

TO WHAT EXTENT DO BIOLOGICAL MARKERS ACCOUNT FOR THE LARGE SOCIAL DISPARITIES IN HEALTH IN MOSCOW?

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ABSTRACT

The physiological factors underlying links between health and socioeconomic position in the Russian population are important to investigate. This population continues to face political and economic challenges, has experienced poor general health and high mortality for decades, and has exhibited widening health disparities. We used data from a population-based survey of Moscow residents 55 and older to investigate whether physiological dysregulation mediates the link between socioeconomic status and health. Results revealed large educational disparities in health outcomes and physiological dysregulation, especially in men. For both sexes, the gap between high and low education persons in standard cardiovascular/metabolic factors was substantial. Heart rate parameters and inflammation showed substantial educational differences only for men. Social disparities in neuroendocrine dysregulation were negligible in both sexes. In terms of mediating effects, physiological dysregulation accounted for more of the education gap in general health and physical function (21-36%) than in bodily pain (9-14%).

EXTENDED ABSTRACT

INTRODUCTION

Social disparities in Russian mortality appear to be wider than those observed in the West (Shkolnikov et al., 1998) and are continuing to increase. The least advantaged segments of the population have borne the brunt of the mortality crisis, whereas highly educated Russians have enjoyed modest improvements in life expectancy in the late 20th century (Murphy et al., 2006; Shkolnikov et al., 2006). For health outcomes other than mortality, there is much less research regarding social disparities. On the one hand, some evidence indicates a sizeable socioeconomic gradient in self-assessed health status (Bobak et al., 2000; Carlson, 2000; Dubikaytis et al., 2010; Nicholson et al., 2005; Perlman & Bobak, 2008). On the other, the results of one study suggest that material deprivation, but not education, is associated with poor physical function in Russia (Bobak et al., 1998).

Researchers have argued that, at least in part, the social gradient in health reflects differences in the burden of physiological stress (Kristenson et al., 2004; Steptoe & Marmot, 2002). The allostatic load framework proposes that a multi-system measure of physiological dysregulation represents the cumulative wear and tear resulting from repeated exposure to environmental challenges, which may ultimately lead to health decline (McEwen & Stellar, 1993). Measures of allostatic load are typically operationalized by examining elevated (or reduced) operating levels of biological parameters related to cardiovascular, metabolic, inflammatory, and neuroendocrine function. These measures have been shown to predict diverse health outcomes including self-assessed health status, physical function, and mortality (Goldman et al., 2006; Hampson et al., 2009; Hasson et al., 2009; Hu et al., 2007; Karlamangla et al., 2002; Seeman et al., 1997; Seeman et al., 2001; Seplaki et al., 2005). Thus, it is reasonable to expect that physiological dysregulation plays an important role in the pathway between socioeconomic status and health.

In this paper, we use data from a population-based survey of Moscow residents aged 55 and older to address two research questions. First, are the social disparities in health reflected by social differentials across the full array of physiological systems we measured or are the differentials manifest only in particular sets of biological parameters? Second, does physiological dysregulation mediate the link between socioeconomic status and health?

METHODS

The data come from the Survey on Stress Aging and Health in Russia (SAHR), a population-based sample of Muscovites aged 55 and older (Shkolnikova et al., 2009). The survey was fielded between December 1, 2006 and June 30, 2009. The fieldwork and data processing were conducted jointly by the National Research Center for Preventive Medicine (NRCPM) in Moscow, the Max Planck Institute for Demographic Research in Rostock (Germany) and Duke University in Durham (USA). The study protocols were approved by the Ethics Committee of the NRCPM and the Institutional Review Board at Duke University. Before being interviewed and medically tested, all of the participants in the SAHR study received information about the survey program and provided informed consent. The study was also approved by the Local Committee for Medical Ethics of the NRCPM. The final SAHR sample includes 1800 respondents (961 women and 839 men) who agreed to participate and who completed an interview and medical testing (response rate = 64%).

RESULTS

On average, men were younger, better educated, and had more material resources than women. They also scored better than women in terms of self-reported general health, physical function and bodily pain.

Age-adjusted social disparities in health outcomes

Social disparities in health outcomes among Muscovites were sizeable. Among men, the differences were greater classified by material resources than by education, whereas that was not true for women. For example, the average score on general health was almost 0.5 SD higher for men in the top tertile of the distribution of material resources than for those in the bottom tertile. In contrast, the educational gap in general health between men who completed a university degree and men with secondary education or less was only 0.3 SD. Among women, the disparity in general health was smaller and similar whether measured by education or material resources (0.2 SD).

Age-adjusted social disparities in physiological dysregulation

In both sexes, the difference in overall physiological dysregulation (PD) between those with high versus low educational attainment was substantial (0.5 SD for men, 0.4 SD for women) and even larger in magnitude than the educational disparity in health outcomes. Among women, the educational gap in dysregulation stemmed primarily from standard cardiovascular and metabolic factors. Men exhibited a sizeable educational disparity in these markers, but they also presented notable educational differences in heart rate parameters and inflammation. Corresponding differences were negligible in women. There was no significant educational gap in neuroendocrine markers in either sex.

Disparities in dysregulation based on material resources generally followed a similar pattern, although they were generally smaller than educational disparities. One notable exception was the difference in the heart rate subscore among men, which was equally large for material resources and for education.

Is physiological dysregulation associated with health outcomes?

If physiological dysregulation acts as a mediator between socioeconomic status and health outcomes, then dysregulation must be associated not only with social status, but also with health outcomes. The results show that higher levels of physiological dysregulation were indeed associated with worse health outcomes, but the magnitude of the relationships was modest. Physical function showed the strongest association with overall dysregulation: a one SD increase in dysregulation was associated with a one-fifth SD decrease in physical function.

When we examined the effects by subscore, we found that heart rate markers and inflammation were significantly associated with most health outcomes in both sexes, but the magnitude remained small. The relationship between standard cardiovascular and metabolic risk factors and health outcomes was also weak, particularly for men. There was little evidence that neuroendocrine activity was associated with these health outcomes. The coefficient was significant in two models, but only one was in the expected direction.

Does physiological dysregulation mediate social disparities in health?

The results suggested that markers of physiological dysregulation played a non-trivial role in mediating the link between social status and several health outcomes. Overall physiological

dysregulation accounted for a sizeable fraction (21-36%) of the education gaps in general health and physical function. Dysregulation played a lesser role in mediating the educational gap in pain (9% for men, 14% for women). With regard to health differences by material resources, dysregulation accounted for a smaller share of the gap than for education. In general, the mediating effect of the subscores was similar to that observed for the overall score.

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