Relative to Whom?
Social Status, Blood Pressure, and How Inequality Gets under the Skin

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INTRODUCTION AND BACKGROUND

Social status—one's position in social groups relative to others—is associated with numerous measures of morbidity as well as mortality. This relationship is independent of income, access to health care, and health behaviors. A growing body of research uses subjective social status (SSS) measures to operationalize social status rather than occupational status. Measures of SSS typically ask respondents to rate their position (or income) relative to a specific reference group (e.g. friends, coworkers, fellow Americans). These measures are attractive for several reasons. First, unlike occupational status, which is only applicable to those with work histories, SSS measures can be asked of everyone. In addition, researchers find that SSS is a better predictor of physical health status than measures of occupational status (Singh-Manoux et al. 2005). This likely reflects that subjective social status better captures chronic stress exposure, one mechanism that links social status with health. A third advantage of SSS measures is that individuals can be asked about their social status relative to a variety of reference groups. Examining how the relationship between SSS and health varies by reference group provides important information on which social contexts are particularly important for health. For example, comparing the relationship between health and SSS relative to peers and SSS relative to American families may provide clues as to whether inequality perceived in local contexts is more detrimental for health than inequality perceived within nations as a whole. Despite the availability of multiple SSS measures within surveys, little research examines how the relationship between subjective social status and health varies by reference group.

I examine the relationship between blood pressure and two subjective social status measures: SSS relative to peers and SSS relative to American families. Focusing on the relationship between social status and blood pressure is important for two reasons. First, cardiovascular health (and particularly high blood pressure) comprises a substantial amount of the morbidity and mortality risk in industrialized countries (Chobanian et al. 2003). Second, stress (which is linked to low social status) is more strongly linked to cardiovascular function indicators such as hypertension than other health outcomes. Thus, examining the relationship between SSS and blood pressure provides insights into how inequality "gets under the skin."

I focus my analysis on biomarker-derived measures of blood pressure rather than more widely-used respondent reports of ever-diagnosis diagnosis of hypertension for three reasons. From a population health perspective, high blood pressure control is of greatest importance, not ever-diagnosis. Also, the association between blood pressure and cardiovascular disease risk is continuous and independent of other risk factors (Chobanian et al. 2003), so continuous biomarker blood pressure readings provide a more detailed picture of population risk over a binary variable of hypertension ever-diagnosis. From a measurement perspective, biomarker measures of blood pressure are more accurate than respondent reports, which are subject to recall bias as well as health literacy. Finally, hypertension is known as "the silent killer" due to its asymptomatic

nature, as individuals generally do not know their blood pressure status unless they have encountered some sort of medical service screening. This not only creates a measurement issue with respondent self-reports but also may create biased estimates. Because of the connections between social status, SES, and medical care access, the use of ever-diagnosis of hypertension may underestimate the association between social status and high blood pressure. In addition, emerging research suggests individuals consider their health when evaluating their social status, which raises concerns of reverse causality (people reporting lower SSS *because* they are unhealthy). For example, health characteristics such as being overweight/obese are also often devalued social statuses (Puhl and Brownwell 2003). Thus, prior research on SSS and health has struggled with establishing the causal ordering of the relationship. Because actual blood pressure is unknown to respondents, my use of biomarker derived-measures of blood pressure provide better evidence of low social status causing unhealthy blood pressure levels.

RESEARCH QUESTIONS

This research addresses three substantive questions. First, what is the association between subjective social status and blood pressure measures? If this association exists, is it independent of traditional measures of socioeconomic status, which are also linked to blood pressure? Second, does the association between subjective social status and blood pressure vary by reference group (peers versus American families)? Third, how does the association between blood pressure and subjective social status vary by the origin of the blood pressure measure (biomarker versus self-report)? Does choice of measure lead to different conclusions about the prevalence of hypertension as well as the relationship between subjective social status and blood pressure?

DATA AND METHODS

Analyses use data from the National Social Life, Health, and Aging Project (NSHAP). The NSHAP is a nationally representative study of non-institutionalized older adults, collected from summer 2005 to spring 2006. The sample was selected from a multi-stage area probability design screened by the Institute for Social Research for the Health and Retirement Study (HRS). The NSHAP data contains information on the demographic characteristics; romantic, sexual, and social relationships; and physical and mental health of 3,005 Americans aged 57 to 85. Most data were collected in an in-home interview, which was conducted in English or Spanish. NSHAP oversampled Blacks, Hispanics, men, and persons aged 75-85. The final unweighted response rate was 74.8%. Analytic sample size is approximately 2200.

Hypertension is assessed in two ways: via respondent report and via biomarker measures. Respondents' answers to the following question were used to assess ever-diagnosis of hypertension: "Has a medical doctor ever told you that you have high blood pressure or hypertension?" Self-report of ever-diagnosis of hypertension is primarily used for comparison purposes with biomarker measures which more accurately reflect health risk, are less subject to measurement issues, and are more instructive as to the causal ordering of SSS and blood pressure. Biomarker measures of blood pressure were assessed by a trained interviewer during the in-home portion of data collection. Two readings were taken using a digital blood pressure monitor. A third reading was taken if the two readings differed substantially. The systolic and diastolic blood pressure readings were

averaged to create a measure of mean systolic and diastolic blood pressure. Individuals with either systolic blood pressure greater than or equal to 140 mm Hg *or* diastolic blood pressure greater than or equal to 90 mm Hg are classified as hypertensive. In addition, because higher blood pressure is associated with greater health risk, even below the hypertensive threshold, I examine two continuous measures of blood pressure of clinical importance: mean systolic blood pressure and pulse pressure (mean systolic minus mean diastolic).

Key Covariates: Subjective Social Status Measures
Respondents were asked two questions to ascertain subjective social status relative to two reference groups. "Compared with <u>most of the people you know personally</u>, like your friends, family, neighbors, and work associates, would you say that your household income is far below average, below average, average, above average, or far above average?" was used to ascertain subjective social status relative to peers. "Compared with <u>American families in general</u>, would you say that your household income is far below average, below average, average, above average, or far above average?" was used to ascertain subjective social status relative to Americans.

Controls
Models control for education, income (missing values imputed), assets (missing values imputed), age (linear and quadratic), gender, race/ethnicity, marital status, and current employment. Several classes of medications are used to control for treatment of hypertension: antihypertensive combinations, diuretics, beta-blockers, angiotensin-converting enzyme inhibitors, angiotensin antagonists, calcium channel blockers, and vasodilators. Use of any number of these medications is collapsed into a dichotomous variable. Controlling for hypertension medication use is justified because in terms of health risks, as uncontrolled high blood pressure is the outcome of interest. In addition, I control for medications that may artificially lower blood pressure—non-steroidal anti-inflammatories (NSAIDs) and immunosuppressants. Because access to and quality of medical care may also affect hypertension control via medications and other interventions, I control for whether the respondent has private health insurance or not.

Analytic Strategy
I utilize ordinary least squares (OLS) regression for mean systolic blood pressure and pulse pressure. I use logistic regression to estimate the odds of reporting ever-diagnosis of hypertension by a physician and classification as hypertensive versus non-hypertensive according to biomarker-derived blood pressure measures. Model 1 regresses subjective social status measures separately (relative to peers—Model 1a; relative to American families—Model 1b) on basic controls and SES. Given prior longitudinal research on subjective social status (Singh-Manoux et al. 2003) predicting health status, as well as on the linkages between stress and health behaviors, it is plausible that subjective social status influences both other health status indicators and health behaviors. To control for health status indicators and health behaviors is to control away part of the total association of subjective social status with blood pressure. Thus, I do not include health behaviors and health status indicators in main models because they are hypothesized to occur after the "treatment" of subjective social status. Their contribution is assessed in

sensitivity analysis, however. Model 2 regresses blood pressure outcomes on both subjective social status measures and all other covariates. Examination of standard errors for SSS measures reveals collinearity between them to not be of concern. Because little is known about variation in the link between subjective social status and blood pressure across sub-populations, research also examines the relationship between pulse pressure and subjective social status by gender, age sub-group, race/ethnicity, and education (results not included in this abstract). Of particular interest are differences in the relationship between blood pressure and subjective social status by race, given the large disparities in hypertension prevalence by race. Analyses are conducted in Stata version 12.0.

PRELIMINARY RESULTS

Results indicate that ever-diagnosis of hypertension is quite high (56%) and the vast majority (nearly 90%) of individuals who have been diagnosed as hypertensive are taking antihypertensive medications. When biomarker data is examined, 46% of the sample is hypertensive. That this number is lower that the prevalence estimate based on ever-diagnosis is not surprising, given the relatively high levels of ever-diagnosis and treatment with medications. The majority of respondents who have been diagnosed as hypertensive and are currently taking antihypertensives are still hypertensive, according to biomarker readings. In addition, 37% of those classified as hypertensive by biomarker data also report never being told by a doctor that they have hypertension. These results suggest that not only does hypertension still have the potential to be a "silent killer," medical diagnosis (and treatment) is not synonymous with high blood pressure control. Bivariate analysis of both biomarker and respondent reports of hypertension reveals a graduated inverse relationship between SSS and hypertension prevalence. This gradient parallels the social status gradient commonly found for other health outcomes. In addition, while estimates for hypertension from respondent self-reports are lower for all social status groups than estimates from biomarkers, there is a greater disparity between estimates for lower status categories, indicating individuals who report lower status are less likely to know they are hypertensive. Results from multiple regression models indicate that higher SSS relative to peers and relative to Americans are associated with lower biomarker-derived measures of blood pressure even after controlling for education, income, and assets. SSS relative to Americans is independently associated with lower blood pressure, even after controlling for SSS relative to peers. In contrast, lower SSS (for both SSS measures) are associated with *lower* odds of ever-diagnosis of hypertension by a doctor. Overall, these results indicate that biomarker measures of blood pressure provide better measures of blood pressure than respondent reports, both from a measurement and population health perspective. These results also provide stronger evidence that lower social status causes poorer blood pressure function.

Citations

Chobanian, A.V. et al. 2003. "The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: The JNC 7 Report." *JAMA*, 289(19), 2560-2572.

Puhl, R.M. and K.D. Brownell. 2003. "Psychosocial origins of obesity stigma: toward changing a powerful and pervasive bias." *Obesity Reviews* 4: 213-27.

Singh-Manoux, A, M.G. Marmot, and N.E. Adler. 2005. "Does subjective social status predict health and change in health status better than objective status? *Psychosomatic Medicine*, 67, 855-861.

------------, N.E. Adler, and M.G. Marmot. 2003. "Subjective Social Status: Its Determinants and its Association with Measures of Ill-Health in the Whitehall II Study." *Social Science and Medicine* 56:1321–33.