



Participation in the Supplemental Nutrition Assistance Program and maternal depressive symptoms: Moderation by program perception

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ABSTRACT

Rationale: Previous studies have observed an association between participation in the Supplemental Nutrition Assistance Program (SNAP) and depression, which is contrary to SNAP's potential to alleviate food insecurity and financial strain.

Objective: This study investigated the impact of change in SNAP participation status on maternal depression, and whether perceptions of government assistance moderate this association.

Methods: Data were from the Fragile Families and Child Wellbeing Study (FFCWS). Logistic regression models with individual-specific fixed-effects, were fit to SNAP-eligible mothers who changed SNAP participation and depression status ($N = 256$) during waves 2 to 4. Perceptions of government assistance were defined as feelings of humiliation or loss of freedom and tested for interactions with SNAP participation.

Results: Perceptions of government assistance moderated the association between SNAP participation and depression (p -interaction = 0.0208). Those with positive perceptions of welfare had 0.27 (95% $CI = 0.08$ to 0.89) times lower odds of depression when enrolled vs. not enrolled in SNAP. Among those with negative perceptions of welfare, SNAP enrollment was not associated with depression ($OR = 1.13$; 95% $CI = 0.85$ to 1.51).

Conclusion: Evidence suggests that SNAP mental health benefits may be context specific. SNAP's capacity to improve mental health may depend on individual perceptions of government assistance. More research is needed to determine whether interventions aimed at mitigating negative perceptions of programs like SNAP could ameliorate poor mental health among program participants.

1. Background

Food insecurity, defined as a lack of access to food of sufficient quality or quantity due to financial constraints (National Research Council, 2006), affects 14% of the United States (US) population (Coleman-Jensen et al., 2015) and is associated with numerous negative health outcomes and chronic diseases, including poor mental health and depression (Stuff et al., 2006; Pan et al., 2012; Gundersen and Ziliak, 2015). The association between food insecurity and depression is especially worrisome. Depression is associated with higher risk of mortality from nearly all major medical causes (Zivin et al., 2015), and is expected to be a leading cause of morbidity and mortality across the globe by 2030 (Mathers and Loncar, 2006). Furthermore, depression among parents is adversely associated with child development (Huhtala et al., 2014), an association believed to be mediated by altered parent-child interactions (Gutierrez-Galve et al., 2015). The link between

maternal depression and child outcomes early in life appears to be particularly strong. Mothers who experience depression during the postnatal period are more likely to have children with behavior problems by age 2–3.5 years (Narayanan and Nærde, 2016). Given the prevalence of food insecurity and its negative health consequences across generations, there are a number of national policies and programs in the US geared toward reducing it.

The Supplemental Nutrition Assistance Programs (SNAP) is one of the largest welfare programs available to Americans (United States Department of Agriculture Food and Nutrition Service (FNS) 2016b). It is also one of the oldest welfare programs and came about following the Great Depression in the 1930's. At that time, a pilot program called the Food Stamp Program was designed to increase the purchasing power of low-income individuals for surplus food resources. This program became permanent in 1964 (Pomeranz and Chriqui, 2015) and is now referred to as SNAP. Over the years Congress has modified SNAP, with

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the most recent changes occurring under the authority of the 2008 Farm Bill (FNS, 2014). In its current form, SNAP provides monthly food vouchers to households so that families can purchase necessary food resources (FNS, 2016a). All food and drink items are eligible with the exception of ready-to-serve foods (i.e. those without a nutrition label), dietary supplements, and alcohol (Pomeranz and Chriqui, 2015).

Administration of SNAP is the responsibility of both federal and state governments. Basic financial eligibility criteria are set by the federal government – individuals who fall below a certain percentage of the poverty level, determined by household income and size, and those who already receive benefits from other specific low-income assistance programs, are automatically eligible for SNAP (Falk and Aussenberg, 2014). SNAP beneficiaries must also meet certain employment or job training requirements and not have assets that exceed a certain value (i.e. liquid assets and/or vehicle ownership) (Bartfeld et al., 2015). States have some flexibility in further defining SNAP eligibility criteria, and can thereby increase or limit the number of individuals eligible. For example, gross income eligibility can range from a 1.30 to 2.00 federal poverty to income ratio (USDA, 2016). Additionally, states govern eligibility of drug felons (McCarty et al., 2012), the types of assets credited to an applicant (Ratcliffe et al., 2008), and enrollment procedures (e.g. call centers, online applications) (Ganong and Liebman, 2013). In 2014, SNAP supported over 46 million participants nationally and cost nearly \$70 billion. Despite the large investment in SNAP, there is inconclusive evidence regarding the program's ability to ameliorate the health effects of food insecurity – particularly regarding its impact on mental health and depression (Bartfeld et al., 2015).

Some evidence suggests that participation in food assistance programs is associated with better mental health among adults (Oddo and Mabli, 2015; Kim and Frongillo, 2007; Kollannoor-Samuel et al., 2011), citing reductions in food insecurity and improved diet quality as potential mechanisms. In a recent study, Oddo and Mabli (2015) found that 6 months of SNAP participation is associated with a 38% reduction in psychological distress. They posited that, in addition to reducing food insecurity, SNAP participation may free up household financial resources that otherwise would have been used to purchase food. This would then allow participating households to meet other expenses, such as utilities or healthcare, which may yield additional psychological benefits for program beneficiaries. In contrast, other studies suggest that participation in SNAP and other food assistance programs may lead to poorer mental health among adults (Heflin and Ziliak, 2008; Leung et al., 2015a; Hwang et al., 2014). In general, qualifying for and using government assistance is associated with social stigma, arising from cultural or societal norms and personal interactions while applying for and receiving benefits (Mickelson and Williams, 2008). Heflin and Ziliak (2008) propose several untested mechanisms that specifically link SNAP participation to depression: SNAP use can result in feelings of dependence and erode self-empowerment, and participants may face social disapproval. In addition, the procedures associated with SNAP application and enrollment require participants to repeatedly overcome a number of potentially stressful situations to maintain benefits, such as limited SNAP office hours and transportation hurdles. Further, the limited number and types of food retailers who accept SNAP benefits can restrict food accessibility and quality (Ohls et al., 1999; Rosenbaum, 2013). One study that sheds light on the potential of programs like SNAP to influence mental wellbeing investigated the acceptability of a home-delivery food aid program among elderly Koreans (Hwang et al., 2014). This study reported that participants experienced feelings of stigma after receiving food assistance, despite benefits due to better quality meals and decreased living expenses. In

other studies, perceptions of stigma have been associated with poorer mental health (Mickelson and Williams, 2008; Broussard et al., 2012).

In addition, investigations into whether food assistance programs may moderate the association between food insecurity and depression have reported mixed results. For example, Kim and Frongillo (2007) observed that elderly persons who participated in a meal home-delivery program and became food insecure after a period of food security did not experience an increase in depressive symptoms. They also reported no association between food insecurity and depression among those participating in SNAP. In contrast, food insecurity was associated with depression among nonparticipants. This suggests that participation in food assistance may increase resiliency against the negative mental health effects of food insecurity. However, associations did not hold in models of lagged effects of SNAP participation, suggesting the effect may not be long-lasting. Similarly, a study by Munger et al., (2016) reported SNAP enrollment was associated with a lower probability of depression, and the loss of SNAP benefits was associated with a higher probability of depression.

Consistent and clear scientific evidence on the relationship between SNAP and mental health is lacking. One hypothesis is that personal perceptions or feelings of stigmatization moderate the association between SNAP participation and mental health. Negative views of government assistance may increase stress levels and preclude mental health benefits that would otherwise be associated with receiving food assistance. Whether moderation by program perceptions explain inconsistencies in current literature is unknown.

Isolating the benefits of food assistance programs is a challenge since those who choose to participate in such programs likely have lower levels of food security or are more socioeconomically disadvantaged than others, even after accounting for observable factors such as income or educational status (Heflin and Ziliak, 2008; Meyerhoefer and Yang, 2011, 2011). Thus, self-selection bias must be addressed when investigating the association between food assistance programs and health outcomes. The Fragile Families and Child Well-being Study (FFCWS) provides a unique opportunity to investigate the relationship between SNAP participation and mental health. FFCWS is a longitudinal study of urban live births and parents with a higher proportion of mothers who are income-eligible for government assistance programs than the general US population. Using data from FFCWS, the aims of this study are to: (1) determine the association between change in SNAP participation and change in maternal depression; and (2) evaluate whether mothers' perceptions of government assistance moderate the association between SNAP participation and depression. It is hypothesized that the mental health benefit of participating in SNAP will be greater among those with positive views of government assistance than among those reporting negative views of government assistance.

2. Methods

2.1. Study sample

The study sample was comprised of mothers who moved on and/or off SNAP benefits and changed depression status with a federal poverty to income ratio (PIR) ≤ 2.00 in FFCWS waves 2 to 4. Data were drawn from waves 1 to 4 of FFCWS core surveys. FFCWS provides data on approximately 4900 urban births sampled from 75 hospitals in 20 large metropolitan areas (with a population size $> 200,000$) across the United States. Informed signed consent was obtained from mothers and fathers at each survey wave. Secondary analysis of FFCWS data was

certified as not human subjects research, thereby considered exempt by the University of Wisconsin Health Sciences Institutional Review Board (IRB). This analysis was limited to data on mothers in 18 of the 20 cities (representing 4242 families) as the questionnaires used in two of the pilot cities, Austin, TX, and Oakland, CA, did not include all variables of interest (Wagmiller, 2010). Participating mothers were interviewed at the hospital within a few days of giving birth (years 1998–2000; wave 1); subsequent phone interviews were conducted when the focal child was 1, 3, and 5 years old (waves 2 to 4). Additional details of FFCWS design and sampling framework are described elsewhere (Reichman et al., 2001; Fragile Families, 2008).

This investigation targeted mothers who were income eligible for SNAP (Bartfeld et al., 2015). The basic federal structure limits SNAP eligibility to those with a household gross income ≤ 1.30 PIR. However, during data collection, the legislature of several FFCWS states expanded SNAP eligibility to include households with a gross income ≤ 2.00 PIR (Danielson et al., 2011; Klerman and Danielson, 2011). Therefore, this study sample was limited to FFCWS mothers reporting a PIR ≤ 2.00 over FFCWS waves 2 to 4. As a sensitivity analysis, this study also used the more conservative PIR cutoff for SNAP eligibility, ≤ 1.30 . In order to account for all individual-level factors associated with self-selection into SNAP, fixed-effects models (described below) assessed the relationship of within-individual changes in depression status with changes in SNAP enrollment. Associations were determined from a subsample of 256 mothers who moved on and/or off SNAP benefits and also experienced changes in depression status over FFCWS waves 2 to 4.

2.2. Measures

Outcome, Depression – Depression was measured at FFCWS waves 2 to 4 using Section A of the Composite International Diagnostic Interview Short Form (CIDI-SF) (Kessler et al., 1998). The CIDI-SF has demonstrated diagnostic and predictive validity (Poutanen et al., 2007) with an 89% sensitivity and 93.9% specificity when compared to the longer CIDI (Kessler et al., 1998). The long form CIDI is considered valid for determining a major depressive disorder diagnosis (kappa/Yule Y coefficient = 0.57) (Wittchen, 1994). In addition, the CIDI-SF has previously been administered in racially and ethnically diverse study samples similar to FFCWS (Dunlop et al., 2003). In brief, screening questions ask mothers if they experienced feelings of sadness or no longer enjoyed things that were normally pleasurable for ≥ 2 weeks during the past 12 months. Those who answered affirmatively to at least one of these two items were asked seven subsequent questions about depressive symptoms during the last 12 months. Items included losing interest in things, feeling more tired than usual, experiencing a weight change of 10 pounds or more, having more trouble sleeping than usual, having more trouble concentrating than usual, feeling worthless, or thinking a lot about death. Using Walters et al. criteria, those with a score ≥ 3 are categorized as having depression (Fragile Families, 2005).

Predictor, Participation in the Supplemental Nutrition Assistance Program (SNAP) – Mothers were considered SNAP participants if they reported receiving SNAP in the past 12 months. In analyses, SNAP participation was time-varying and measured at three time points, FFCWS waves 2 to 4.

Moderators, Perceptions of Government Assistance – Two variables were used as indicators of maternal attitudes toward and perceptions of government assistance programs, measured once at FFCWS wave 4. If mothers indicated that they strongly disagreed with the statement “The rules of the welfare program take away personal freedom,” they were considered to perceive that they maintained personal freedom when participating in welfare. If mothers indicated that they strongly

Table 1

Baseline demographics and perceptions of welfare among mothers that move on and off of SNAP and change depression status with a ≤ 2.00 PIR participating in FFCWS waves 2 to 4.

Baseline Demographics ^a	Total N = 256
	N (%)
Marital status	
Single	137 (53.5)
Cohabiting	101 (39.5)
Married	18 (7.0)
Race/Ethnicity	
Non-Hispanic Black	159 (62.1)
Hispanic	55 (21.5)
Non-Hispanic White	34 (13.3)
Other	8 (3.1)
Educational attainment	
< High school or equivalent	103 (40.2)
High school or equivalent	99 (38.7)
Some college and above	54 (21.1)
History of mental illness	40 (18.8)
Poverty to income ratio	
< 0.50	51 (19.9)
0.50 to < 1.30	115 (44.9)
1.30 to < 2.00	36 (14.1)
2.00 and above	54 (21.1)
Age	
< 18 years	12 (4.7)
18 to < 30 years	206 (80.5)
30 to < 40 years	37 (14.5)
≥ 40 years	1 (0.4)
Perceptions of Welfare	
Maintain personal freedom	15 (5.9)
Not humiliated	21 (8.2)
Maintain personal freedom and not humiliated	12 (4.7)

SNAP = Supplemental Nutrition Assistance Program; FFCWS = Fragile Families and Child Wellbeing Study.

^a Due to missingness in baseline demographic variables total N may vary.

disagreed with the statement “The application process to apply for welfare is humiliating” they were considered not to feel humiliated by participation in welfare. Additionally, an indicator (1 = no negative perceptions of government assistance, 0 = 1 or 2 negative perceptions of government assistance) was created to measure the combined effect of positive perceptions of government assistance for those who feel their personal freedom is maintained *and* are not humiliated by participation in welfare.

Covariates – A number of time-variant covariates may be associated with both SNAP participation and depression status including, household federal poverty to income ratio (PIR), marital status (single, cohabitating, married), health insurance status (private, subsidized, uninsured), unemployment, and food insecurity were assessed at each survey wave. Unemployment and food insecurity were treated as dichotomous measures. Those who did not work a regular job in the previous week were considered unemployed. Food insecurity was defined by maternal report of having received free food or meals, had gone hungry, or her child/children had gone hungry in the past 12 months due to limited financial resources.

Additional covariates were used for descriptive purposes. Variables from

FFCWS wave 1 included maternal age, race/ethnicity (Non-Hispanic White, Non-Hispanic Black, Hispanic, and Other), and education (< High school, High school or equivalent, and Some college and above). An indicator variable of pre-pregnancy diagnosis of mental illness (prior to wave 1) was derived by FFCWS using electronic health record data and included as a co-variate. Mental illness was determined by mothers' mental health history and psychiatric medication use collected from laboratory test results, notes, and International Classification of Diseases-9 (ICD-9) codes.

2.3. Statistical analysis

All analyses were conducted using SAS software, version 9.4 (SAS Institute, Inc., Cary, North Carolina). Descriptive statistics for baseline demographics and perceptions of government assistance were calculated for the study sample. Descriptive statistics were also computed for time-variant covariates by SNAP participation for FFCWS waves 2 to 4.

Fixed-effects logistic regression was used to investigate the impact of SNAP enrollment on maternal depression. The coefficient for SNAP participation estimates the association between concurrent SNAP enrollment and the log-odds of depression among those who moved on and/or off SNAP benefits and changed depression status over FFCWS waves 2 to 4. This statistical approach provides within-individual parameter estimates for time-varying factors and still allows for estimation of interaction between time-variant and time-invariant factors (Fitzmaurice et al., 2012). Finally, interaction terms were added to the model to test whether positive perceptions of government assistance moderate the association between SNAP participation and maternal depression. Equation (1) below details the fixed-effects logistic regression model used in this analysis, where Y_{it} is the dependent variable observed for individual i at time t , X_{1it} is SNAP status, X_{2it} represents time-variant regressors, and Z_{1i} are individual-level covariates interacting with SNAP status. The model was fit via conditional likelihood, which does not explicitly estimate individual intercepts (β_{0i}).

$$\text{logit}(\text{PR}(Y_{it} = 1)) = \beta_{0i} + X_{1it} * \beta_1 + X_{2it} * \beta_2 + \dots + \gamma_1 X_{1it} * Z_{1i} \quad (1)$$

3. Results

Table 1 presents the distribution of baseline characteristics and perceptions of government assistance for the sample. At baseline the majority of this study sample was single or cohabitating, Non-Hispanic Black or Hispanic, between 18 and < 30 years old, and had a high school degree or less. The distribution of these factors was similar when using a more conservative study sample, $\text{PIR} \leq 1.30$ [$N = 172$], data not shown].

Table 2 presents the distribution of time-variant variables across FFCWS waves 2 to 4 by SNAP participation status. In waves 2 and 3, the proportion meeting depression criteria among those on SNAP is similar or lower than among those not on SNAP. However, in wave 4, a larger proportion of those on SNAP met depression criteria compared to those not on SNAP (34.7% versus 24.2%). Across waves, a larger proportion of those on SNAP were simultaneously unemployed or food insecure, and on average they had a lower PIR than those not on SNAP. In contrast, those receiving SNAP benefits were more likely to have health insurance than nonparticipants. However, a larger proportion of non-participants reported having private insurance, whereas SNAP participants were more likely to have subsidized health plans (e.g. Medicaid). These trends were similar for the $\text{PIR} \leq 1.30$ study sample, as was the proportion of mothers participating in SNAP at each study (data not shown).

Table 2

Time-variant variables across FFCWS waves 2 to 4 by SNAP participation.^a

FFCWS wave 2	Total N = 256 ^b	
	SNAP = Yes	SNAP = No
	N = 112	N = 131
Meets criteria for depression ^c	42 (37.5)	57 (43.5)
Standardized depressive symptoms score, mean (95% CI) ^c	−0.12 (−0.29, 0.06)	0.03 (−0.14, 0.21)
PIR, mean (95% CI)	0.64 (0.55, 0.74)	0.85 (0.76, 0.95)
Marital status		
Single	62 (55.4)	70 (53.4)
Cohabitating	37 (33.0)	44 (33.6)
Married	13 (11.6)	17 (13.0)
Unemployed	61 (54.5)	64 (48.9)
Health insurance status		
Private	10 (8.9)	29 (22.1)
Subsidized	70 (62.5)	51 (38.9)
Uninsured	32 (28.6)	51 (38.9)
Food insecure	27 (24.1)	28 (21.4)
FFCWS wave 3	SNAP = Yes	
	SNAP = Yes	SNAP = No
	N = 132	N = 109
Meets criteria for depression ^c	73 (55.3)	59 (54.1)
Standardized depressive symptoms score, mean (95% CI) ³	0.05 (−0.12, 0.22)	0.08 (−0.11, 0.28)
PIR, mean (95% CI)	0.76 (0.68, 0.85)	0.93 (0.82, 1.04)
Marital status		
Single	69 (51.9)	62 (56.9)
Cohabitating	43 (32.3)	31 (28.4)
Married	21 (15.8)	16 (14.7)
Unemployed	73 (54.9)	57 (52.8)
Health insurance status		
Private	12 (9.1)	19 (17.4)
Subsidized	87 (65.9)	50 (45.9)
Uninsured	33 (25.0)	40 (36.7)
Food insecure	32 (24.1)	18 (16.5)
FFCWS wave 4	SNAP = Yes	
	SNAP = Yes	SNAP = No
	N = 144	N = 91
Meets criteria for depression ^c	50 (34.7)	22 (24.2)
Standardized depressive symptoms score, mean (95% CI) ³	−0.01 (−0.17, 0.15)	−0.24 (−0.43, −0.06)
PIR, mean (95% CI)	0.70 (0.62, 0.78)	0.94 (0.83, 1.05)
Marital status		
Single	87 (60.4)	47 (51.7)
Cohabitating	38 (26.4)	24 (26.4)
Married	19 (13.2)	20 (22.0)
Unemployed	76 (52.8)	41 (45.1)
Health insurance status		
Private	15 (10.4)	15 (16.5)
Subsidized	107 (74.3)	39 (42.9)
Uninsured	22 (15.3)	37 (40.7)
Food insecure	104 (72.2)	74 (81.3)

SNAP = Supplemental Nutrition Assistance Program; FFCWS = Fragile Families and Child Wellbeing Study; PIR = Poverty to Income Ratio.

^a Values represent column percents unless otherwise indicated.

^b Refers to the total number of mothers who move on and off of SNAP and change depression status with a ≤ 2.00 PIR participating in FFCWS waves 2 to 4.

^c Depression measured using the Composite International Diagnostic Interview Short Form (CIDI-SF).

Table 3

Odds ratios (OR) and 95% confidence intervals (CI) for the association between SNAP enrollment and depression among mothers eligible for SNAP^a during FFCWS waves 2 to 4.^b

	OR	95% CI	P-value
SNAP (ref = No)	1.04	(0.79, 1.38)	0.762
Survey Wave (ref = 2)			< 0.0001
3	1.28	(1.05, 1.55)	
4	0.81	(0.66, 1.00)	
PIR	1.01	(0.79, 1.28)	0.935
Marital status (ref = Single)			0.0100
Married	0.72	(0.47, 1.09)	
Cohabiting	0.68	(0.52, 0.88)	
Unemployed (ref = No)	1.21	(0.95, 1.54)	0.120
Health insurance status (ref = Private)		0.0367	
Uninsured	1.57	(1.05, 2.35)	
Subsidized	1.15	(0.78, 1.69)	
Food insecure (ref = No)	1.45	(1.10, 1.90)	0.0077

SNAP = Supplemental Nutrition Assistance Program; FFCWS = Fragile Families and Child Wellbeing Study; PIR = Poverty to Income Ratio.

^a Defined as those with a ≤ 2.00 PIR.

^b Depression measured using the Composite International Diagnostic Interview Short Form (CIDI-SF).

In fully adjusted fixed-effect models that controlled for individual time-varying factors (Table 3), no association was observed between SNAP enrollment and depression (OR = 1.04; 95% CI = 0.79 to 1.38). This was also the case for the PIR ≤ 1.30 study sample (data not shown).

Perceptions of government assistance appeared to moderate the association between SNAP enrollment and depression (Table 4). The interaction between SNAP participation and perceptions of maintaining personal freedom during welfare participation was statistically significant (interaction p -value = 0.0208). Among those who self-reported that they maintained personal freedom when participating in welfare, SNAP enrollment was associated with a 0.27 (95% CI = 0.08 to 0.89) times lower odds of depression. For those who did not perceive themselves to maintain personal freedom during welfare participation, SNAP enrollment was not associated with a lower odds of depression (OR = 1.13; 95% CI = 0.85 to 1.51).

When considering other maternal perceptions of government assistance, those who felt more positive and strongly disagreed with negative perceptions tended to have a lower odds ratio between SNAP

Table 4

Odds ratios (OR) and 95% confidence intervals (CI) for moderation of the association between SNAP enrollment and depression by perceptions of government assistance among mothers eligible for SNAP^a during FFCWS waves 2 to 4.^b

Dimensions of Government Assistance Perceptions ^c	OR ^d	(95% CI)	Interaction p -value
Perception of Participating			0.0208
Maintain personal freedom	0.27	(0.08, 0.89)	
Do not maintain personal freedom	1.13	(0.85, 1.51)	
Perception of Application Process			0.101
Not humiliated	0.49	(0.19, 1.26)	
Humiliated	1.12	(0.84, 1.49)	
Maintain Personal Freedom and Not Humiliated			0.110
Yes	0.39	(0.11, 1.35)	
No	1.10	(0.83, 1.46)	

SNAP = Supplemental Nutrition Assistance Program; FFCWS = Fragile Families and Child Wellbeing Study; PIR = Poverty to Income Ratio.

^a Defined as those with a ≤ 2.00 PIR.

^b Depression measured using the Composite International Diagnostic Interview Short Form (CIDI-SF).

^c Interactions tested separately in models that account for study wave and time-variant PIR, marital status, employment status, and food insecurity.

^d Odds of depression when enrolled in SNAP vs. not enrolled.

participation and depression than those who held negative perceptions and did not strongly disagree, although the null hypothesis cannot be rejected at the $\alpha = 0.05$ level. In addition, results regarding moderation by perceptions of government assistance are consistent but less precise when using the more restricted ≤ 1.30 PIR sample (data not shown).

4. Discussion

Food insecurity has been repeatedly associated with poor mental health (Whitaker et al., 2006; Bronte-Tinkew et al., 2007; Lent et al., 2009; Jones, 2017). However, this study is among the few to empirically examine whether welfare programs like SNAP influence maternal depression. In addition, this study is the first to provide evidence that perceptions of government assistance may moderate SNAP mental health benefits, such that; those who perceive participating in welfare as restricting personal freedom do not experience a mental health benefit when participating in SNAP.

Overall, no association was observed between intermittent SNAP participation and depression status. Associations remained insignificant even when accounting for time-invariant factors and a number of time-varying covariates. These results differ from previous studies that have demonstrated SNAP participation to significantly improve mental health. Evidence demonstrates the potential for SNAP participation to reduce depression within the context of food insecurity (Kim and Frongillo, 2007; Oddo and Mabli, 2015; Munger et al., 2016). Given that this study assessed SNAP participation, depression status and food insecurity over the previous 12 months, the timing of SNAP receipt in relation to food insecurity onset may be an important factor when considering program efficacy in future research. For example, SNAP participation may provide short-term relief within the first few months of enrollment (Oddo and Mabli, 2015), but little data are available to demonstrate a mental health benefit beyond this period. Understanding the periodicity of SNAP participation with maternal depression may provide important insight into program design and the varying resources or assets that SNAP participants may need with respect to mental health services.

Notably, results of this study are the first to indicate that the association between SNAP participation and depression is moderated by perceptions of government assistance. For example, among those who did not perceive welfare rules to limit personal freedom, SNAP use was associated with a lower odds of depression. Among those who did perceive welfare rules to limit personal freedom, SNAP use was not associated with a mental health benefit. These findings suggest that context may play an important role in SNAP efficacy, which is in line with results from another recent study using data from FFCWS. King (2017) reports that SNAP's ability to reduce food insecurity may be moderated by social capital and SNAP participation may be especially crucial for mothers lacking informal support.

Psychological theories may provide further insight into results of this study. It has long been established that undesirable life experiences are associated with mental stress and emotional disturbances (Vinokur and Selzer, 1975). Those who perceive welfare to take away personal freedom may experience SNAP enrollment as a negative life event, thus limiting SNAP's ability to relieve mental distress associated with food and economic insecurity. Further, social psychological theories suggest that a state of cognitive dissonance, due to simultaneously holding two discordant cognitions such as participating in SNAP while viewing such assistance unfavorably, produces negative affectivity and thus increases risk for symptoms of depression over time (Prinstein and Aikins, 2004).

Additionally, this study supports the need for additional evidence regarding whether addressing certain aspects of participation in social programs can improve mental health outcomes among participants by reducing stigma and negative perceptions. Some SNAP participants have reported leaving SNAP due to the social stigma tied to a dependency on welfare (Kaye et al., 2013). In the late 1980's to early 2000's, SNAP began introducing Electronic Benefit Transfer (EBT). EBT

is designed to increase the efficiency of SNAP and potentially reduce feelings of stigma among beneficiaries since it resembles a credit or debit card (Kaye et al., 2013; FNS, 2014). However, other factors associated with SNAP participation may contribute to negative perceptions among some participants. These include strict income cutoffs to determine eligibility and the inability of individuals on SNAP to allocate their financial resources as they see fit (e.g. use governmental assistance to pay for other needs like housing, energy, or health care).

Continued integration of services including health insurance along with SNAP benefits may be important to ensure positive mental health benefits. Descriptive data from this study suggest that mothers who participate in SNAP are less likely to be uninsured than nonparticipants, indicating that SNAP participants may have greater access and are perhaps better equipped to navigate other government assistance programs to meet their needs. Additionally, in some states Medicaid and SNAP are applied for simultaneously (Sommers et al., 2015). Recent evidence also indicates that SNAP participation is associated with a decrease in health care expenditures compared to food insecure individuals who do not participate in SNAP (Berkowitz et al., 2017). Previously, Gregory and Deb (2015) reported that SNAP participants spend 3 fewer days in bed due to illness per year. They also reported that while SNAP participants have fewer office visits overall, general health checkups are more common – visits that might help maintain good health or prevent decline among those with chronic conditions. Whether SNAP participation translates to greater utilization of mental health services, specifically, could be the focus of future research. Low-income individuals including SNAP participants respond well to mental health treatment (Santiago et al., 2013), however barriers exist. Access to health care is one consideration. In 2014, the Affordable Care Act increased the number of low-income individuals with health insurance (Heintzman et al., 2017), expanded access to private insurance (Sommers et al., 2013), and required all health plans to cover mental health and substance abuse treatment (Beronio et al., 2014). However, stigma surrounding mental illness persists (Feldman and Crandall, 2007) and may prevent individuals from seeking treatment.

4.1. Limitations

Data from FFCWS provide a large cohort of relatively disadvantaged families with a disproportionate likelihood of food insecurity and enrollment into SNAP. This made it possible to assemble a sample of mothers switching on and off SNAP to perform comparisons adjusting for all time-invariant factors that influence self-selection into SNAP. However, since the FFCWS sample is restricted to mothers of urban births, this may limit the generalizability of study results to SNAP eligible individuals living in suburban and rural areas. These are subpopulations who may have different experiences and perceptions of government assistance than FFCWS families. In addition, results may not be generalizable to women from other age groups or men. Comparison across SNAP participants and nonparticipants within FFCWS also indicates that those who are intermittent SNAP participants tend to fare worse socioeconomically than those who never report enrollment in SNAP, and slightly better than consistent SNAP participants (data not shown). A number of factors at the program, household, and macro-cultural level are associated with rates of nonparticipation among individuals eligible for SNAP; however, few studies have attempted to identify underlying causal mechanisms (Nicoll, 2015).

In addition, there may be important differences between individuals captured in the fixed-effects models and those excluded due to being classified as depressed during waves 2 to 4 of FFCWS. Similar to SNAP status, depression status is transient, characterized by major depressive episodes (MDE) and periods of remission. Chronicity and recurrence of MDE can vary widely between individuals and is dependent on a number of factors including severity of depression, comorbidities and type of treatment (Melartin et al., 2004).

Further, despite the strength of having repeated time points for

testing associations between SNAP and maternal depression, both exposure to SNAP use and depression are measured over the previous 12 months of a given survey wave. Therefore, drawing causal conclusions is not possible. In addition, the questions used to measure food insecurity do not capture individuals who experience mild to moderate levels of food insecurity, nor food insecurity at the household level, which can also influence individual mental health (Whitaker et al., 2006). Moreover, whereas fixed-effects adjust for all time-invariant sources of confounding (Fitzmaurice et al., 2012), there may be other unobserved time-variant factors that bias results. Social desirability bias may lead to mothers underreporting both SNAP participation and symptoms of depression (Kreider et al., 2012; Hunt et al., 2003). Depending on how underreporting is distributed within the FFCWS sample, results may be biased toward or away from the null. Finally, since a complete-case sample was used, missing data is a limitation of this study; however, when repeating this analysis using multiple imputation (data not shown), conclusions remain unchanged.

4.2. Conclusion

While a number of studies have investigated the ability of SNAP to improve food security, recently summarized in a report by the White House Council of Economic Advisers (2015), it is still to be determined whether SNAP universally improves adverse mental health outcomes. Additionally, while existing studies investigate associations between SNAP and health outcomes, few are able to determine the pathways by which these associations are linked. Findings suggest that perceptions of welfare and the experience of using welfare benefits may influence SNAP's capacity to improve mental health and well-being. If program perceptions influence the efficacy of programs like SNAP to ameliorate socioeconomic health disparities, then perhaps policy makers will be encouraged to further prioritize the perspective of social program participants. For example, while some stakeholders have proposed restricting food purchases considered to be unhealthy (Leung et al., 2015b), this may not result in positive mental health outcomes if such restrictions perpetuate stigma among program participants (Barnhill and King, 2013).

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