Robert Kaestner
Institute of Government and Public Affairs
University of Illinois at Chicago
815 West Van Buren Street, Suite 525
Chicago, IL 60607
312.996.8227
kaestner@uic.edu

Stress and Immigrant Health:
The Relationship Between Time in US and Allostatic Load of Immigrants

It is well known that most immigrants arrive in this country healthier than comparable US-born persons, but that their health declines with time in US (Harker 2001; Singh 2002; Singh and Siapush 2001; Jasso et al. 2004; Kandula et al. 2004; Lara et al. 2005; Antecol and Bedard 2006). The conventional explanation of this immigrant health trajectory is that immigrants are positively selected on health, which explains their health advantage on arrival, and that assimilation is unhealthy because over time immigrants adopt unhealthy behaviors that adversely affect their health. While there is considerable evidence of a positive selection effect, the evidence is less clear as to the extent and causes of the assimilation effect (Jasso et al. 2004). Moreover, there is significant heterogeneity among immigrants in both health selection and health assimilation.

One potential explanation of the "unhealthy assimilation" effect is greater stress. There is considerable evidence that the processes of immigration and acculturation result in high levels of stress (Thomas 1995; Vega and Rumbault 1991; Vega et al. 2003; Gil et al. 1994). Stress results in physiological changes (allostasis) such as the increased production of hormones (e.g. cortisol) that help the body adjust to maintain proper functioning or homeostasis (McEwan 1998). Stress can also result in changes in health behaviors (i.e., coping) that in turn produce physiological change (Vega and Rumbault 1991; Vega et al. 2003; Gil et al. 1994; Lara et al. 2005). In the short run, these biological and behavioral changes may have a positive effect on health, but over longer periods, stress and its physiological consequences are likely to damage health (McEwen 1998; McEwen and Seeman 1999). McEwen (1998) referred to the physiological effects of stress as allostatic load and Seeman et al. (1997) conceptualized allostatic load as the physiological burden imposed by stress across a range of regulatory systems such as the sympathetic nervous and cardiovascular, and metabolic functions. Allostatic load is intended as a measure of chronic, high-level physiologic response to stress (Seeman et al. 1997).

In this study, I investigate the relationship between stress and immigrant health, and how time in the US mediates this relationship. Specifically, I use a multivariate regression framework to obtain associations between allostatic load and nativity status, and how time in US mediates this association. To isolate the effect of non-behavioral related physiological changes from behavioral changes, I control for several health behaviors such as tobacco use, food intake, alcohol use and exercise. While stress may

be a cause of changes in health behaviors, such changes may also be part of the acculturation process and be unrelated to stress. Immigrants' behaviors may be influenced by the culture of the host country and immigrants may adopt (assimilate) prevailing behaviors. Therefore, by controlling for these behavioral changes, estimates of the association between allostatic load and nativity (time in US) will identify what I will refer to as the purely physiologic effect of stress on immigrant health.

Data for the analysis will come from the National Health and Nutrition Examinations Surveys for 199 to 2004. This survey provides information on nativity and time in US, and most importantly has information on the necessary biomarkers that are used to measure allostatic load. To measure allostatic load, I follow the algorithm used by Geronimus et al. (2006) who based their work on the original model developed by Seeman et al. (1997). Allostatic load is measured by 10 biomarkers: systolic and diastolic blood pressures, body mass index (BMI), glycated hemoglobin, albumin, creatinine clearance, triglycerides, C-reactive protein, homocysteine, and total cholesterol. Geronimus et al. (2006) combine these 10 indicators into an index of allostatic load. This index has been shown to be associated with older age, increased rnortality, lower socioeconomic status, and cognitive decline (Seeman et al. 1997; Geronimus et al. 2006).

In recognition of the significant heterogeneity of immigrants and immigrants' experiences in the US, separate models are estimated by country of origin. Consequently, not all immigrant groups can be examined because of insufficient sample sizes. Therefore, the analysis is limited to immigrants from the primary sending countries: Mexico, India, China and the Philippines. In addition, models are estimated using samples of only immigrants and pooled samples of immigrants and natives. Adjustment is made for personal characteristics and geography.

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