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Commentary

Challenges and opportunities for integrative health research in the context of culture: A commentary on Gersten

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Abstract

A new generation of research in population health is drawing on models and methods from the social and biomedical sciences to combine rich measurement of everyday contexts with objective measures of physiological function and health in field-based settings. We are at the beginning of an exciting era of discovery, and this commentary focuses on two questions of particular importance to comparative research. First, how do we use biological measures to define "health"? Second, how do we define and measure social context, particularly across cultural settings? Answers to these questions, as well as others addressed by scholars working at the intersection of the social and biomedical sciences, will ultimately lead to a better, more multidimensional understanding of human biology and health.

Keywords: Stress; Neuroendocrine biomarkers; Allostatic load; Culture; Social relations; Health; Taiwan; USA; Neuroendocrine allostatic load (NAL)

1. Introduction

These are exciting times to be engaging in transdisciplinary, community-based research on the social determinants of health. Call it a biobehavioral, biocultural, biodemographic, or biopsychosocial perspective, current efforts to integrate models and methods from the social and biomedical sciences promise to cast new light on intractable health problems, and to generate insights into the dynamic relationships between human biology and the complex environments in which we live. Gersten's analysis of the neuroendocrine correlates of social stressors in a representative sample of older Taiwanese is part of this new wave, and it raises a number of compelling issues that will challenge the field as it moves forward (Gersten, 2008). This commentary focuses on two issues of particular salience to comparative research: defining health, and defining context.

Traditional disciplinary boundaries are such that the vast majority of health research in the social/behavioral sciences features in-depth analysis of psychosocial, economic, demographic, and/or cultural processes in relation to subjective, self-report measures of health. In contrast, biomedical research employs sophisticated physiological measures, but typically relies on small clinic-based samples and rarely evaluates social contexts beyond standard measures of socioeconomic status or self-reported health behaviors. The recent expansion of minimally invasive methods for collecting biological samples in participants' homes is helping to bridge

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these perspectives, and has encouraged a growing number of social scientists to consider integrating biomarkers into their research agendas (National Research Council, 2000; McDade, Williams, & Snodgrass, in press).

These methods, as well as recent calls for integrative, multi-method, interdisciplinary research on human health (Singer & Ryff, 2001; Zerhouni, 2003), have been the catalyst for a new generation of population-based studies that combine rich measurement of social contexts with objective indicators of physiological function and health. The Social Environment and Biomarkers of Aging Study (SEBAS) in Taiwan is a prime example of this trend (although SEBAS relied on more standard clinical methods of biomarker sample collection). Several large, nationally representative social science surveys in the US are now collecting biomarkers (e.g., Health and Retirement Study, National Longitudinal Study of Adolescent Health), and similar initiatives have been implemented or are being planned for the UK, Mexico, Indonesia, and China.

Now what? Soon we will no longer be limited by the availability of integrative datasets, but by our imagination in how to use them. The important questions before us include: How do we define "health"? How do we define and measure social context, particularly across cultural settings? How do we answer these questions in ways that facilitate comparison, but also respect uniqueness across individuals, and across research settings?

2. Defining health

For Gersten, allostatic load is the answer to the first question of how we define health. Allostatic load has emerged as a prominent construct for research into the social determinants of health, particularly since a number of recent studies have documented prospective associations between allostatic load scores and increased risk for all-cause mortality, cardiovascular disease, and declines in cognitive and physical function (Karlamangla, Singer, McEwen, Rowe, & Seeman, 2002; Seeman, Singer, Rowe, Horwitz, & McEwen, 1997). In addition, the construct has a certain amount of intuitive appeal in its attempt to summarize the impact of stressors across key regulatory systems: In theory, with one number it provides a multidimensional, objective assessment of "health" that represents dysregulation, or shifted functional set points, across important aspects of endocrine, cardiovascular, and metabolic function. This is a more comprehensive assessment of health than is possible with more traditional system-specific measurement approaches (e.g., focusing only on blood pressure as an indicator of cardiovascular function), and it has the added statistical benefit of reducing the chances of type I error when multiple biomarkers are consolidated into a single outcome, rather than analyzed separately.

On the flip side, summing scores on a diverse panel of biomarkers may obscure significant heterogeneity in dysregulation across individuals, physiological systems, and types of stressors. Responses to various stressors, for example, are not always generalized, and different types of stressors may activate different physiological pathways (Bernston & Cacioppo, 2003; Kemeny, 2003). Gersten's analysis recognizes that a simple counting of high-risk cut-points for all the biomarkers typically used to define allostatic load may overlook interesting biological processes, and it is part of a recent trend toward disentangling the components of allostatic load to explore their unique associations with health outcomes of interest (Gruenewald, Seeman, Ryff, Karlamangla, & Singer, 2006; Seplaki, Goldman, Weinstein, & Lin, 2006).

These approaches reflect the conceptual tension between cumulative vs. system-specific attempts to quantify the impact of social contexts on physiological function and health. Gersten resolves this tension by limiting his analysis to four biomarkers that are of particular significance because of their role as "primary mediators" (Gersten, 2008)—common neuroendocrine pathways that link stressors to secondary outcomes (e.g., elevated blood pressure, adverse lipid profiles) that predict clinical health outcomes (McEwen, 1998). There is a solid biological basis for this approach, which provides interpretative advantage in limiting analyses to biomarkers that represent the same level of biological process.

However, this comes at a cost to comparisons with prior research using the allostatic load construct, and it misses an opportunity to investigate the heterogeneity of dysregulation in response to stressors. Why not construct summary variables representing primary mediators, secondary outcomes, as well as allostatic load as traditionally defined, and analyze each in relation to social stressors? Are similar patterns of results evident for, say, women vs. men? Older vs. younger individuals?

For measures of social integration vs. measures of socioeconomic status? This may be a productive way to take advantage of the wide range of biomarkers available in many datasets while exploring the merits of summary vs. more delimited approaches of defining health.

Comparisons across populations living in diverse social, cultural, and ecological settings are powerful tools for generating hypotheses regarding the role of contextual factors in shaping health, but such comparisons raise additional challenges for allostatic load. First, since most formulations use sample-specific values to define high-risk cut-off points for each biomarker, allostatic load scores cannot be meaningfully compared across samples. For example, Gersten follows previous applications and creates an allostatic load variable by summing the number of biomarkers for which an individual exceeds the 25th percentile cut-off score. In his case, individual scores can range from 0 to 4, but since percentiles are used to define cut-off values the average score for the entire sample is a simple arithmetic function of the cut-off percentile and the number of biomarkers used to define allostatic load, regardless of the sample's location with respect to each biomarker. That is, the mean allostatic load score will be the same whether the average cortisol concentration is 29.9 μg/g, as is the case for Gersten's sample, or twice that at 59.8 μg/g.

How, then, can we compare results from Taiwan and the US with respect to allostatic load? Our only recourse is to inspect for similarities in patterns of associations between allostatic load and comparably defined and measured independent variables. For most purposes this is probably sufficient. But to take full advantage of diverse datasets and the comparative possibilities they provide, one option is to consider fixed—rather than relative—high-risk cut points for allostatic load biomarkers. Clinical cut points (e.g., systolic blood pressure >140 mmHg for hypertension) can serve as a guide for several biomarkers, although others (e.g., cortisol) do not have established cut-off values.

There is a second complication, related to this point: It cannot be assumed that the relationship between various biomarkers and health outcomes (e.g., between allostatic load and mortality risk) will be the same across populations. Recent research into the early origins of adult disease has underscored the point that physiological systems embody significant degrees of developmental plasticity that may improve the fit between an organism and its environment (Kuzawa, 2005). In Filipino adolescents, for example, the association between adiposity and immune function is different for individuals born at small-for-gestational age, compared to those born with normal birth weight (McDade, Beck, Kuzawa, & Adair, 2001). In India, type II diabetes is becoming common at lower levels of body mass index than in other populations, perhaps due to different metabolic regulatory set points that are the result of intergenerational histories of undernutrition and maternal growth stunting (Yajnik, 2004). Neuroendocrine stress pathways may similarly be calibrated over the course of development, with early exposure to psychosocial adversity heightening reactivity to subsequent stressor exposure (Boyce & Ellis, 2005). A lifecourse approach to human biology suggests that developmental processes may modify the relationships between environmental stressors and biomarkers, and between biomarkers and clinical health outcomes, across populations. Similarly, populations, or subgroups within populations, may differ in the frequency of functionally significant genes that modify these relationships as well.

Questions regarding cumulative vs. system-specific measures of health, relative vs. fixed cut points in allostatic load, and genetic or developmental influences on physiological systems will undoubtedly be addressed as more investigators explore the determinants of human biological variation and health in diverse settings. In the meantime, it is likely that we will pursue a variety of analytic strategies for dealing with these issues. It is imperative that in-depth knowledge of physiological principles and mechanisms guide the integration of biological measurement into social science research.

3. Defining context

Gersten finds only modest associations between social stressors and allostatic load, a pattern that diverges from several studies in the US but that is similar to prior research in this Taiwanese sample (Seeman et al., 2004). The opportunity to explore the health impact of social relationships in a substantially different cultural context is an important contribution of SEBAS, although cultural factors receive scant attention here. Culture is a collective property of social groups that exists in the minds and actions of individuals, and that defines the salience of stressors and the significance of social

relationships in contributing to, or ameliorating, the impact of stress on health.

Research on the social determinants of health located in Western industrial settings takes for granted prevailing beliefs in individualism and self-reliance, and often demonstrates that various types of social involvement are health protective. Cross-cultural research underscores the point that this is not always the case. For example, on the islands of Samoa, socialization practices have historically undermined a sense of subjective self and emphasized one's identification with, and obligations to, kin and community (Shore, 1982). It is likely that Samoans would perceive the lives of even the most socially integrated westerner as relatively alienated, and several studies have demonstrated health costs associated with social obligations in Samoans' everyday life (Janes, 1990; McDade, 2003). Cultural factors give meaning to the social worlds in which people live their lives, and they are therefore central to defining and structuring the social determinants of health.

This is an important point for measurement. Cross-cultural research is challenged to apply methods that capture social contexts with accuracy and validity. One strategy is to translate (literally) standard instruments developed in Western contexts for measuring perceived stress, social integration, loneliness, etc. This is the approach employed by SEBAS, and it has the advantage of providing opportunities for direct comparison across cultures. However, it raises questions regarding interpretation. For example, do the modest associations between social stressors and allostatic load in SEBAS indicate that social relationships do not matter to health in Taiwan, or does it say that these measures did not tap into the relevant dimensions of sociality in this cultural environment?

An alternative is to develop measures that are similar to standard instruments applied in Western settings, but that are specific to the cultural context in which they are applied. A major challenge here is to create measures that successfully capture meaningful aspects of everyday experience, and that can be modeled within a quantitative statistical framework. There are a number of ways in which this can be achieved (Bernard, 2005). Recent research in Brazil has used structured ethnographic and analytical methods to reveal the local cultural model of social support, comprised of a "hierarchy of resort" in which the help of certain types of people (e.g., friends, family, colleagues) is preferentially enlisted for particular types of problems (e.g., debt, family difficulties) (Dressler, Balierio, Ribeiro, & Dos Santos, 2005). The degree to which individuals conformed to local cultural templates for drawing on social resources in times of need was a significant predictor of systolic and diastolic blood pressure in Brazilian adults.

These types of measures take time to develop, and impose limitations on direct comparisons across cultural environments. However, if social contexts are measured with greater depth and validity within cultures, one might argue that the ability to compare across cultures is enhanced, at least with respect to exploring general trends in the relationships among sociality and health.

Serious attention to culture allows us to go a step further and investigate unique factors that may be important determinants of health in different societies. For example, like many remote rural populations around the world, the Tsimane' of lowland Bolivia rely on their collective knowledge of local natural resources—accumulated and handed down across generations—to ensure their survival and health. Ethnobotanical knowledge is thus an important part of the Tsimane' cultural heritage, and recent analyses demonstrate that mothers who score higher on measures of plant knowledge and use have healthier children (McDade et al., 2007). Ethnobotanical knowledge is a stronger predictor of child health than measures of household economic resources or maternal schooling, underscoring the importance of local cultural factors to child health in this setting.

Similar opportunities for investigating health in relation to culture may present themselves in other locales, including Taiwan. Gersten notes that growing old is considered a "great blessing" that brings considerable respect and deference to the elderly that may offset some of the adverse health consequences of aging, particularly in comparison to societies like the US. What makes aging a blessing, and what dimensions shape the quality of life of older Taiwanese? What is the cultural model for normative social relationships, responsibilities, and daily activities among the elderly? How successful are individuals in conforming to these expectations, and does low conformity predict poorer health? Are models of aging in Taiwan changing as a result of globalization, particularly among younger generations, and might this have implications for health among the elderly? Structured ethnographic methods allow us to operatio-

nalize bounded aspects of the cultural environment so that we can move from culture as a shared property of the group, to culture as a property of the individual (Dressler, Borges, Balierio, & Dos Santos, 2005). We can then test hypotheses regarding the importance of cultural factors to health in a multivariate framework, while also considering more commonly measured social, behavioral, and ecological variables.

In the social and behavioral sciences, it has long been fashionable to claim that the nature–nurture controversy has been laid to rest, or to point to the fallacy of mind–body dualism. But rarely does current research embody these ideals. A minor revolution in transdisciplinary population-based health research is poised to change this, as we are now in a position where we can combine rich measurement of social and cultural contexts with objective measures of physiological function and health in field-based settings. This is the beginning of an exciting era of discovery, yet we face considerable challenges in defining and measuring health, and in defining and measuring social and cultural contexts in diverse societies around the world. The collective efforts of scholars working at the intersection of the social and biomedical sciences are opening up innovative new research directions that will ultimately lead to a better, more multidimensional understanding of human biology and health.

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