



## The inverse hazard law: Blood pressure, sexual harassment, racial discrimination, workplace abuse and occupational exposures in US low-income black, white and Latino workers<sup>☆</sup>

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### ABSTRACT

Research on societal determinants of health suggests the existence of an “inverse hazard law,” which we define as: “The accumulation of health hazards tends to vary inversely with the power and resources of the populations affected.” Yet, little empirical research has systematically investigated this topic, including in relation to workplace exposures. We accordingly designed the *United for Health* study (Greater Boston Area, Massachusetts, 2003–2004) to investigate the joint distribution and health implications of workplace occupational hazards (dust, fumes, chemical, noise, ergonomic strain) and social hazards (racial discrimination, sexual harassment, workplace abuse). Focusing on blood pressure as our health outcome, we found that among the 1202 low-income multi-racial/ethnic working class participants in our cohort – of whom 40% lived below the US poverty line – 79% reported exposure to at least one social hazard and 82% to at least one high-exposure occupational hazard. Only sexual harassment, the least common social hazard, was associated with elevated systolic blood pressure (SBP) among the women workers. By contrast, no statistically significant associations were detectable between the other additional highly prevalent social and occupational hazards and SBP; we did, however, find suggestive evidence of an association between SBP and response to unfair treatment, implying that in a context of high exposure, differential susceptibility to the exposure matters. These results interestingly contrast to our prior findings for this same cohort, in which we found associations between self-reported experiences of racial discrimination and two other health outcomes: psychological distress and cigarette smoking. Likely explanations for these contrasting findings include: (a) the differential etiologic periods and pathways involving somatic health, mental health, and health behaviors, and (b) the high prevalence

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of adverse exposures, limiting the ability to detect significant associations. As clarified by the “inverse hazard law,” to understand health inequities, research is needed that contrasts exposures and health status population-wide, not just among those most inequitably exposed.

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In 1971, Julian Tudor Hart famously penned the “inverse care law”: “The availability of good medical care tends to vary inversely with the need for the population served” (Hart, 1971). Research on societal determinants of health likewise suggests the existence of an “inverse hazard law,” which we define as: “The accumulation of health hazards tends to vary inversely with the power and resources of the populations affected.” Clustered together and embodied conjointly (Krieger, 2004), these health hazards include economic deprivation, discrimination, and hazardous living and working conditions, harming the health of societal groups exposed to – as compared to those who are buffered from, and often benefit from – these inequities (Krieger, 2004; Levy & Sidel, 2006).

As a case in point, research indicates that in the United States low- compared to high-wage workers are more likely to be exposed to occupational hazards, have less job autonomy, have less or no coverage for health insurance, fewer resources to live a healthy life, and are more likely to be persons of color and women, reflecting past and present patterns of racial/ethnic and gender discrimination (Baron & Dorsey, 2006). Yet, to date, scant research has focused on the combined health impact of social and occupational hazards at work (Lipscomb, Loomis, McDonald, Argue, & Wing, 2006; Quinn, 2003).

We accordingly designed the *United for Health* study to investigate the joint distribution and health implications of occupational (dust, fumes, chemical, noise, ergonomic strain) and social (racial discrimination, sexual harassment, workplace abuse) hazards in a US population of predominantly low-wage white, black, and Latino women and men unionized workers. In prior publications, we have reported on this cohort’s high levels of exposures to economic deprivation and both social (Krieger et al., 2006) and occupational (Quinn et al., 2007) hazards; a sub-sample analysis documented associations between racial discrimination and both cigarette smoking and psychological distress (Krieger, Smith, Naishadham, Hartman, & Barbeau, 2005). In this paper, we analyze associations between the workers’ blood pressure and their exposure to social and occupational hazards. Fig. 1 presents our conceptual model. It is premised on an ecosocial analysis of embodying inequality in relation to pathways, levels, and lifecourse (Krieger, 1994, 2004), with the specific content informed by research on social, physical, occupational, behavioral, and anthropometric determinants of blood pressure, their societal distribution, and social disparities in blood pressure (Baron & Dorsey, 2006; Huang & Ghio, 2006; Kasl, 1996; Krieger, 1999; Lundberg, 2002; Pickering, 2001; Talbott, Gibson, Burks, Engberg, & McHugh, 1999; Wyatt et al., 2003).

## Study population and methods

### *Study population and protocol: the United for Health cohort*

As described in detail in our prior publications (Barbeau, Hartman, Quinn, Stoddard, & Krieger, 2007; Krieger et al., 2005, 2006; Quinn et al., 2007), we recruited participants in the *United for Health* study from the rosters of union members employed in 14 worksites located in the greater Boston area in Massachusetts and variously engaged in meat processing, electrical light manufacturing, retail grocery stores, and school bus driving. The unions and management had no access to the study data and no role in the preparation, review, or approval of the study’s scientific papers. The study incentive was either a 1-h paid work-release plus a \$25 pre-paid grocery card (handed out after the survey was completed) or, if paid work-release was not an option, a \$50 pre-paid grocery card. All participants received an informed consent reference sheet and provided verbal informed consent. Conduct of the study was approved by the Dana-Farber Cancer Institute’s Office for the Protection of Research Subjects, the Human Subjects Committee of the Harvard School of Public Health, and the Institutional Review Board of the University of Massachusetts.

Recruitment took place between March 2003 and August 2004. Union members at each worksite were sent an introductory letter by the union. Study staff then screened, recruited, and administered the survey to the workers on-site. The 40–45 min survey was administered (either in English or Spanish) in a private room, followed by a 15-min health check. For the survey, we used audio-computer assisted self-interviewing (ACASI), both to improve likelihood of obtaining sensitive information and to enable persons with low literacy to respond (Office of Applied Studies, 2001). The Spanish version of the survey was translated from English and then back-translated to ensure accuracy. One or more of the interview staff were bilingual in English and Spanish and were available to answer participants’ questions.

Among the 2323 union members on the list we were given by the unions, 1776 stated that they met study eligibility criteria for age (25–64 years old) and length of employment (at least 2 months). Of these, 1282 (72%) completed the survey, of whom 80 had an age that was either unknown or outside the eligible age range, yielding an analytic sample of 1202 age-eligible workers.

### *Sociodemographic measures: individual-level and worksite*

We obtained self-reported data on race/ethnicity, gender, sexuality, age, nativity, and current and childhood socioeconomic position. All persons who self-identified as

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