



Research report

Food insecurity and its association with co-occurring postnatal depression, hazardous drinking, and suicidality among women in peri-urban South Africa



Sarah Dewing^a, Mark Tomlinson^{b,c}, Ingrid M. le Roux^d, Mickey Chopra^e, Alexander C. Tsai^{f,g,*}

^a Health Systems Research Unit, Medical Research Council of South Africa, Tygerberg, South Africa

^b Department of Psychology, Stellenbosch University, Stellenbosch, South Africa

^c Alan J. Flisher Centre for Public Mental Health, Department of Psychiatry and Mental Health, University of Cape Town, Cape Town, South Africa

^d Philani Child Health and Nutrition Project, Khayelitsha, Elonoabeni, Cape Town, South Africa

^e Health Section, United Nations Children's Fund, NY, United States

^f Center for Global Health and Chester M. Pierce, MD Division of Global Psychiatry, Massachusetts General Hospital, Boston, MA, United States

^g Harvard Medical School, Boston, MA, United States

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ABSTRACT

Background: Although the public health impacts of food insecurity and depression on both maternal and child health are extensive, no studies have investigated the associations between food insecurity and postnatal depression or suicidality.

Methods: We interviewed 249 women three months after they had given birth and assessed food insecurity, postnatal depression symptom severity, suicide risk, and hazardous drinking. Multivariable Poisson regression models with robust standard errors were used to estimate the impact of food insecurity on psychosocial outcomes.

Results: Food insecurity, probable depression, and hazardous drinking were highly prevalent and co-occurring. More than half of the women (149 [59.8%]) were severely food insecure, 79 (31.7%) women met screening criteria for probable depression, and 39 (15.7%) women met screening criteria for hazardous drinking. Nineteen (7.6%) women had significant suicidality, of whom 7 (2.8%) were classified as high risk. Each additional point on the food insecurity scale was associated with increased risks of probable depression (adjusted risk ratio [ARR], 1.05; 95% CI, 1.02–1.07), hazardous drinking (ARR, 1.04; 95% CI, 1.00–1.09), and suicidality (ARR, 1.12; 95% CI, 1.02–1.23). Evaluated at the means of the covariates, these estimated associations were large in magnitude.

Limitations: The study is limited by lack of data on formal DSM-IV diagnoses of major depressive disorder, potential sample selection bias, and inability to assess the causal impact of food insecurity.

Conclusion: Food insecurity is strongly associated with postnatal depression, hazardous drinking, and suicidality. Programmes promoting food security for new may enhance overall psychological well-being in addition to improving nutritional status.

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1. Introduction

Depressive and alcohol use disorders are major contributors to global disease burden, and depression is the leading cause of disease burden worldwide among women of reproductive age (Mathers et al., 2008; Tomlinson et al., 2007). Both are significant

risk factors for suicide (Nock et al., 2009, 2010). All of these contribute heavily to the disease burden in South Africa (Bradshaw et al., 2003).

Women are particularly vulnerable to depression during the postnatal period (Gavin et al., 2005), which in turn can have adverse impacts on their children's health and development (Tsai and Tomlinson, 2012). The prevalence of postnatal depression is greater in low- and middle-income countries compared to high-income countries (Gavin et al., 2005; Halbreich and Karkun, 2006; Sawyer et al., 2010), and the prevalence in socioeconomically deprived settings within sub-Saharan Africa may be even greater. Several studies of antenatal and postnatal depression among

* Corresponding author at: MGH Center for Global Health, 100 Cambridge Str., 15th floor, Boston, MA 02114, United States. Tel.: +1 617 724 1120.
E-mail address: actsai@partners.org (A.C. Tsai).

women in Khayelitsha, a peri-urban settlement near Cape Town, have shown prevalence rates ranging from 16–47% (Ramchandani et al., 2009; Rochat et al., 2011; Tsai and Tomlinson, 2012).

Food insecurity, defined as having uncertain or limited availability of nutritionally adequate food or as being unable to procure food in socially acceptable ways (Anderson, 1990), is an emerging risk factor for poor emotional wellbeing (Lund et al., 2010; Sorsdahl et al., 2011; Tsai et al., 2012a; Weaver and Hadley, 2009) that demonstrates gendered patterning in both low- and high-income settings (Carter et al., 2011; Tsai et al., 2012a). Food insecurity has a substantial but potentially modifiable public mental health impact given its high prevalence in low- and middle-income countries. In South Africa, for example, between one-quarter and one-third of households have been estimated to be food insecure (Sorsdahl et al., 2011).

Although the public health impacts of food insecurity and depression on both maternal and child health are extensive, no studies have investigated the association between food insecurity and postnatal depression or suicidality. Several studies have examined the association between socioeconomic disadvantage and poor emotional wellbeing (Carter et al., 2011; Lund et al., 2010; Tsai et al., 2012a), including postnatal depression (Fisher et al., 2012; Ramchandani et al., 2009). However, food insecurity is a more specific and policy-relevant marker of uncertainty and unpredictability and is, in many low- and middle-income countries, the predominant form of uncertainty experienced in daily living (Pike and Patil, 2006). To address these gaps in the literature, we conducted this study to estimate the associations between food insecurity, postnatal depression, hazardous drinking, and suicidality among postnatal women living in a peri-urban settlement near Cape Town, South Africa.

2. Methods

2.1. Study population, design and data collection

South Africa is a middle-income country in which a growing majority of the population is urbanized. Khayelitsha, a socio-economically deprived urban area on the outskirts of Cape Town, is home to a primarily Xhosa-speaking, black African population. Approximately one-half of residents are unemployed. Most live in informal housing, and nearly three-quarters of households have a monthly household income below subsistence level. Among all Cape Town sub-districts, Khayelitsha had the highest age-standardized mortality rates in 2006, with the leading causes being HIV/AIDS, homicide, and tuberculosis (Groenewald et al., 2010).

Study participants were recruited from among those newly invited to participate in an ongoing child health and nutrition programme delivered by Philani, a community-based non-governmental organisation in the area (le Roux et al., 2010). Outreach workers identify women at various stages of pregnancy and invite them to take part in the programme which is aimed at improving maternal and child health and nutrition outcomes through home-based intervention. Women were invited to participate in the perinatal depression screening study by Philani outreach workers at the same time that they were invited to take part in the maternal and child health and nutrition programme. All participants provided written informed consent. Three months after birth, trained fieldworkers (hired independently of Philani) visited participants at their homes to administer the study survey using mobile phones (Tomlinson et al., 2009). Ethical approval for all study procedures was granted by the Health Research Ethics Committee, Faculty of Health Sciences, Stellenbosch University; the Committee on Human Research, University of California at San

Francisco; and the Office of Human Research Administration, Harvard School of Public Health.

2.2. Measures

We used the Xhosa version of the 10-item Edinburgh Postnatal Depression Scale (EPDS) to screen for postnatal depression (Cox et al., 1987). The EPDS scale items enquire about depressive symptoms such as tearfulness, anhedonia, and motivation with a seven-day recall period. Responses range from 0 to 3 based on symptom severity, and the maximum possible score is 30. Among Xhosa-speaking women, the EPDS has been demonstrated to have a coherent internal structure (De Bruin et al., 2004), and it has been shown to have a high sensitivity for detecting postnatal depression in numerous settings worldwide (Eberhard-Gran et al., 2001; Gibson et al., 2009), including South Africa (Rochat et al., *in press*). Following previous studies in this population, we employed a cutoff score of ≥ 13 to indicate probable depression (Honikman et al., 2012; Rochat et al., 2006).

Suicide risk was assessed using the suicidality module of the Mini International Neuropsychiatric Interview (MINI), version 5.0.0 (Sheehan et al., 1998), a structured interview that has been deployed in numerous studies of psychiatric morbidity in South Africa (Myer et al., 2008; Olley et al., 2005). The suicidality module consists of 10 questions about suicidal ideation, planning, and attempts over the past month, and one question about lifetime suicide attempts. The recommended algorithm was applied to the MINI scores to identify women at high risk for suicide. Participants indicating any level of risk for suicide were immediately referred to a social worker.

To screen for hazardous drinking, we used the TWEAK screening instrument, which derives its name from the five items of inquiry ([t]olerance, [w]orry expressed by others, consumption of an "[e] ye-opener," [a]mnestic episodes due to alcohol-induced blackouts, and need to [k]ut down on drinking) (Russell, 1994; Russell et al., 1994). In contrast to other screening instruments that were originally developed on samples of men and that rely primarily on direct questioning to assess risk, the TWEAK was developed specifically to assess hazardous drinking during pregnancy and relies on indirect questioning. A TWEAK score of two or greater was used as the cutoff for hazardous drinking.

Food insecurity was measured using the Household Food Insecurity Access Scale (HFIAS), a nine-item experience-based measure of food insecurity that captures three domains of food insecurity experience: anxiety and uncertainty about supply, insufficient quality and insufficient intake and its physical consequences (Swindale and Bilinsky, 2006). The HFIAS has been shown to represent apparently universal domains of the food insecurity access experience and to distinguish between food secure and food insecure households across different cultural contexts. Consistent with best practices, the scale was adapted to include culturally specific probes and interviewer clarifications (Swindale and Bilinsky, 2006).

2.3. Statistical analysis

All analyses were conducted with the use of the Stata statistical software package (version 12.0, StataCorp LP, College Station, Tex.). We estimated the Pearson's correlation coefficients between the HFIAS, EPDS, MINI, and TWEAK scores on the continuous scale (Cox, 2008). To estimate the association between food insecurity and probable depression, high-risk suicidality, and hazardous drinking, we fit three separate Poisson regression models to the data with the continuous food insecurity score as the primary exposure of interest. Robust estimates of variance were employed, thereby enabling the interpretation of the exponentiated

regression coefficients as adjusted risk ratios (Zou, 2004). We also estimated the predicted probabilities of the outcomes evaluated at the 25th and 75th percentiles of the HFIAS scores and at the means of the other variables (Williams, 2012).

All estimates were adjusted for potential confounding by age, self-reported diagnosis of HIV that was newly ascertained during the pregnancy, self-reported cigarette smoking status, marital status (married vs. other), employment status (any vs. none), employment status of the baby's father, and type of housing (informal vs. other). Because of small cell sizes caused by the rarity of the suicide risk outcome variable, in the suicide risk regression model we encountered the problem of separation, i.e., regressors that perfectly predicted the outcome therefore yielding infinitely large or infinitely small parameter estimates. We checked the robustness of our estimates from that model by re-fitting a logistic regression model to the data with a penalized-likelihood correction to eliminate this small-sample bias (Firth, 1993; Heinze and Schemper, 2002).

We undertook several sensitivity analyses by exploring different cutoff thresholds in the exposure and outcome variables for the regression models. First, we applied the algorithm recommended by the developers of the HFIAS (Swindale and Bilinsky, 2006) to categorize women as severely food insecure vs. other. Second, we used the MINI algorithm to categorize women as having any suicide risk or moderate-high risk. Third, similar to other studies, we used the cutoff EPDS ≥ 10 to define probable depression (Tsai and Tomlinson, 2012). Dichotomous variables based on these thresholds were then used to re-fit the regression models to the data.

3. Results

Fieldworkers recruited and consented 361 women at various stages of pregnancy (estimated dates of conception were not recorded). Of these, 83 women (23%) were not successfully interviewed at the 3-month postnatal visit: 22 were unavailable to complete the interview during the prespecified time window, 47 relocated to the Eastern Cape shortly after giving birth, eight had dropped out of the Philani program, and six rescinded

consent. Twenty-nine women (8%) were lost to follow up: 22 women's records in the Philani program were lost or closed for unknown reasons, and the whereabouts of seven were unknown. The analytic sample consisted of 249 women successfully interviewed at the 3-month postnatal visit. These interviews were conducted between May 3, 2010 and February 18, 2011. Summary statistics are displayed in Table 1. The median age was 26 years (interquartile range [IQR], 23–29), and most were not married (153 [62%]). In addition, few mothers were employed (34 [14%]), and most lived in informal housing (144 [58%]).

There was a high prevalence of adverse psychosocial outcomes. The median EPDS was 8 (IQR, 4–13), and 79 women (32%) met the threshold for probable depression. Nineteen women (8%) had significant suicidality: eight were classified as low risk, four were classified as moderate risk, and seven were classified as high risk. Thirty-nine women (16%) screened positive for hazardous drinking on the TWEAK screening instrument. The primary exposure of interest, food insecurity, was also highly prevalent. The median food insecurity score was 7 (IQR, 2–12), and 149 women (60%) were classified as severely food insecure. Co-occurrence of these psychosocial variables was common (Table 2). The estimated between-score correlations ranged from 0.15–0.27 and were statistically significant, with the exception of the correlation between suicidality and TWEAK scores ($r = -0.08$; 95% confidence interval [CI], -0.21 to 0.05).

In multivariable regression models, food insecurity had a statistically significant association with each of the outcomes of interest (Table 3). Each additional point on the HFIAS was associated with a 5% increased risk of probable depression (adjusted risk ratio [ARR], 1.05; 95% CI, 1.02–1.07), a 4% increased risk of hazardous drinking (ARR, 1.04; 95% CI, 1.00–1.09), and a 12% increased risk of high-risk suicidality (ARR, 1.12; 95% CI, 1.02–1.23). These associations were large in magnitude: evaluated at the means of the other covariates, there was nearly a twofold difference between the predicted probabilities of probable depression and hazardous drinking at the 25th and 75th percentiles of the food insecurity scores, and a threefold difference between the corresponding predicted probabilities of high-risk suicidality (Table 4).

Our sensitivity analyses using different cutoffs for the outcome and exposures yielded qualitatively similar findings. Each additional point on the HFIAS was associated with increased suicidality, whether the outcome was specified as any suicide risk (ARR, 1.14; 95% CI, 1.07–1.22) or moderate to high risk (ARR, 1.10; 95% CI, 1.02–1.19). Similar findings were also obtained with regards to probable depression when a cutoff of ≥ 10 was employed for the outcome (ARR, 1.03; 95% CI, 1.01–1.05). When the HFIAS was specified as a binary exposure (severe food insecurity vs. other), severe food insecurity was associated with an increased risk of probable depression (ARR, 1.60; 95% CI, 1.04–2.45). Severe food insecurity was also associated with an increased risk of suicidality (ARR, 2.69; 95% CI, 0.56–12.9) and hazardous drinking (ARR, 1.94; 95% CI, 0.88–4.26), but these estimated risk ratios were not statistically significant.

Table 1
Summary statistics.

Characteristic	Median (interquartile range) or number (percentage)	Missing values
Age (years)	26 (23–29)	6
Self-reported HIV, newly discovered during the pregnancy	33 (13%)	7
Smokes	14 (6%)	4
Married	90 (36%)	6
Employed	34 (14%)	8
Father of baby employed	162 (65%)	8
Informal housing	144 (60%)	0
Severely food insecure	149 (59.8)	7

Table 2
Co-occurrence of food insecurity, postnatal depression, suicidality, and hazardous drinking.

	Pearson correlation coefficient (95% confidence interval)			
	Food insecurity	Postnatal depression	Suicidality	Hazardous drinking
Food insecurity	1.00	–	–	–
Postnatal depression	0.27 (0.14–0.38)	1.00	–	–
Suicidality	0.19 (0.06–0.31)	0.15 (0.02–0.27)	1.00	–
Hazardous drinking	0.15 (0.02–0.28)	0.16 (0.03–0.29)	–0.08 (–0.21 to 0.05)	1.00

Table 3

Associations between food insecurity and probable postnatal depression, hazardous drinking, and high-risk suicidality.

	Adjusted risk ratio (95% confidence interval)		
	Probable postnatal depression	Hazardous drinking	High-risk suicidality
Food insecurity score (per point)	1.05 (1.02–1.07)	1.04 (1.00–1.09)	1.12 (1.02–1.23)
Age	0.98 (0.95–1.02)	1.02 (0.95–1.09)	0.95 (0.84–1.08)
Incident self-reported HIV	1.04 (0.64–1.70)	1.62 (0.81–3.24)	1.03 (0.17–6.16)
Smoking status	0.84 (0.36–1.94)	0.68 (0.22–2.14)	0.48 (0.02–10.1)
Married	0.92 (0.61–1.41)	0.43 (0.18–1.07)	0.78 (0.19–3.23)
Employed	1.48 (0.89–2.47)	0.91 (0.37–2.24)	2.02 (0.33–12.4)
Father of baby employed	0.90 (0.61–1.33)	0.51 (0.28–0.94)	1.16 (0.28–4.81)
Informal housing	1.22 (0.82–1.81)	0.53 (0.27–1.02)	11.7 (1.02–135)

Table 4

Predicted probabilities of probable postnatal depression, hazardous drinking, and high-risk suicidality.

	Predicted probability of the outcome (95% confidence interval)	
	Evaluated at the 25th percentile of food insecurity	Evaluated at the 75th percentile of food insecurity
Probable postnatal depression	23.7% (16.5–30.8)	37.6% (30.9–44.3)
Hazardous drinking	11.2% (6.0–16.4)	17.0% (12.0–22.0)
High-risk suicidality	1.2% (0.0–2.5)	3.7% (1.0–6.4)

4. Discussion

In this sample of mothers living in a South African peri-urban settlement who had recently given birth, we found extremely high rates of co-occurring food insecurity, probable postnatal depression, high-risk suicidality, and hazardous drinking. Food insecurity had a statistically significant association with each of these outcomes, and the associations were large in magnitude. Given the clinical and public health importance of food insecurity and depression to the well-being of women and children, this study has important implications for antenatal and postnatal programs and policies worldwide and especially in low and middle-income countries.

Our findings on the association between food insecurity and depression mirror previously published findings in this area (Carter et al., 2011; Sorsdahl et al., 2011; Tsai et al., 2012a; Weaver and Hadley, 2009). Two primary points of departure of our study from this literature are our unique access to data on depressed mood collected from women during the postnatal period and our expanded focus on hazardous drinking and high-risk suicidality. One study from India showed that a single-item measure of food insufficiency was associated with an increased odds of a positive screen for postnatal depression (Patel et al., 2002). However, food insecurity is a complex, multidimensional phenomenon characterized not only by insufficient food intake, but also by poor diet quality, disrupted eating patterns, anxiety and uncertainty about access, and inability to procure food in a socially acceptable manner (Radimer et al., 1990). Furthermore, the single-question item incorporated into the Third National Health and Nutrition Examination Survey has demonstrated poor sensitivity for identifying food insecure households (Frongillo et al., 1997).

This study additionally extends the findings of Patel et al. (2002) to other psychosocial domains such as hazardous drinking and high-risk suicidality that have not been well-studied in other research. Food insecurity has been associated with suicidality among HIV-positive patients recruited from government-funded HIV clinics in Uganda (Kinyanda et al., 2012) and with self-reported suicide attempts among women in India (Maselko and Patel, 2008). These studies, however, assessed food insecurity with

single-item measures of hunger or food insufficiency and are subject to the limitations described above. One study employed a multi-item scale to assess food insecurity and showed that it was associated with problem drinking among South African women attending alcohol drinking establishments (Pitpitani et al., 2013). The authors of this study emphasized the co-occurrence of psychosocial problems such as food insecurity, poor mental health, problem drinking, and HIV risk transmission behaviors. We lacked access to data on HIV transmission risk behaviors among the women in our sample, but food insecurity (Miller et al., 2011; Tsai et al., 2012b; Weiser et al., 2007), in addition to depression and alcohol abuse (Kalichman et al., 2007; Lennon et al., 2012; Weiser et al., 2006), has emerged as a consistent risk factor for HIV acquisition risk among women in a wide range of other settings.

5. Limitations

Interpretation of our findings is subject to several limitations. First, the EPDS was intended for use as screening instrument and not as a definitive diagnosis (Kagee et al., 2013). However, even subsyndromal depression has been found to compromise quality of life and functioning (Judd et al., 2002). Second, there is a well-known gender bias in intra-household food allocation, with pregnant or lactating women at particular disadvantage relative to men and non-pregnant/non-lactating women (DeRose et al., 2000). Because the HFIAS is a household-level measure, it is possible that study participants' individual experience of food insecurity was under-reported. Third, the women in our study sample were participating in a community-based program aimed at reducing child malnutrition (le Roux et al., 2010). Our study sample was characterized by extremely high rates of severe food insecurity, not an unexpected finding given the multiple adverse structural barriers that conspire to undermine women's well-being in Khayelitsha. It is likely that in the absence of the intervention the rates of food insecurity would have been even higher, but the intervention's synergistic effects on improving psychosocial well-being would have biased our estimates away from the null. Finally, the direction of causality is generically uncertain with data of a cross-sectional nature. For example, it is possible that the

psychosocial disability that accompanies depression may compromise the ability to work, thereby leading to food insecurity.

6. Conclusions

These findings are highly relevant to programming and policy in low and middle-income countries given the importance of perinatal depression to the well-being of mothers as well as their children (Tsai and Tomlinson, 2012). Given the lack of adequate human resources for addressing the burden of mental disorders in resource-limited settings, existing programmes and policies could target modifiable risk factors for poor mental health outcomes. School feeding programmes have been widely implemented in many sub-Saharan African countries, including South Africa (Labadarios et al., 2011). Nutrition support programmes could be delivered in the context of existing ante- and postnatal care programmes (Lartey, 2008) to target pregnant and lactating women as well. Social support interventions, delivered through community-based outreach (le Roux et al., 2010), can potentially be used to buffer the effects of food insecurity on psychosocial well-being.

In summary, our study provides convincing evidence of an important association between food insecurity and depression, suicidality, and hazardous drinking among new mothers in a socioeconomically deprived South African peri-urban settlement. The estimated associations are large in magnitude and robust to alternative specifications. Interventions aimed at improving food security for new mothers in resource-limited settings are likely to benefit their health and mental health and may also benefit their children as well.

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Conflict of interest

None

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