



Cross-border ties, nativity, and inflammatory markers in a population-based prospective study of Latino adults

Jacqueline M. Torres^{a,*}, Elissa S. Epel^b, Tu My To^a, Anne Lee^a, Allison E. Aiello^c, Mary N. Haan^a

^a Department of Epidemiology and Biostatistics, University of California, San Francisco, 550 16th Street, San Francisco, CA, 94143, United States

^b Center for Health & Community, University of California, San Francisco, United States

^c Gillings School of Public Health, University of North Carolina, Chapel Hill, United States

ARTICLE INFO

Keywords:

Transnationalism
Inflammation
Social ties
Nativity
Latinos

ABSTRACT

Even after migration, immigrants and their descendants may continue to have ties to family and friends who remain in places of origin. Recent research suggests that these cross-border social ties have implications for health, although this scholarship has been limited to self-reported outcomes. Using data from the Sacramento Area Latino Study on Aging (SALSA), we estimate associations between cross-border social ties and inflammatory biomarkers among Latino adults ($n = 1786$). We find that immigrants who maintained any cross-border connection to family and friends in Latin America had significantly lower levels of baseline interleukin-6 (IL-6) and C-reactive protein (CRP) compared to their US-born counterparts with no cross-border ties. These results held for values of CRP at five-year follow-up for men only. In contrast, US-born women with cross-border ties to family and friends in Latin America had both significantly higher levels of CRP and significantly lower levels of tumor necrosis factor-alpha (TNF- α) at five-year follow-up relative to their US-born counterparts with no cross-border ties. We find descriptively that men who have cross-border ties are also less likely to be socially isolated within local contexts. Considering place-of-origin social connections may contribute critical nuance to studies of immigrant health, including disparities in inflammatory markers that may serve as indicators of underlying chronic disease.

Building on a long-standing body of research linking social relationships to health (Berkman et al., 2000), recent work has investigated links between social relationships and inflammatory markers (Bajaj et al., 2016; Gleit et al., 2012; Yang et al., 2016; Yang et al., 2014) that may serve as early indicators of subsequent morbidity (Das, 2016; Ridker et al., 2000a; Ridker et al., 2000b) and mortality (Kaptoge et al., 2010). These studies have found some evidence that social relationships influence inflammatory markers, including pro-inflammatory cytokines such as interleukin-6 (IL-6) and acute phase proteins (e.g. C-reactive protein) (Ford et al., 2006; Loucks et al., 2006; Yang et al., 2016), although findings overall have been mixed, with some evidence of null or modest associations (Bajaj et al., 2016; Gleit et al., 2012).

Notably, the extant research has been largely limited to US-born non-Latino white respondents, and has therefore given less consideration to the sociocultural context of family and community networks for US immigrants and their descendants. This paper extends recent research on the links between social relationships and inflammatory biomarkers to a population-based sample of older Latino adults 60 years and older. Pro-inflammatory cytokines IL-6 and tumor necrosis factor-

alpha (TNF- α) have been linked to all-cause and cardiovascular disease mortality (Roberts et al., 2010) and C-reactive protein has been linked to functional impairment (Aiello et al., 2008) and cognitive decline (Yaffe et al., 2007) in this sample, underscoring the wide-ranging implications for multiple health outcomes.

We carry out this work with a transnational framework, which acknowledges the potential for immigrants to maintain social connections to family and friends both locally and in places of origin (Acevedo-Garcia et al., 2012). We therefore estimate associations between both cross-border and local social connection and inflammation in our sample. This work builds from recent research that suggests that continued cross-border ties are significantly associated with mental health and health behaviors for both immigrants and their US-born descendants, even after accounting for local social connections to family and community members (Alcántara et al., 2015a; Alcántara et al., 2015b; Torres et al., 2016a, b). Finally, we examine whether cross-border ties might reveal potential heterogeneity in the relationship between nativity and inflammation. While immigrants have been found to have lower levels of inflammation than their US-born counterparts

Abbreviations: (CRP), C-Reactive Protein; (IL-6), Interleukin-6; (SALSA), Sacramento Area Latino Study on Aging; (TNF- α), Tumor Necrosis Factor- α ; (US), United States

* Corresponding author.

E-mail address: Jacqueline.Torres@ucsf.edu (J.M. Torres).

<https://doi.org/10.1016/j.socscimed.2018.05.028>

Received 12 September 2017; Received in revised form 21 March 2018; Accepted 15 May 2018

Available online 16 May 2018

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(Crimmins et al., 2007; Peek et al., 2010), it is possible that this immigrant “advantage” in inflammation differs by whether or not immigrants are connected to places of origin.

1. A transnational approach to the study of social relationships and inflammation

Inflammation is a potential biological mediator linking social relationships to multiple health outcomes (Eisenberger and Cole, 2012; Kiecolt-Glaser et al., 2010). Social connections may influence inflammation by activating responses in neural and endocrine systems (Eisenberger and Cole, 2012). Social relationships may also influence health behaviors, such as smoking and physical activity, that in turn contribute to systemic inflammation (Kiecolt-Glaser et al., 2010). While the relationships between social relationships and inflammation have been tested in population-based data sources (Glei et al., 2012; Yang et al., 2014, 2016), this work has incorporated limited nuance regarding the sociocultural particularities of family and community networks for diverse populations, including immigrants and their US-born children.

Scholars have recently emphasized the importance of incorporating a transnational perspective into research on the social determinants of health for immigrants and their family members (Abraído-Lanza et al., 2016). A transnational perspective emphasizes the connections that immigrants and their descendants often maintain with family and friends in places of origin even as they develop social relationships within communities in the US (Waldinger, 2015). These place-of-origin connections may be in the form of return visits, the transmission of remittances, or communication by phone or the Internet. A nascent body of immigrant health scholarship has considered the potential influence of these cross-border social relationships on self-reported health and health behaviors (Alcántara et al., 2015a; Alcántara et al., 2015b; Torres et al., 2016a, b; Villa-Torres et al., 2017), although this work has yet to examine whether these associations with self-reported measures extend to biological indicators of health, including inflammatory markers.

Scholars have, however, proposed a number of potential psychosocial and behavioral mechanisms that may explain any observed association between cross-border ties and inflammation (Torres et al., 2016a; Villa-Torres et al., 2017; Viruell-Fuentes and Schulz, 2009), which we review below. Each of these mechanisms may have countervailing protective and adverse implications for inflammation (see conceptual framework in Supplemental Appendix). Although we are secondarily interested in the role of local social relationships, the potential mechanisms linking local social relationships within family and community networks and inflammation have been addressed elsewhere (Kiecolt-Glaser et al., 2010). However, we note that cross-border connection may also intersect in important ways with social relationships – as well as social isolation – experienced in the US. It may be that those who have fewer social connections in the US are more likely to engage with family and friends across borders as a way of coping. On the other hand, those who have strong social networks in the US could rely less on cross-border ties for emotional, instrumental, or informational support (Waldinger, 2015).

2. Cross-border social ties and inflammation: possible psychosocial pathways

Connection with family and friends in places of origin may have protective effects on inflammation through both supportive and stress-exacerbating psychosocial pathways. For one, family and friends abroad may serve as a critical source of support and provide a sense of belonging within a cross-border family network and/or ethnonational community (Viruell-Fuentes and Schulz, 2009). Scholars have documented through qualitative research that family and friends who remain in places of origin often continue to provide social, informational,

and instrumental support to immigrants and their family members – lending an ear to discuss challenging emotional experiences related to living in the US, or providing advice about medical care or home remedies, for example (Menjívar, 2002; Villa-Torres et al., 2017). This support and sense of belonging is often critical as immigrants and their family members experience social isolation and marginalization in the US. Continued cross-border social connection may in turn contribute to lower levels of inflammation through pathways of reduced depression and elevated social and instrumental supports (Kiecolt-Glaser et al., 2010).

There may also be potentially adverse implications of cross-border ties for inflammation among immigrants and their family members, which may occur through stress-related pathways. Immigrants may continue to provide emotional or financial support to family members across borders, possibly in addition to caring for family members locally (Abrego, 2014; Viruell-Fuentes, 2006). Qualitative scholarship has uncovered the particularly acute burden of cross-border caregiving for immigrant women, who may be charged with coordinating and providing care to family members both at home and abroad (Viruell-Fuentes, 2006). Chronic stress resulting from family strain and caregiving burden in general has been linked to higher levels of inflammation (Kiecolt-Glaser et al., 2003). While the potential for social strain and the burden of caregiving is not unique to cross-border relationships, cross-border ties *are* unique from local ties in that they occur in a context of cross-border separation (Menjívar, 2012). That is, family members connect across borders because they are separated across borders. Often this separation is the result of immigration policies that make it difficult for immigrants to return to places of origin, or that make family reunification in the US a legal or financial impossibility (Abrego, 2014; Menjívar, 2002). Prior research finding significant, adverse associations between cross-border ties and the psychological wellbeing of immigrant women in population-based studies of US Latinos may reflect the strain of cross-border separation and caregiving that often accompanies these transnational connections (Alcántara et al., 2015a; Torres et al., 2016b).

3. Cross-border social ties and inflammation: possible behavioral pathways

Cross-border ties may also be linked to inflammatory markers through behavioral pathways. As the result of primarily qualitative research, scholars have suggested that cross-border ties may facilitate immigrants' ongoing exposure to behavioral norms and preferences of communities of origin (Villa-Torres et al., 2017). These norms and preferences may include health behaviors that may be reflected in inflammatory markers. In one of the few empirical tests of the potential associations between cross-border ties and health behaviors, Alcántara et al. (2015b) found significant cross-sectional associations between cross-border ties –measured as the number of return visits to place of origin per year, and remittance-sending to family and friends in Latin America– and lower odds of being a current smoker in a national sample of Latino migrants. The protective association between remittance-sending and smoking status was particularly pronounced for Latina women.

Cross-border ties may also have implications for other health-related behaviors, including interaction with the health care system, self-care practices, and medication adherence (Villa-Torres et al., 2017). Specifically, immigrants and their descendants who maintain cross-border ties may be more likely to return to places of origin for health care; seeking health care in places of origin may be preferred for those who experience barriers to care in the US, or who are accustomed to systems of care in places of origin. Even for those who are not able to travel due to legal, financial, or health-related constraints, cross-border social ties may serve as channels of health-related information, including traditional self-care practices (Villa-Torres et al., 2017).

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