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Social status and biological dysregulation: The "status syndrome" and allostatic load

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ABSTRACT

Data from a national sample of 1255 adults who were part of the MIDUS (Mid-life in the U.S.) follow-up study and agreed to participate in a clinic-based in-depth assessment of their health status were used to test the hypothesis that, quite part from income or educational status, perceptions of lower achieved rank relative to others and of relative inequality in key life domains would be associated with greater evidence of biological health risks (i.e., higher allostatic load). Results indicate that over a variety of status indices (including, for example, the person's sense of control, placement in the community rank hierarchy, perception of inequality in the workplace) a syndrome of perceived relative deprivation is associated with higher levels of biological dysregulation. The evidence is interpreted in light of the well-established associations between lower socio-economic status and various clinically identified health morbidities. The present evidence serves, in effect, both as a part of the explanation of how socio-economic disparities produce downstream morbidity, and as an early warning system regarding the ultimate health effects of currently increasing status inequalities.

1. Introduction

The centrality of social inequalities, and the concomitant sense of low personal control, has been an established motif regarding health behavior and health outcomes for more than thirty years (Langer, 1983; Rodin, 1986; Seeman and Seeman, 1983; Wilkinson and Pickett, 2009). In 1979, Norman Cousins, the former editor of the now-defunct *Saturday Review*, wrote in the diary of his life-threatening illness: "There is, first of all, the feeling of helplessness – a serious disease in itself" (Cousins, 1979). His work sparked a new field of psychoneuroimmunology; but at the time this close association between control and disease was largely metaphorical; and in a certain degree it remains so today. Though we know now a good deal about the connection between the sense of control and a variety of morbidities (Lachman et al., 2011), it remains the case that the pre-clinical documentation that would help to support the "disease in itself" proposition is slim, indeed. If lack of control and its status counterparts constitute in any sense "a disease in itself," the biological harms ought to be observable in dysregulation well before the obvious morbidities that we know are associated with low personal control. It is the purpose of this paper to provide evidence that leads in that direction.

The importance of such evidence is highlighted by the fact that Marmot's work on "The Status Syndrome: How Social Standing Affects Our Health and Longevity" (Marmot, 2004) makes the sense of control a central feature of individual status (along with social engagement and opportunity more generally). As he notes, having low standing in the social hierarchy entails having less control over your life. There is no doubt that socio-economic status differences have a significant impact on morbidity, as the extensive work on health disparities along socio-economic lines amply documents (Adler and Stewart, 2010; Wolfe et al., 2012). But the subtler aspects of status distinction, as represented by the control concept and by the finer distinctions in status that people make in their daily life, are significant in their own right—one's standing in the close as well as the larger community being putatively important elements in the health equation. It is our purpose to examine these status features as they bear on biological dysregulation in a national sample.

Though the bulk of the relevant literature has focused heavily on the health disparities associated with socio-economic status, it has

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not escaped attention that there are good grounds for proposing that status distinctions more generally have biological consequences. Such consequences have been explored in both animal and human models, focusing especially on the deleterious stress-related cortisol effects of lower social status (Sapolsky, 2004, 2005). In a more microscopic way, brain imaging has provided evidence of neural pathways that may account, at least in part, for the health consequences of status differences. Such imaging shows evidence of potential early neural embedding of perceived low parental social status, with lower perceived standing being associated with greater amygdala reactivity to threatening facial expressions; see also, McEwen and Gianaros (2010). The authors argue that the stressful circumstances of low status environments may impair the development of stress regulatory systems and result in increased vigilance and sensitivity to potential social threats. In a similar use of the MRI model and the more expansive concept of social status beyond economic rank involved in our own study, Zink et al. (2008) demonstrate that experimentally-induced status differences in a performance setting (requiring visual discrimination in a simulated social context) engaged distinctly different emotional and cognitive neural processes. They conclude that the results "identify neural mechanisms that may mediate the enormous influence of social status on human behavior and health" (p. 273).

Here, we focus on parameters of physiological regulatory systems that lie between such detailed micro examination of brain and neural processing on the one hand, and the larger scale examination of disease outcomes on the other hand. We seek to discern whether, and how, status considerations are evidenced early on in the individual's major regulatory systems such as the autonomic nervous system, the hypothalamic–pituitary–adrenal (HPA) axis, and the cardiovascular system. We examine physiology from a cumulative, multi-systems perspective, drawing on the concept of allostatic load which has been demonstrated to be reliably measurable and to provide insight into the way in which status gradients get under the skin to affect health over the life course (Evans et al., 2012; Karlamangla et al., 2002; Seeman et al., 2001).

The concept of allostatic load, initially developed by McEwen and Stellar (1993), is based on the earlier treatment of allostasis by Sterling and Eyer (1988) referring to the process of maintaining stability (or homeostasis) through change over time—e.g., in the cardiovascular system as it adjusts to alternating demands on the person's resources. But this notion can be applied to other physiological mediators (e.g., the secretion of cortisol), and the concept of allostatic load was proposed to refer to the more general wear and tear that the body experiences due to repeated cycles of allostasis, including the result of inefficient initiation and completion of the homeostatic process over time. McEwen and Seeman present a detailed portrait of the physiological basis for this view of allostatic load as a comprehensive index of the cumulative cost of the varied adaptations that individuals make to their life circumstances (McEwen and Seeman, 1999). Most important for present purposes, they note in particular that the typical emergence of dominance hierarchies in human and other animal societies, and the associated stress they induce, not only can impair cognitive function but can also promote disease (e.g., atherosclerosis) among those vying for the dominant position. Thus, the struggle for control and the burdens of inferior status are presumably implicated in an on-going way in the development of potentially consequential physiological reactivity with negative health consequences in the long term.

The measure of "allostatic load" (AL) used here is a refinement of the initial index that was developed for use on broad-scale community samples (Seeman et al., 1997) — the present refinement being largely a matter of the inclusion of parameters of physiological function that were not available in earlier studies (Gruenewald et al., 2012). As noted, prior work has shown that measures of allostatic load are robust in predicting health-related outcomes (Juster et al., 2010; Seeman et al., 2001). Research has also shown that measures of AL are also related (as predicted) to factors such as socio-economic (SES) and aspects of social engagement (Brooks et al., 2014; Seeman et al., 2004a, 2004b).

In sum, our hypotheses coordinate with the well-known connection between social class status and health, but probe the status issue from a broader-than-class perspective as far as status is concerned. We examine multiple status indices in relation to allostatic load – an index of multisystem physiological dysregulation. The broader canvas with respect to status leads to the hypothesis that (a) low scores on the sense of personal control over life events will be associated with high allostatic load, and (b) the person's sense of inequality and/or relative deprivation with respect to a variety of status domains (e.g., work, family, etc.) will likewise be associated with high allostatic load.

Table 1
Sample characteristics, $n = 1239$.[a]

	n	Mean; median; std or %	Range
Background variables			
Age	1239	54.5, 54.0, 11.7	34–84
White	956	77.3%	
Non-white	281	22.7%	
Male	538	43.4%	
Female	701	56.6%	
Poverty–income ratio	1209	5.2, 4.2, 4.2	0–26.3
Married	804	65.0%	
Divorced/Widowed/Separated	284	23.0%	
Never married	149	12.1%	
Education	1227		
≤High school	342	27.9%	
Some college	364	29.7%	
≥College	521	42.5%	
Social status			
Social class ladder	1216	6.6, 7.0, 1.8	1.0–10.0
Perceived mastery	1235	5.8, 6.0, 0.9	1.0–7.0
Perceived constraint	1235	2.5, 2.4, 1.1	1.0–6.6
Perceived control regarding			
Work	1232	7.3, 8.0, 2.2	0–10.0
Finances	1238	6.8, 7.0, 2.2	0–10.0
Contributions to others	1237	7.6, 8.0, 1.9	0–10.0
Relationship with children	1083	7.6, 8.0, 2.2	0–10.0
Marital relationship	951	7.8, 8.0, 1.9	0–10.0
Domain summary score (based on 5 domains)	1238	7.4, 7.6, 1.4	0–10.0
Perceived inequality			
Work	875	1.6, 1.5, 0.5	1.0–4.0
Home	1235	1.5, 1.3, 0.5	1.0–3.5
Family	1077	1.6, 1.5, 0.5	1.0–4.0
Lifetime discrimination	1166	1.2, 0, 1.9	0–11.0
Outcome–allostatic load			
Allostatic load score	1239	2.0, 1.9, 1.1	0–5.6

[a] All MIDUS biomarker participants with assigned AL score, and at least one social status measure.

2. Methods

The present analyses use data from the Study of Mid-life in the US (MIDUS), a longitudinal study of health and aging in the United States. The initial wave of the study (MIDUS 1) was conducted in 1994–1995, when a national sample of 3487 individuals were surveyed via telephone using random digit dialing. All participants were non-institutionalized, English-speaking adults aged 25–74 living in the U.S. The original cohort was resurveyed approximately