of risk) to describe how health trajectories may be shaped by social, material, and psychological forces experienced across the life course.

Critical period effects illustrate the nature of these socially embedded developmental transitions. In *critical period* processes, health shocks that occur during developmentally critical or sensitive periods can lead to irreversible adaptations in the structure and functioning of important biological systems (Ben-Shlomo and Kuh, 2002). For example, intrauterine nutritional deprivation resulting from resource scarcity can alter a number of physiological processes in the body of the gestating fetus that persist throughout life. This includes cardio-metabolic processes (Barker, 2007), immune function (Cohen et al., 2004; McDade, 2005) and inflammatory pathways (Crimmins and Finch, 2006). Such adaptations may increase fetal survival in the short term, while manifesting in disease pathology decades later. Accordingly, four decades of research have documented the relationship between early life health and adult disease, physical functioning, and mortality

* Corresponding author.
E-mail address: Sah49@psu.edu (S.A. Haas).

https://doi.org/10.1016/j.socscimed.2018.07.047
Received 5 February 2018; Received in revised form 23 July 2018; Accepted 26 July 2018
Available online 29 July 2018

(Bartley, 2017; Blane et al., 2007).

The foundational insight of the life course perspective is that individual outcomes can only be understood within the context of the cumulative impact of lived experience. That includes insults and investments resulting from the social and physical conditions one is exposed to across the life course, from the intrauterine environment to late life. Therefore, individual health trajectories are shaped by the process of *accumulation*, in which salubrious inputs and noxious risks deriving from social, environmental, and behavioral exposures accumulate over the life course. An established body of research has shown that those from socially disadvantaged backgrounds have increased risk of chronic disease (Hart et al., 2000), steeper disability trajectories (Haas, 2008), and higher mortality (Davey Smith, Hart, Blane and Hole, 1998). The impacts of early life health and social conditions are compounded by subsequent socioeconomic deprivation and health insults. Alternatively, they may be ameliorated by upward social mobility and healthy investments (Tushar et al., 2018).

In the *pathways* or *chains of risk* process, early life factors influence later life health by generating subsequent etiologies of risk. For example, childhood socioeconomic position is thought to influence disease risk not through its own independent influence per se, but through its role as a determinant of adult status attainment and that it is adult socioeconomic characteristics that are the central etiologic pathway. Thus, early life may matter only in so far as it initiates chains of risk that cascade throughout the life course (Power and Mathews, 1997). Though often presented as such, these processes need not be mutually exclusive. While risk accumulation is thought to be a fundamental process, critical periods and chains of risk are important complimentary mechanisms, helping to understand the specific etiologic processes connecting early life to adult disease (Blane et al., 2007).

More recent work has proposed a fourth process in which an array of cognitive and non-cognitive human capital attributes developed very early in life, such as intelligence, conscientiousness, and sense of control act as a *selection* mechanism, sorting individuals into higher socioeconomic positions and also leading them to make health producing choices and investments, improving later life health (Mackenbach, 2010). Thus at least some of the social variation in adult health can be attributed to selection processes involving personal psychosocial attributes (Oi and Alwin, 2017; Chapman et al., 2009; Singh-Manoux et al., 2005).

2.2. Developmental origins in international context

Previous research has documented substantial heterogeneity in adult health across international contexts, most frequently comparing high income contexts (Solé-Auró et al., 2015; Mackenbach et al., 2008). This literature has often focused on either institutional/welfare state regimes or on compositional differences in psychosocial/behavioral risk factors as determinants of international variation and has given little consideration to the life course processes discussed above. Likewise, the DOHD literature has largely lacked a comparative-international focus. The scarcity of comparative DOHD research is surprising given that a central tenet of the life course perspective is that lives are structured by the unique circumstances associated with *time* and *place*, which determine the array of opportunities and constraints within which individuals exercise agency (Elder, 1998). Consideration of national context in DOHD research is critical given that the factors that shape the distribution of risks within and between populations can be quite different than those that put particular individuals at risk (Rose, 2001). We propose that national context may influence population health through structuring the life course processes discussed above.

One way in which national context may influence population health through life course processes is through generating differential *exposure* to noxious and salubrious forces during developmentally critical/sensitive periods. As children, members of currently aging cohorts were exposed to substantial international variation in epidemiologic environments as countries differed in the timing and pace of the epidemiologic transition. For example, in the 1930s the infant mortality rate in Switzerland was 47 per 1000, while it was 66 in the UK, 80 in France, and over 100 in Italy and Spain (authors' calculations of Human Mortality Database). Indeed, geographic variation (within countries) in infant mortality was central in early DOHD research (Forsdahl, 1977). Prior research has shown that the timing and pace of the epidemiologic transition is associated with international differences in later life chronic disease risk (McEniry, 2014). Similarly, there is substantial variability in exposure to socioeconomic conditions in early life such as childhood poverty rates or human capital investments. For example, 79% of the older population in Spain has not completed upper secondary schooling while only about 15% of older Germans failed to do so (author's calculations of SHARE data). The same cohorts in those two contexts faced very different opportunities for human capital accumulation and the health benefits that derive from it.

National environmental and institutional conditions may also modulate life course processes of *accumulation* and *chains of risk*. The last century has seen a great expansion in the "social capacity for health" resulting from technological and biomedical innovation and the rise of educational and social welfare institutions (Hayward and Sheehan, 2016 pp. 355). However, the timing, degree, and nature of this health capacity expansion has been uneven. For example, across high income Western European contexts there is substantial heterogeneity in welfare state institutions in terms of orientation, structure, and generosity. This includes the extent to which they are centralized vs. fragmented and universal vs. exclusionary, the degree to which they de-commodify labor and buffer individuals and families from the vicissitudes of the market, and act as agents of resource redistribution (Esping-Anderson, 1990; Wood and Gough, 2006). Such institutional differences may play an important role in creating heterogeneity in health within and between populations. Context-specific factors such as labor market conditions during the transition to adulthood, or rates of social mobility, are likely to modulate the relationship between early life socioeconomic conditions and adult health (Cutler et al., 2015). More egalitarian orientations towards human capital investment may facilitate intergenerational socioeconomic mobility, helping to ease the pernicious impacts of prior health insults or socioeconomic disadvantage. For example, recent work has found that investments made by the Indonesian government in the 1970s to expand access to primary schooling were strong enough to completely eliminate inequalities associated early life resource shocks (Tushar et al., 2018). Conversely, the effect of childhood deprivation on adult health may be magnified in societies where human capital investment was/is more heavily dependent on private/familial resources. Substantial research has investigated the population health impacts of welfare state regimes. Some evidence suggests that institutional arrangements can influence life course accumulation processes and their influence on health trajectories (Sacker et al., 2011). However, the welfare state literature overall has provided mixed, often counterintuitive, results with findings frequently dependent on the welfare state typology used (Bartley, 2017; Bergqvist et al., 2013; Bambra, 2011).

2.3. The present study

In the present study, we address three research questions that emerge at the nexus of the DOHD and comparative-international approaches. First, to what extent does exposure to health insults and socioeconomic conditions in the critical/sensitive period of childhood among aging cohorts vary across international contexts? Second, to what extent does variation in early life exposures explain variation in late-life health across countries? Finally, does the association that childhood exposures have with later life health vary across national context? Scant research has tackled the first and third question while a pair of studies have examined the second. However, those studies were limited in important ways. Banks, Oldfield, and Smith (2011) compared