



## Original Article

# Male social status and its predictors among Garisakang forager-horticulturalists of lowland Papua New Guinea



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## ABSTRACT

Social hierarchy exists in all human societies, yet the characteristics important for achieving high social status may differ cross-culturally. Studies among Western industrialized populations often use indices of socioeconomic status (SES) to determine individual social position. Conversely, studies among small-scale societies typically use locally relevant traits. Cross-cultural applicability and the relationships between these two strategies have rarely been investigated. Studies limited to industrialized societies demonstrate that low social status is associated with poor health and elevated levels of chronic stress. It remains unclear, however, if and to what extent this relationship is a recent phenomenon in industrialized Western society or a universal human characteristic that has likely been present throughout much of our recent evolutionary history. In this study, we investigate relationships between various SES and locally relevant measures of male social status, age, body-mass index (BMI), and levels of waking salivary cortisol among relatively egalitarian Garisakang forager-horticulturalists of lowland Papua New Guinea. We employ a photo-ranking method using 32 raters (16 women, 16 men) to evaluate 15 measures of social hierarchy in men ( $N = 32$ ). These measures target locally relevant traits considered important for male social status (e.g., sociability, hunting skills, fighting ability, and community influence). Using principal component analysis (PCA), we extracted two components labeled as *Dominance-Respect* and *Prosociality-Skills*. Models investigating predictors of social status demonstrate that age was significantly and positively related to both *Dominance-Respect* and *Prosociality-Skills* while BMI was positively related to only *Dominance-Respect*. Neither *Dominance-Respect* nor *Prosociality-Skills* predicted salivary cortisol levels. However, the SES measure of *Income* was significantly and positively related to cortisol levels, suggesting that men with higher income experience higher levels of stress. This finding may be explained by increased psychological stress accompanying market integration among the Garisakang or, alternatively, by culturally specific expectations for resource sharing and fear of conflict. These findings emphasize the usefulness of diverse social status measures in anthropological research and stress the need for broadened perspectives regarding the causes and consequences of social status among small-scale populations.

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## 1. Introduction

Social hierarchy in human and stable animal societies is a universal feature (Anderson, Hildreth, & Howland, 2015; Boehm, 1999). In such contexts, social status can be defined as relative access to contested resources, which may include food, sexual or social partners or preferred locations (de Waal, 1982). High-ranking individuals are characterised by the priority of access and the ability to acquire a disproportionate share of resources. Social status in humans can influence patterns of

conflict, resource allocation, mating and coordination of group tasks/decisions (Cheng, Tracy, Foulsham, Kingstone, & Henrich, 2013; Cheng, Tracy, & Henrich, 2010; Henrich & Gil-White, 2001). Social rank plays an important role in mating and reproduction and, thus, has important fitness consequences (Sapolsky, 2004; von Rueden, Gurven, & Kaplan, 2011; von Rueden & Jaeggi, 2016).

In nonhuman primates, physical strength and ability to threaten opponents play primary roles in the acquisition and maintenance of male social status (de Waal, 1982; Sapolsky, 2005). However, several additional traits appear to be important to this process, including ability to form and maintain social relationships and engage in coalitions with other group members (de Waal, 1982; Foster et al., 2009). Determinants of social status are thought to be even more numerous among humans, for whom capacity for cooperation, various social

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abilities and specific knowledge and expertise can play important roles in the acquisition and maintenance of male social status (Cheng et al., 2013). Thus, social status among humans is typically considered to be a multidimensional trait (Henrich & Gil-White, 2001; von Rueden, Gurven, & Kaplan, 2008).

Although social hierarchy is a universal feature of animal life, societies of humans and other species differ widely in degree of dominance hierarchies and the relative importance of social status in everyday lives (Boehm, 1999; Thierry, 2000). Predominantly egalitarian societies experience relatively low variation in social status and the distribution of available resources in comparison to more hierarchical societies.

Among humans, socioeconomic status (SES) has been suggested as a functional proxy for social rank (Cavigelli & Chaudhry, 2012). Human SES is traditionally based on relative income, wealth and education (Dowd, Simanek, & Aiello, 2009). Although SES and animal rank concepts are often used as analogous, they are not completely identical. For example, as for some other animals, human social status can be inherited across generations and can change over the course of the lifespan (Cavigelli & Chaudhry, 2012). On the other hand, SES as a measure of social status allows for the comparison of people that have never met, while animal ranks are assessed using face-to-face repeated social interactions among group members. Several recent studies among non-industrial, small-scale human societies have employed non-SES social status measurements based on locally and culturally relevant characteristics (Decker, 2000; von Rueden et al., 2008). Based on peer or group member ratings, these measurements are perhaps more analogous to animal ranks than SES indices.

Social status, typically measured using SES, accounts for significant health disparities among humans, particularly in developed industrialized societies (Cavigelli & Chaudhry, 2012; Dowd et al., 2009; Sapolsky, 2004). Every step down the human social ladder is thought to result in higher morbidity, although the strength of such patterns for different indicators of health vary (Cavigelli & Chaudhry, 2012). One of the physiological mechanisms that has been suggested to explain the SES-health relationship is chronic stress. Building upon previous work with nonhuman animals (Abbott et al., 2003; Creel, 2001; Sapolsky, 2005), this body of research has often reported increased levels of stress hormones and/or lower health in subordinates compared to dominant individuals (Cavigelli & Chaudhry, 2012; Sapolsky, 2004). Although acute stress reaction is potentially adaptive, chronic activation of the stress response hypothalamic-pituitary-adrenal (HPA) axis can lead to damaging effects such as cardiovascular disease, metabolic syndrome and impaired reproduction (Sapolsky, 2004). The prototypical stress hormone cortisol has often been used as a measure of the HPA activity in this work, and several studies have shown that people who occupy higher social status have significantly lower levels of cortisol (Cohen, Doyle, & Baum, 2006; Steptoe et al., 2003; Tucker-Drob et al., 2016). This finding has been attributed to a higher rate of stressful events and fewer available options for stress release among those at the bottom of the social hierarchy (Sapolsky, 2004). However, as reviewed by Dowd et al. (2009), the relationship between SES and stress hormone levels is not consistent. Several studies have reported no or opposite relationships between SES and human cortisol levels (Brandtstatter, Baltes-Gotz, Kirschbaum, & Hellhammer, 1991; Chen & Paterson, 2006; Ranjit, Young, & Kaplan, 2005; Rosero-Bixby & Dow, 2009). Study-to-study methodological differences in cortisol laboratory analyses and SES calculations complicate the interpretation of these mixed patterns (Dowd et al., 2009). The fact that individuals living in industrialized societies are often simultaneously a part of several social hierarchies involving different members (e.g. at work, family, friends) (Sapolsky, 2005), further complicates many analyses of relationships between social status and stress. Ethnic differences in the relationship between SES and stress adds additional complexity to interpretation of the literature (Chen, Miller, Brody, & Lei, 2015; Cohen, Schwartz, et al., 2006; DeSantis et al., 2007).

Studies focusing on less complex, small-scale societies (i.e., where individuals are involved in a single local social hierarchy) and assessing social status simultaneously via both SES and locally relevant, peer-based methods may help to clarify underlying relationships between social status and stress among humans. However, to date, very few studies have investigated the relationship between social status and HPA activity among small-scale societies. Decker (2000) investigated relationship among SES, peer-rated social status and cortisol levels in men living on the Caribbean island Dominica. He did not observe a relationship between cortisol and SES (income, education and material property) but did document that men who were rated as more influential, agreeable, trustworthy and helpful exhibited lower cortisol levels. Similarly, among Tsimane' forager-horticulturalists of Amazonian Bolivia, men with higher political influence have been found to have lower cortisol levels (von Rueden et al., 2014). Surprisingly, however, Tsimane' men with higher income had higher cortisol levels than their peers (von Rueden et al., 2014). These findings underscore the important implications of market integration (Godoy, Reyes-García, Byron, Leonard, & Vadez, 2005; Lu, 2007; Reyes-García et al., 2008) for studies of social status, stress and health among small-scale populations. The cultural consonance framework (Dressler, Balieiro, Ribeiro, & dos Santos, 2007; Dressler & Bindon, 2000) has been proposed to help explain the common negative impact of market integration on health. According to this approach, market integration challenges individual beliefs and behavior in relation to the expectations of a new cultural model, such that the inability to meet new cultural shared standards can lead to increased psychosocial stress and resultant poor health (McDade, Stallings, & Worthman, 2000).

### 1.1. Aims of the study

To address limitations of previous research exploring relationships between human social status and stress, the present study seeks to investigate the multiple dimensions of male social status among the Garisakang, a small-scale society from lowland Papua New Guinea (PNG). Predominantly subsistence forager-horticulturalist, the Garisakang can be characterised as relatively egalitarian with widespread resource sharing and low social stratification. Using a study design that includes the simultaneous measurement of SES components, peer-based assessments of locally relevant individual characteristics, and measures of body-mass-index and cortisol, we investigate the nature of Garisakang social status and its relationship to stress and physical health.

## 2. Methods

Research approval was obtained from local village leaders, the Ethics Committee of the University of South Bohemia, and the Institutional Review Board of Harvard University. The research was conducted under a research visa issued by the National Research Institute of PNG.

### 2.1. Study population

The Garisakang are a Maghu-speaking (Daniels, 2016) indigenous clan of  $\approx 500$  individuals inhabiting the Middle Ramu River Valley of central lowland Madang Province, Papua New Guinea (PNG). The current study took place in Wanang village where, at the time of the study, the settlement was comprised of approximately 200 people. Wanang was established in its current location around 1995. Land in Papua New Guinea is owned directly by indigenous inhabitants and is passed down within clans. Traditionally, most people lived in small hamlets on their clan's land. These settlements were temporary, and communities or their parts would move after several years to a new location. This semi-nomadic pattern is now constrained by government efforts to establish schools and health centers, and local communities are now generally sedentary and stable. A small dirt road connecting

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