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Food insufficiency, depression, and the modifying role of social support: Evidence from a population-based, prospective cohort of pregnant women in peri-urban South Africa

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ABSTRACT

Rationale: Food insecurity has emerged as an important, and potentially modifiable, risk factor for depression. Few studies have brought longitudinal data to bear on investigating this association in sub-Saharan Africa.
Objective: To estimate the association between food insufficiency and depression symptom severity, and to determine the extent to which any observed associations were modified by social support.
Methods and results: We conducted a secondary analysis of population-based, longitudinal data collected from 1238 pregnant women during a three-year cluster-randomized trial of a home visiting intervention in Cape Town, South Africa. Surveys were conducted at baseline, 6 months, 18 months, and 36 months (85% retention). A validated, single-item food insufficiency measure inquired about the number of days of hunger in the past week. Depression symptom severity was measured using the Xhosa version of the 10-item Edinburgh Postnatal Depression Scale. In multivariable regression models with cluster-correlated robust estimates of variance, lagged food insufficiency had a strong and statistically significant association with depression symptom severity ($\beta = 0.70$; 95% CI, 0.46–0.94), suggesting a 6.5% relative difference in depression symptom severity per day of hunger. In stratified analyses, food insufficiency had a statistically significant association with depression only among women with low levels of instrumental support. Using quantile regression, we found that the adverse impacts of food insufficiency were experienced to a greater degree by women in the upper end of the conditional distribution of depression symptom severity. Estimates from fixed-effects regression models and fixed-effects quantile regression models, accounting for unobserved confounding by time-invariant characteristics, were similar.
Conclusions: Food insufficiency was associated with depression symptom severity, particularly for women in the upper end of the conditional depression distribution. Instrumental social support buffered women against the adverse impacts of food insufficiency.

1. Introduction

Depressive disorders are among the most disabling conditions worldwide, comprising a substantial proportion of the global burden of disease (Whiteford et al., 2013). The social and economic conditions of poverty – including stressful life events, social exclusion, malnutrition, and other stressors that are particularly pervasive in resource-limited settings – have been linked to increased risks of developing depressive disorders generally (Lund et al., 2010) as well as during critical periods such as pregnancy and postpartum (Fisher et al., 2012). The public health impacts of untreated or sub-optimally treated depression extend beyond index

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cases, as depression has been shown to undermine economic productivity (Ettner et al., 1997), and maternal depression compromises caregiving and child health (Perry, 2008; Rahman et al., 2004; Tsai and Tomlinson, 2012).

Food insecurity, which occurs whenever the availability of nutritionally adequate food or the ability to procure food in culturally acceptable ways is limited or uncertain (Anderson, 1990), has recently emerged as a particularly important – and potentially modifiable – risk factor for depression. The construct of food insecurity comprises a number of different concepts, including food insufficiency, inadequacy of coping strategies, and hunger. While numerous cross-sectional studies from resource-limited settings have examined the association between food insecurity and mental health, only four of these have examined this relationship using longitudinal data (Cole and Tembo, 2011; Hadley and Patil, 2008; Maes et al., 2010; Tsai et al., 2012). Pregnancy and the puerperium represent particularly vulnerable periods for women, yet in two recently published systematic reviews of risk factors for postpartum depression (Fisher et al., 2012; Yim et al., 2015), only three studies – all cross-sectional, and only one conducted in sub-Saharan Africa (Dewing et al., 2013) – were noted to have assessed the association between food insecurity and postpartum depression. Finally, all of these studies have focused exclusively on investigating locational shifts in the distribution of depression, with less attention paid to the shape of the distribution. This is an important gap in the literature: if the effects of a potential food security intervention vary across the distribution of depression in a population, then this could provide insight into vulnerable subgroups who might benefit the most from such interventions. The overall thrust of this body of research is that food insecurity, food insufficiency, and hunger all exert negative impacts on mental health, but significant gaps remain.

To address these gaps in the literature, we conducted a secondary analysis of population-based, longitudinal data collected from 1238 pregnant women during a three-year cluster-randomized trial in Cape Town, South Africa. The study's primary aim was to determine whether a community-based home visiting program could improve maternal and child health over three years post-delivery. With repeated measures of both food insufficiency and depression symptom severity, these data offered us the opportunity to estimate their relationship while adjusting for both observed and unobserved confounding.

2. Conceptual framework

Our conceptual framework draws heavily on Pearlin and colleagues' (Pearlin, 1989, 1999; Pearlin et al., 1981) conceptualization of stressors as being rooted in social and economic structures of daily living. Stressors with more consequential impacts for mental health are those for which culturally embedded aspects of role function are particularly implicated (Kessler et al., 1985). In settings of generalized poverty where subsistence-level strategies are needed to ensure household viability, food insufficiency should be expected to emerge as a strong predictor of emotional distress, particularly among women, who occupy a central role in food production for their households (Quisumbing et al., 1995). In many countries in sub-Saharan Africa, insufficiency of food is the predominant stressor experienced in daily living (Pike and Patil, 2006).

In many ways, the hypothesized association between food insecurity and depression provides a unique illustration of Krieger's (2001) concept of embodiment. In Krieger's (2001) formulation, embodiment is defined as "how we literally incorporate, biologically, the material and social world in which we live" (p.672). Peri-urban South Africa has been described as an environment that compromises the well-being of women, who are subject to numerous co-occurring and potentially synergistic (i.e., "syndemic" (Singer, 1994; Tsai and Burns, 2015)) psychosocial health risks. These risks include depression, non-communicable disease, intimate partner violence, HIV, and substance abuse (Dewing et al., 2013; O'Connor et al., 2011; Pitpitan et al., 2013; Tomlinson et al., 2014). Qualitative work has described how structural violence (Farmer, 1999) plays a fundamental role in undermining South African women's access to affordable, reliable, and healthy food, and how the resulting food insecurity in turn becomes manifest as poor health (Mendenhall, 2015; Mendenhall and Norris, 2015). The lived experiences of these chronic, conjoint health risks as "daily stressors" (Miller and Rasmussen, 2010) may uniquely erode coping resources, ultimately converging to result in "syndemic suffering" (Mendenhall and Norris, 2015).

In an analysis of food insecurity and emotional distress in urban Ethiopia, Maes et al. (2010) hypothesized that the adverse mental health impacts of food crises could potentially be moderated by social networks of psychological support and exchange. Their hypothesis is consistent with the theory that social support exerts a "buffering," or moderating, influence against life stressors (Cassel, 1976; Cobb, 1976). We therefore hypothesized that the association between food insufficiency and depressed mood would be weaker among women with less social support. We further hypothesized that the extent of buffering would be strongest for instrumental social support rather than emotional social support. This hypothesis is consistent with the "matching" theory (Cohen and McKay, 1984), which predicts that the experience of food insufficiency should be most effectively buffered with support that is delivered in the form that most closely counters the stressor. Thus, we expected that instrumental support – as distinguished from emotional, informational, or diffuse support (Cohen and Wills, 1985) – would be the most relevant type of social support to consider when testing the buffering hypothesis.

3. Methods

3.1. Ethics statement

All research assistants received training on how to administer surveys for gathering sensitive information and provided assurances of confidentiality. Written informed consent was obtained from all study participants. The survey was framed generally as being part of a study of family health and well-being. In consultation with on-site supervisors, research assistants provided referrals to local counseling resources and/or child social services as needed, with standardized protocols in place to refer women to emergency services in the case of acutely elevated risk of harm to self or harm from others. All study procedures were approved by the South General Institutional Review Board of the University of California at Los Angeles and the Health Research Ethics Committee of the Stellenbosch University Faculty of Health Sciences. A four-person Data Safety Monitoring Board populated by local and international experts monitored implementation of the study.

3.2. Study population

The protocol for the randomized trial was registered with ClinicalTrials.gov (NCT00972699), and the 6-, 18-, and 36-month outcomes have been published (le Roux et al., 2014, 2013; Rotheram-Borus et al., 2011, 2014, 2015). The study was conducted in three informal settlements near Cape Town, South Africa, where major community health challenges include HIV, tuberculosis, malnutrition, and alcohol use (Hartley et al., 2011; O'Connor et al., 2011; Tomlinson et al., 2014). Research assistants went from house to house to identify all pregnant women living in 24