



Low perceived control over health is associated with lower treatment uptake in a high mortality population of Bolivian forager-farmers



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ABSTRACT

Indigenous people worldwide suffer from higher rates of morbidity and mortality than neighboring populations. In addition to having limited access to public health infrastructure, indigenous people may also have priorities and health perceptions that deter them from seeking adequate modern healthcare. Here we propose that living in a harsh and unpredictable environment reduces motivation to pursue deliberate, costly action to improve health outcomes. We assess whether variation in Health Locus of Control (HLC), a psychological construct designed to capture self-efficacy with respect to health, explains variation in treatment uptake behavior among Tsimane Amerindians (N = 690; age range: 40–89 years; 55.8% female; data collection: 2008–2012), a high mortality and morbidity indigenous population in the Bolivian Amazon, Beni Department. Comparisons with two industrialized populations in Japan (Miyagi prefecture; $e_0 = 76.6$ years) and the United Kingdom (Caerphilly county borough; $e_0 = 81.2$ years) confirm that Tsimane ($e_0 = 54.1$ years) have a more externalized HLC. Multilevel level models were used to investigate whether HLC predicts treatment uptake, and mediates the relationship between modernization and treatment uptake. External HLC scores were predictive of treatment outcomes: *Powerful others* scores were positively associated with probability of receiving modern treatment (adjusted odds ratio [OR] = 1.33), while *Chance* scores were negatively associated with probability of receiving modern treatment (adjusted OR = 0.76). We found no effects, however, of *Internal* HLC or educational capital on treatment uptake. Overall, our findings indicate that health-related decision-making is influenced more by a psychological orientation affecting self-efficacy, shaped in part by perceptions of environmental unpredictability and harshness, than by limited knowledge, education or other indicators of modernization.

1. Introduction

Indigenous populations typically experience worse health outcomes than their non-indigenous neighbors, including malnutrition, stunted growth, infectious and chronic diseases, and thus lower life expectancy (King et al., 2009). They face numerous obstacles to accessing quality health care (e.g. geographic isolation, lack of public health infrastructure, insufficient resources), which are often compounded by linguistic barriers, ethnic discrimination and mistrust of health care institutions (King et al., 2009). Indigenous people may also prefer treatments that better reflect their own traditional beliefs of disease etiology, progression and transmission, and types of treatment perceived to be most effective. Greater exposure to and positive experience with modern treatments, perhaps through schooling or other means (e.g. town visits, social networks), may increase the likelihood of using

modern healthcare, which may complement or substitute for traditional treatments. Preferences and decisions about treatments may also vary by illness type. For example, Chinese patients are more likely to use traditional treatments for respiratory infections, and modern treatments for traumas (Giordano et al., 2004). Treatment choice may not just reflect beliefs about disease etiology and preferences for efficacy (Huanca, 2006), but may also reflect constraints to obtaining preferred alternatives, e.g., if traditional treatments are readily available as fallback options (Lasker, 1981).

Here, we study the psychological underpinnings affecting treatment uptake and how they vary with modernization. We propose that preferences for and decisions to pursue treatments are affected by cues of environmental unpredictability, such as unsanitary living conditions, high rates of infectious disease, low socioeconomic status, natural disasters and displacement by governments or foreign entities (Ford et al.,

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2010). Cues of environments characterized by high mortality and morbidity have been linked to more present-oriented time preferences, as short-term fitness considerations may outweigh potential longer-term gains that may never be realized (Quinlan et al., 2016). A related literature on the psychology of poverty suggests that low income conditions affect decision-making by reducing self-efficacy and sense of personal control, increasing vigilance and impulsivity (Sheehy-Skeffington and Haushofer, 2014). Thus, a combination of resource limitation, harsh environment and uncertainty about the future may lead to undervaluing long-term health. Under such conditions of relative deprivation, one might expect under-utilization of available health care (Nettle, 2010).

1.1. Health locus of control (HLC)

HLC describes the extent to which individuals believe their health is controllable and determined by their own actions, rather than by chance or deeds of other potent individuals (Wallston et al., 1978). HLC measures beliefs along three dimensions: i) Internal, ii) Powerful others and iii) Chance. *Internal* HLC is the extent to which individuals believe their health is due to their own actions. *Powerful others* HLC is the extent to which individuals believe their health is influenced by potent others (e.g. kin, friends, medical professionals). *Chance* HLC is the extent to which individuals believe their health is unpredictable and due to luck, fate, or other external factors over which they have no control. These three measures reflect underlying beliefs about the relative importance of self, others, and happenstance in determining one's own health status (Wallston et al., 1978).

High *Internal* individuals believe that their health can be improved by their own actions, so they are more likely than others to seek treatment or engage in preventative health behaviors. High *Chance* individuals, on the other hand, believe they have relatively limited control over their health. They are thus less likely to pursue treatment or engage in preventive health behaviors. While considered an aspect of a more externalized locus of control, *Powerful others* HLC occupies a more ambiguous position. On one hand, individuals with high *Powerful others* may take fewer preventative health measures, believing that any health problems could be managed by others; on the other hand, for the same reason, they may be more likely to seek treatment and follow health recommendations provided by influential actors (Steptoe and Wardle, 2001).

In accordance with these general predictions, different HLC orientations are associated with a wide range of health behaviors and outcomes. Commitment to regular physical exercise (Duffy, 1997; Steptoe and Wardle, 2001), dental health behaviors (Macgregor et al., 1997; Steptoe and Wardle, 2001), frequency of cancer screening among women (Murray and McMillan, 1993), and reduced stress (Roddenberry and Renk, 2010) have been positively associated with Internal HLC and negatively with Chance and Powerful others. Self-reported poor health was negatively associated with both Internal and Chance HLC in the UK, but positively associated with Powerful others (Poortinga et al., 2008). Burker et al. (2005) found Internal HLC to be positively associated with the odds of surviving a lung transplant surgery, but null associations were found with Chance and Powerful others. However, associations with some health-related behaviors, including alcohol consumption and smoking, are inconsistent (Callaghan, 1998; Calnan, 1989). Explanations for these inconsistencies include small sample sizes, low statistical power, inappropriate statistical tests, inherent differences between risk-enhancing (e.g. smoking) and risk-reducing (e.g. regular exercise) behaviors and the multiple factors that affect them, as well as conceptual concerns with the HLC construct (reviewed in Steptoe and Wardle, 2001). The Chance HLC, for example, may be multidimensional reflecting not only beliefs in luck or fate, but also beliefs in other environmental factors over which individuals have some limited control (Steptoe and Wardle, 2001).

Although many HLC studies are correlational, experiments inducing

a “poverty mindset” similarly show that experiences of poverty reduce self-efficacy (Sheehy-Skeffington and Haushofer, 2014, p.97–98). One observational study across seven countries showed that effects of socioeconomic status on health were mediated largely by perceived control over health (Bobak et al., 2000).

1.2. Life history theory and HLC

While individual differences in perceived control over one's health could arise from differences in stable personality traits (Hampson and Friedman, 2008), we expect HLC variation to reflect a more flexible response to environmental uncertainty (Nettle, 2010). Life history theory posits that individuals face trade-offs between investing limited resources across fitness-relevant functions, including growth, somatic maintenance and reproduction, in ways that maximize fitness (Stearns, 1992). As many resources cannot be allocated to multiple functions simultaneously, the emphasis of life history theory on trade-offs has been instructive in illuminating why people often make decisions that knowingly compromise long-term health for short-term fitness benefits (e.g. Hill, 1993). Life history theory predicts that living in an unpredictable environment characterized by high morbidity and mortality should lead to more present-oriented time preferences promoting the valuation of short-term benefits despite long-term costs (e.g. cigarette smoking), while discounting short-term costs that yield long-term benefits (e.g. regular exercise). Cues of poverty similarly are expected to lead to greater preference for short-term gains (Liu et al., 2012). Development of a suite of relevant psychological traits guiding preferences and decision-making, such as self-efficacy, impulsivity, self-regulation and temporal discounting, may be shaped by exposures in early life (Gale et al., 2008), though additional changes over the life course are also important (Schneider et al., 2006).

We propose that HLC, reflecting an adaptive psychological attribute affecting motivation to deliberate and pursue action to improve one's health, will co-vary with cues of environmental unpredictability. “Exogenous” sources of morbidity and mortality reflect those that are difficult to reduce with changes in resource allocation, and are thus often viewed as unavoidable. To some extent, all causes of mortality have “endogenous” and “exogenous” components (Carnes et al., 2006, p.184), but the utility of invoking the “exogenous” quality of environmental unpredictability focuses attention on the *perceived* difficulty of lowering morbidity and mortality, and the great efforts necessary to reduce associated risks. For example, living in a neighborhood with a high rate of violent crime may foster perceptions of environmental harshness, even though one could relocate to a safer neighborhood. Environmental cues of unpredictability, resource shortfalls and high mortality serve to discount potential benefits of carefully planned behaviors that have long-term consequences, whereas they may enhance appeal of behaviors producing short-term rewards (e.g. risky sexual behaviors, criminal behavior) (Pepper and Nettle, 2014). Conversely, other activities that provide longer-term benefits but that have immediate costs (e.g. adherence to a healthy diet, safe sex practices) are associated with living in a relatively stable environment (Huston and Finke, 2003).

Evidence from psychology and behavioral economics supports the notion that HLC internalization is more costly than externalization, given the greater time and effort associated with conscious planning and forethought (reviewed in Rucas and Miller, 2013). Similarly, stressors associated with poverty and a reduced sense of power may be associated with greater susceptibility to misleading cognitive biases and poor decision-making (Sheehy-Skeffington and Haushofer, 2014). A “deficit” approach to cognition views these cognitive biases as errors, whereas an evolutionary-minded interpretation suggests instead that early exposure to sustained adversity induces adaptive shifts in cognition that help individuals cope in those hostile environments (Ellis et al., 2017, p.561–562). Consistent with this “adaptive resilience” approach, individuals in high stress contexts outperform others in

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