

RESEARCH

Open Access



Prenatal weight stigma can affect relationship quality and maternal health outcomes

Taniya S. Nagpal¹ and Angela C. Incollingo Rodriguez^{2*}

Abstract

Background Weight stigma is defined as negative misconception and stereotypes associated with weight, and it is commonly experienced during pregnancy. Weight stigma during pregnancy may be sourced from trusted close relationships including family members, partners, and friends. Social support is a necessary psychosocial factor for optimal health and wellbeing throughout pregnancy, and weight stigma sourced from these integral relationships may negatively affect health outcomes. The purpose of this study was to assess the impact of weight stigma from close others on maternal health outcomes.

Methods A survey was administered via Qualtrics to pregnant women (≥ 13 weeks, residence within the United States or Canada, ≥ 18 years old, singleton pregnancy). During pregnancy, participants completed questionnaires identifying whether they had experienced weight stigma from a close relationship (i.e., family, partners, or friends), how often, and relationship quality scales for each source. At three months postpartum, they were surveyed about their pregnancy outcomes including gestational diabetes, gestational hypertension, preeclampsia, chronic pain, anxiety/depression. They also completed the Edinburgh Postpartum Depression Scale (EPDS), and a linear regression was performed with frequency of weight stigma. Logistic regressions were performed between frequency of weight stigma and health outcomes. If significant, relationship quality was tested as a potential mediator. Significance was accepted as $p < 0.05$.

Results 463 participants completed both surveys of which 86% had experienced weight stigma from close others. Frequency of weight stigma was significantly associated with chronic pain ($\beta = 0.689$, $p < 0.001$), and anxiety/depression ($\beta = 0.404$, $p = 0.005$). The relationship between frequency of weight stigma in pregnancy and chronic pain was mediated by quality of all relationships. Family relationship quality mediated between frequency of weights stigma and anxiety/depression. Frequency of weight stigma was significantly associated with depression symptom severity measured by the EPDS ($\beta = 0.634$, $p < 0.001$).

Conclusion These findings underscore the issue of weight stigma and show that experiencing this from trusted close others is associated with poor health outcomes like chronic pain. Advocacy efforts to mitigate weight stigma in pregnancy and strengthen close relationships to improve maternal health and wellbeing is warranted.

Keywords Close relationships, Weight stigma, Maternal health, Chronic pain, Depression

*Correspondence:
Angela C. Incollingo Rodriguez
acrodriquez@wpi.edu

¹Faculty of Kinesiology, Sport, and Recreation, University of Alberta,
Edmonton, Canada

²Psychological & Cognitive Sciences, Department of Social Science
& Policy Studies, Worcester Polytechnic Institute, 100 Institute Road,
Worcester, MA 01609, USA



© The Author(s) 2024. **Open Access** This article is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License, which permits any non-commercial use, sharing, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if you modified the licensed material. You do not have permission under this licence to share adapted material derived from this article or parts of it. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/>.

Introduction

The prenatal and postpartum period naturally, and often necessarily, include changes in body weight. Accompanying these changes are social expectations for how women's bodies should appear, even in this sensitive life stage [1]. During pregnancy, gestational weight gain is a result of many factors, including the developing fetus, growing placenta, changes in blood volume, and water retention [2]. Accordingly, weight in pregnancy may be distributed differently for all bodies. However, the common aspiration grounded in prevailing social expectations is to gain weight only in the abdominal region [1]. In the postpartum, the social expectation is to “snap back” and lose pregnancy weight as quickly as possible [1]. These perinatal body ideals are promoted through various channels, such as social media and celebrity culture, and can subject women to experiencing weight stigma during and after pregnancy [3]. Weight stigma, defined as social misconceptions and stereotypes commonly associated with higher body weight [4], can in turn promote detrimental outcomes including increased risk of depression, social withdrawal and avoidance of healthcare [5].

Specific to the context of pregnancy, a growing body of research shows that pregnancy-related weight stigma is a common experience for expecting and new mothers [1, 6]. These weight-stigmatizing experiences occur through a variety of sources, including healthcare providers, the media, close relationships, and even strangers [7]. Moreover, this stigma carries with it potential negative consequences for maternal mental and physical health. For instance, pregnancy-related weight stigma has been shown to increase risk of prenatal and postpartum depression, gestational weight gain, gestational diabetes, maladaptive eating behaviors, postpartum weight retention and early cessation of breastfeeding [8–12].

The accumulating research on this topic, however, has focused primarily on pregnancy-related weight stigma experienced in two domains: healthcare and the media. For instance, our previous work reported that weight stigma is common in prenatal care, manifesting through negative attitudes, disrespectful or inappropriate treatment, and impaired quality of care [3, 12]. In fact, pregnant individuals have suggested that healthcare professionals require further education on weight stigma in pregnancy, its harms, and ways to reduce occurrences, such as through sensitive communication practices [13]. Other recent studies describe negative and harmful “memorable messages” that mothers have received while attempting to conceive through the time after having their babies [14, 15]. In terms of the media, our prior work also revealed that the media commonly propagate pregnancy-related weight stigma [3, 16]. This includes through promoting an unrealistic “ideal” for a pregnant figure; creating pressure to “bounce back” quickly after

pregnancy; and blaming women for their weight, the associated health risks, and the burden that their risk poses to the healthcare system [16].

While this evidence is strong and consistent, the literature is lacking when it comes to stigma experienced in other key domains, namely from close relations. This gap has been highlighted in recent reviews as a key area for future research to address [6]. Filling this gap is necessary as pregnancy is a time when close relationships are already highly in flux. Not only does having a child change the nature of romantic relationships [17], both mothers and their partners experience marked shifts in their social systems – both for family and friendship networks – during the transition to parenthood [18]. When these changes are for the worse, the impact can be detrimental for maternal health. Indeed, family and friends are critical sources of social support during a woman's pregnancy and postpartum period and can buffer against adverse health outcomes such as prenatal and postpartum depression [19]. Social support is also critical for mothers coping with complex health conditions such as chronic pain [20].

We previously published some of the first evidence on the nature of pregnancy-related weight stigma from close others [21]. In a sample of 501 pregnant and postpartum women, over 30% reported experiencing weight stigma in their close relationships, including from partners, family, and friends [21]. General characterizations of this stigma included negative assumptions about the mother's lifestyle and associated risk to the child; comparisons of the mother to pregnant body ideals; and comments that led to negative self-stigma and judgment [21]. While these findings underscore that close relations are indeed a common source of pregnancy-related weight stigma that require further targeted inquiry, the implications of this stigma for maternal health are still largely unknown.

The present study took an a priori interest in close relationships, specifically, as sources of pregnancy-related weight stigma. In a sample of 463 women, we assessed pregnancy-related weight stigma caused by close others and its impact on both relationship quality with each source independently (friends, partners, family) and also on maternal health outcomes. We first sought to examine the direct effect of pregnancy-related weight stigma from partners, friends, and family as a predictor of negative mental and physical health indicators (gestational hypertension, gestational diabetes, postpartum depression/anxiety, preeclampsia, and chronic pain). We then probed whether relationship quality (marital, friendship, and family) mediated any of these relationships. Overall, this study sought to proffer the first evidence of how weight stigma from close others in particular confers negative maternal health risk over pregnancy and into the postpartum period.

Methods

Participants

Potential participants were recruited via flyers posted on social media forums (e.g., Facebook, Instagram) and through panel research recruitment with Qualtrics. Inclusion criteria were the following: at least 13 weeks pregnant, residence within the United States or Canada, 18 years of age or older, and pregnant with only one child.

Procedure

Eligible participants completed a battery of questionnaires online via Qualtrics [22]. Panel recruitment via Qualtrics ensures duplicate IP addresses are not included, and further IP address screening for those recruited via social media was conducted; no duplicate IDs were retrieved. In addition, we included a CAPTCHA question in the beginning and a general open-ended attention-check question in the end ("what is the current year?"). Participants reviewed the study information on the first screen and provided their informed consent prior to beginning the study. They were then directed to a series of questionnaires, described below. At the end of the questionnaires, participants were asked to provide their email address to be contacted for the postpartum follow-up. All participants were contacted roughly three months after their due date. At this assessment, they provided information about prenatal complications they experienced by indicating 'yes' or 'no' to whether they had been diagnosed with gestational diabetes, gestational hypertension, preeclampsia, chronic pain, or depression/anxiety. These conditions were selected as they are listed by the National Institute of Child Health and Development as common prenatal complications; in addition there is evidence supporting each of these as potentially preventable and/or manageable with lifestyle and social support [23–26]. They also completed the Edinburgh Postpartum Depression Scale (EPDS) at this time which measures severity of current depression symptoms [27]. The EPDS includes 10 items scored continuously with a maximum score of 30 and a greater score is indicative of more depression severity. Participants received a \$10.00 honorarium for completing the first questionnaire, and \$20.00 for completing the follow up. This study was approved by the Worcester Polytechnic Institute Institutional Review Board.

Measures

Participants first completed a demographic questionnaire collecting information on their age, gestational age, pre-pregnancy body mass index (BMI, calculated from their last known weight before pregnancy and height), ethnicity, and education. To assess pregnancy-related weight-stigmatizing experiences, we adapted a question developed and tested by Incollingo Rodriguez et al., 2019

[8]. Participants were prompted, "Some people are made to feel good or bad about how they look. [Since becoming pregnant OR since you had your baby], have you ever been treated differently because of your weight or has something or someone made you feel bad or uncomfortable because of your weight? (Options: Yes or No); If yes, please indicate who or what the source of this experience was. Select all that apply." Choices included friends, partner/spouse, or other family (e.g., mother or partner's mother, father or partner's father, siblings, grandparents, cousins), other: please indicate, and this has not happened to me at all. Participants were then asked to report how often in general these experiences occurred with seven response options ranging from "less than once a month" to "3 or more times a day."

Next, participants completed three relationship quality scales. The Friendship Network Satisfaction (FNS) Scale was used to assess satisfaction with friendships in adulthood. Participants responded to 14 items on a six-point Likert scale ranging from 0 "Not at all agree" to 5 "Completely agree." [28] The FNS scale Cronbach's alpha in this sample was 0.79. The Dyadic Adjustment Scale Short Form (DASSF) was used to assess marital adjustment and distress among any participants who indicated they were currently in a romantic relationship [29]. The Cronbach's alpha for the DASSF scale in this sample was 0.67. Participants responded to three items probing the degree to which they and their partners tended to agree or disagree about certain topics such as "philosophy of life" on a six-point Likert scale ranging from 5 "Always agree" to 0 "Always Disagree." They then responded to three items probing the frequency of certain events occurring between them and their partners, such as "have a stimulating exchange of ideas" on a six-point Likert scale ranging from 0 "Never" to 5 "More often [than once a day]." They answered a question indicating their degree of happiness in their relationship on a seven-point Likert scale from 0 "Extremely Unhappy" to 6 "Perfect." Finally, The Satisfaction with Family Life Scale (SFLS) was used to assess relationship quality with family members [30]. Participants responded to 5 items on a seven-point Likert scale ranging from 1 "Strongly disagree" to 7 "Strongly agree." A sample item is, "In most ways my family life is ideal." The Cronbach's alpha for the SFLS scale in this sample was 0.71. Responses were summed across all items, with higher scores indicating greater satisfaction for all three scales.

Analysis

The sample included only participants who completed both the prenatal and postpartum follow-up assessment. Frequency of weight-stigmatizing experiences was modeled as a continuous measure. Demographic data were summarized by means and frequency. First,

logistic regressions were performed to assess the association between frequency of weight stigma experienced in pregnancy from close others and perinatal complications including gestational diabetes, gestational hypertension, preeclampsia, chronic pain, and anxiety and depression. Next, if a regression analysis was significant, relationship quality was then tested as a mediator of the direct path between frequency of weight stigma (from that particular close other: friends, family, or partners) and the health outcome/complication. We also performed a linear regression between frequency of weight stigma in pregnancy from close others and postnatal depression symptom severity measured by the EPDS. For all analyses, we controlled for pre-pregnancy BMI, and gestational age as weight may change as pregnancy progresses. Analyses were performed on SPSS Version 27 [31]. The PROCESS

procedure created by Preacher and Hayes was used to complete the mediation analysis using Model 4 [32]. Significance was accepted as $p < 0.05$.

Results

A total of 463 participants completed the study ($n = 463$). Average age was 29.2 ± 3.5 years. Participants were 22.9 ± 6.01 weeks pregnant when they completed the survey. Most participants identified as White (76%) and had post-secondary education (80%). For most participants this was their first child (94%). The majority (86%) of the participants indicated they had experienced weight stigma in their pregnancy from close others including friends (38%), partners (38%), and family (47%). Participant characteristics, frequency of weight stigma, diagnosis of pregnancy complications, and average scores on each of the relationship scales are presented in Table 1.

There was no association between frequency of weight stigma in pregnancy from close others and gestational diabetes ($p = 0.050$), gestational hypertension ($p = 0.602$), or preeclampsia ($p = 0.343$). Frequency of weight stigma was, however, significantly associated with both chronic pain ($\beta = 0.689$, Odds Ratio [OR] = 1.992, 95% Confidence Interval [CI] = 1.346, 2.950, $p < 0.001$), and anxiety/depression ($\beta = 0.404$, OR = 1.498, 95% CI = 1.127, 1.991, $p = 0.005$). The mediation analysis was therefore performed for chronic pain and anxiety/depression.

A summary of all tested mediated relationships for chronic pain is presented in Fig. 1, and in Fig. 2 for anxiety/depression. The relationship between frequency of weight stigma experienced by friends and chronic pain was significantly mediated by friendship quality ($\beta = 0.0622$, 95% bias corrected CI = 0.005, 0.1549). The relationship between frequency of weight stigma experienced by partners and chronic pain was significantly mediated by partner relationship quality ($\beta = 0.0434$, 95% bias corrected CI = 0.002, 0.1026). The relationship between frequency of weight stigma experienced by family and chronic pain was significantly mediated by family relationship quality ($\beta = 0.3459$, 95% bias corrected CI = 0.2199, 0.5846). In summary, the relationship between frequency of weight stigma in pregnancy and chronic pain was mediated by quality of all relationships. This explains that more occurrences of weight stigma in pregnancy sourced from close others can be associated with increased chronic pain and this can be further explained by poor relationship quality with friends, partners and family. The relationship between frequency of weight stigma in pregnancy experienced by friends ($\beta = 0.0347$, 95% bias corrected CI = -0.0034, 0.0986) and partners ($\beta = 0.0217$, 95% bias corrected CI = -0.0037, 0.0671), and anxiety/depression was not mediated by the relationship quality with each source, whereas it was significantly impacted by family ($\beta = 0.1052$, 95%

Table 1 Summary of participant characteristics ($n = 463$)

Characteristics	Mean; SD
Age (yrs)	29.2 ± 3.5
Pre-pregnancy BMI (kg/m ²)	24.7 ± 10.4
Gestational Age (weeks)	22.9 ± 6.01
FNS Scale	38.5 ± 7.5
DASSF Scale	19.9 ± 6.9
SFLS Scale	22.7 ± 4.1
EPDS Score	12.4 ± 3.9
N; %	
<i>Ethnicity:</i>	
Black	38; 8.2
East Asian	2; 0.4
Indigenous	4; 0.8
Latino	8; 1.8
Middle Eastern	1; 0.3
South Asian	3; 0.6
White	407; 87.9
<i>Education:</i>	
Less than highschool	3; 0.6
Highschool	90; 19.4
Technical or college degree	149; 32.2
Bachelor's degree	188; 40.6
Graduate degree	33; 7.2
<i>Prenatal condition:</i>	
GDM	40; 8.6
Chronic Pain	18; 3.9
Anxiety/Depression	37; 8.0
Gestational Hypertension	27; 5.8
Preeclampsia	12; 2.6
<i>Relationship with Child's Other Parent:</i>	
Married/In a relationship	459; 99.1
Not in a relationship	3; 0.6
Prefer not to answer	1; 0.3
<i>Previous children:</i>	
First child	434; 93.7

BMI – Body mass index; DASSF - Dyadic Adjustment Scale Short Form; EPDS - Edinburgh Postpartum Depression Scale; FNS - Friendship Network Satisfaction; GDM – Gestational diabetes mellitus; SFLS - Satisfaction with Family Life Scale

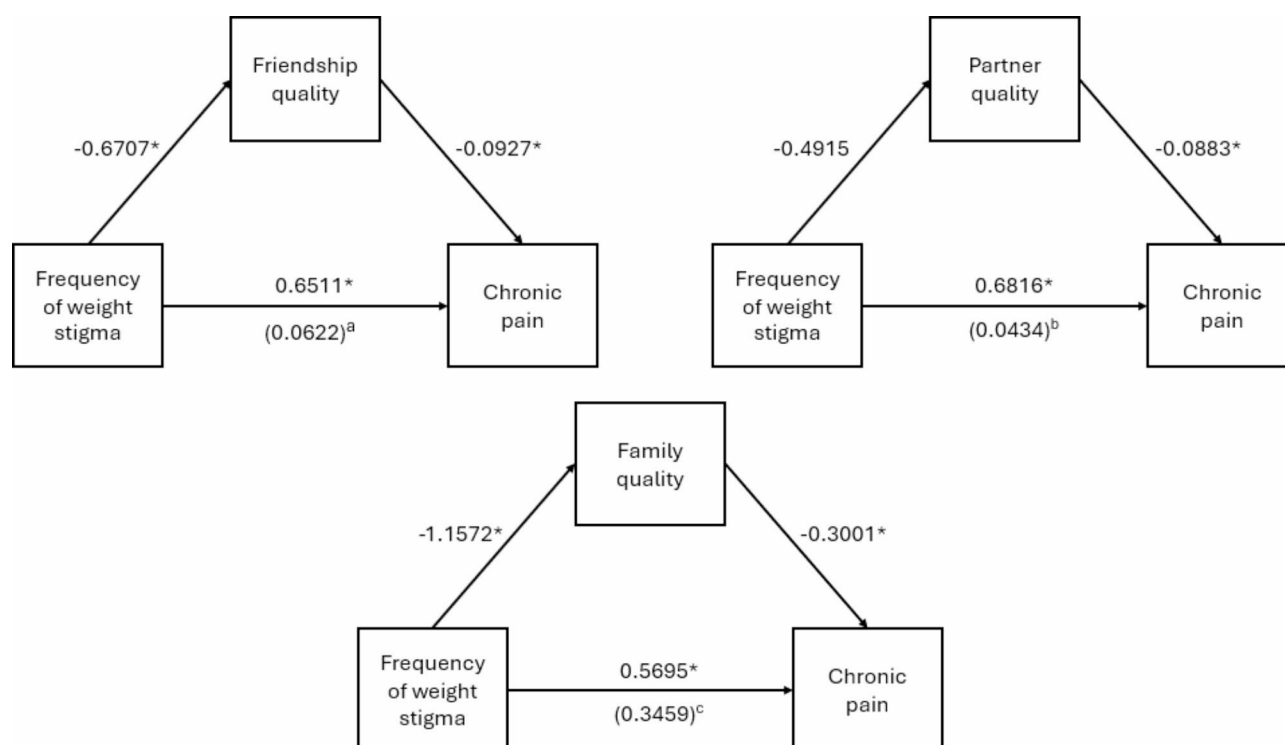


Fig. 1 A summary of tested mediation relationships for frequency of weight stigma, relationship quality, and chronic pain

* $p < 0.05$

^a 95% bias corrected confidence interval = 0.005, 0.1549

^b 95% bias corrected confidence interval = 0.002, 0.1026

^c 95% bias corrected confidence interval = 0.2199, 0.5846

Parentheses represents the standardized regression coefficient between frequency of weight stigma from friends and chronic pain, mediated by relationship quality

Friendship quality was measured by the Friendship Network Satisfaction scale, partner quality was measured by the Dyadic Adjustment Scale Short Form, and family quality was measured by the Satisfaction with Family Life Scale

bias corrected CI=0.0060, 0.2499). Finally, frequency of weight stigma was significantly associated with depression symptom severity as measured by the EPDS (average score = 12.4 ± 3.9 , $\beta = 0.634$, $p < 0.001$, 95% CI=0.346, 0.921).

Discussion

This study aimed to assess the relationship between experiencing weight stigma in pregnancy from close others and maternal health outcomes. Experiencing weight stigma in pregnancy from close others was associated with chronic pain and anxiety/depression. Moreover, the quality of relationship with each respective source mediated the relationship between frequency of weight stigma in pregnancy and chronic pain, as well as by family for anxiety/depression. There was no relationship between weight stigma in pregnancy from close others and gestational diabetes, gestational hypertension or preeclampsia. Positive relationships with close others in pregnancy can facilitate positive prenatal experiences and outcomes [33–35], and contrary to that, poor relationship quality can be detrimental to prenatal wellbeing [19]. This

study underscores previous literature demonstrating that weight stigma is pervasive in pregnancy from close others and adds that this may result in poor prenatal outcomes including chronic pain and anxiety/depression.²¹

In the non-pregnancy literature, a recent cross-sectional study including more than 3000 adults found a strong association between chronic pain and experiencing weight stigma [36]. Similar findings were reported by Olson et al., (2019) where they surveyed 61 women with an overweight or obese BMI and found that experiencing weight stigma mediated the relationship between higher weight and pain [37]. The present study extends these findings with evidence that weight stigma is also associated with chronic pain in the maternal health context. Interestingly, when we assessed relationship quality within each potential source (i.e., friends, partners, and family) as a mediator of the relationship between weight stigma in pregnancy and chronic pain, all models were significant. These findings suggest that weight stigma may promote chronic pain through impairing the quality of one's relationships in pregnancy. That is, perhaps through undermining relationships with close others,

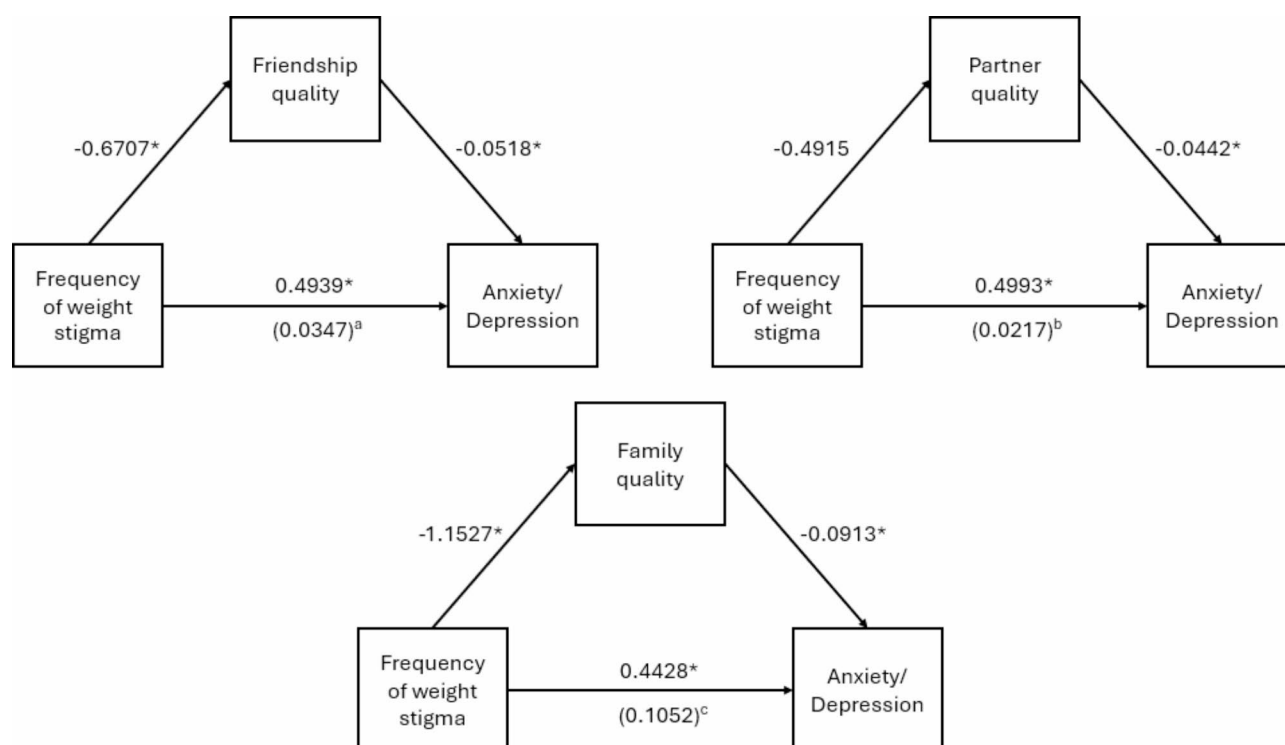


Fig. 2 A summary of tested mediation relationships for frequency of weight stigma, relationship quality, and anxiety/depression

* $p < 0.05$

^a 95% bias corrected confidence interval = -0.0034, 0.0986

^b 95% bias corrected confidence interval = -0.0037, 0.0671

^c 95% bias corrected confidence interval = 0.0060, 0.2499

Parentheses represents the standardized regression coefficient between frequency of weight stigma from friends and chronic pain, mediated by relationship quality

Friendship quality was measured by the Friendship Network Satisfaction scale, partner quality was measured by the Dyadic Adjustment Scale Short Form, and family quality was measured by the Satisfaction with Family Life Scale

weight stigma removes an important coping resource for managing chronic pain and its interference in daily life. This is in line with previous studies in non-pregnant participants that have highlighted that low relationship quality with close others is a barrier to receiving appropriate care for chronic pain [38, 39]. On the opposite end, having positive relationships can help facilitate pain management [40]. For example, a study with older adults who have chronic pain found that friends were noted to be a positive social support. Here, patients felt they could discuss their concerns and severity of the pain they were feeling with friends without fearing any judgement [40]. Overall, family and friends may provide necessary affective support for individuals experiencing chronic pain, and weight stigma may threaten this positive buffering relationship [41].

Weight stigma from close others was also associated with anxiety and depression in pregnancy, and was further mediated by family relationship quality. In addition, similar to previous work that has assessed weight stigma frequency and depressive symptoms [10], there was a positive association with depression symptom severity.

These findings suggest that the more weight stigma experienced in pregnancy from close others, the greater the risk for mental health concerns including postpartum depression. Social support is a critical factor to protect maternal mental well-being and prevent depression and anxiety [19, 35, 42]. It is therefore important to ensure family and friends are aware of the potential harm they may be causing through implicit or explicit weight-stigmatizing comments. Weight stigma from close others generally manifests through judgmental comments surrounding weight change, such as assuming the pregnant woman is eating too much if her weight gain is perceived to be too high or that she does not care for the growth of her developing baby if her weight gain is perceived to be too low [21]. Overall, awareness on the harmfulness weight-related judgements can have during pregnancy is needed to ensure that close others do not make remarks that could result in increasing the risk for depression or anxiety. Weight stigma and depression/anxiety were not mediated by relationship quality with friends and partners, although this is not in line with previous work and may be attributed to limitations such as sample size of

those who had anxiety/depression. Partners notably have been highlighted as a key support system against experiences of weight stigma in pregnancy, serving as confidants and as defenders when others make judgmental remarks [43]. Also, friends are supportive agents for mental health in pregnancy especially if they have relatable experiences to resonate with [44, 45]. Therefore, it is important to prevent weight stigma from close others including friends, partners, and family, given their imperative role in protecting maternal mental health.

No associations were found between weight stigma in pregnancy from close others and occurrences of gestational diabetes, gestational hypertension, and preeclampsia. Studies with non-pregnant samples that have aimed to assess the relationship between weight stigma and physical health outcomes have suggested that the strongest mediating factor is internalization of stigma, whereby the person accepts and self-directs negative weight-related judgments [46]. Accordingly, it may be necessary to not only assess relationship quality but also its impact on other psychological outcomes, like internalization of stigma, and how this then effects risk of other physical health outcomes like gestational diabetes, hypertension and preeclampsia. Additionally, this study examined these conditions dichotomously (whether or not the condition occurred or had been diagnosed). It may be that continuous measures of, for instance, blood pressure or blood sugar would reveal more nuanced associations between weight stigma and these health indicators.

Strengths of the present study include the large sample size that provided data at two time points, with the latter offering information on pregnancy complications that may have developed. We also assessed outcomes both clinically (i.e., presence or absence of a diagnosis) as well as continuously with present symptom severity for depression, which is most commonly associated with experiencing weight stigma. Additionally, relationship-specific scales were used to assess relationship quality for each potential target source (partners, friends, family). However, the sample was somewhat homogeneous, and these scales were limited in that they do not indicate explicitly whether relationship quality is a result of or influenced by weight stigma. In addition, the Cronbach's alpha for the DASSF scale was low and therefore should be interpreted with caution. We also relied on self-report data for the prenatal complications, and combined anxiety and depression in a single question. It is possible that participants were unaware of their diagnosis or unwilling to report it, and also that some had not yet received a diagnosis at the time of study completion. Future research may include a mixed-methods approach such as incorporating interviews to better capture nuances of relationship quality and presence of weight stigma and corroborate quantitative results through contextualizing

within lived experience. Finally, although data were collected across two waves, we cannot conclude that weight stigma caused any outcomes, only that it was associated with increased risk or prevalence.

Conclusion

Weight stigma in pregnancy is commonly experienced from close others, including partners, friends and family, and this may increase the risk for prenatal complications including chronic pain and depression/anxiety. Poor relationship quality may be indicative of low levels of social support, which may result from close relations perpetrating pregnancy-related weight stigma. This may, in turn, be a detriment to chronic pain. It is therefore essential to make close others aware of the potential harm that weight-related judgments may have on their pregnant spouse, friend, or family member. Healthcare visits or birthing and parenting classes may be ideal settings in which to communicate this message to ultimately improve prenatal experiences, enhance relationship quality, and reduce prenatal and postpartum maternal health concerns. Further research is needed to establish directionality and causality of relationships between weight stigma in pregnancy, relationship quality, and health outcomes.

Acknowledgements

We would like to thank Kathryn E. Nippert and Mia Velletri for their help with study management, Jen McLellen for her advocacy for this cause and support with recruitment, the participants who shared their experiences with us, and the Summit View Research Foundation for funding this work.

Author contributions

TSN and ACIR conceptualized the study, acquired funding, recruited participants, analyzed and interpreted data, and prepared the manuscript. Both authors approved the final manuscript for submission.

Funding

Summit View Research Foundation.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

This work was conducted in compliance with the American Psychological Association ethical standards for the treatment of human subjects. The Worcester Polytechnic Institute Institutional Review Board approved all procedures (IRB-21-0682, effective 2 July 2021). All participants consented to participate in the study through the online survey platform Qualtrics. They indicated their consent by reading the online consent form and then checking a box indicating that they agreed to participate. This method of consent was approved by the Institutional Review Board given that all procedures were online. All analyses were conducted on deidentified data.

Consent for publication

N/A.

Competing interests

The authors declare no competing interests.

Received: 11 December 2023 / Accepted: 24 September 2024

Published online: 18 October 2024

References

1. Hill B, Incollingo Rodriguez AC. Weight stigma across the preconception, pregnancy, and postpartum periods: a narrative review and conceptual model. Thieme Medical Publishers, Inc. 333 Seventh Avenue, 18th Floor, New York, NY ... -422.
2. Ferraro ZM, Contador F, Tawfiq A, Adamo KB, Gaudet L. Gestational weight gain and medical outcomes of pregnancy. *Obstetric Med.* 2015;8(3):133–7.
3. Nippert KE, Tomiyama AJ, Smieszek SM, Incollingo Rodriguez AC. The media as a source of weight stigma for pregnant and postpartum women. *Obesity.* 2021;29(1):226–32.
4. Puhl RM, Himmelstein MS, Pearl RL. Weight stigma as a psychosocial contributor to obesity. *Am Psychol.* 2020;75(2):274.
5. Puhl R, Suh Y. Health consequences of weight stigma: implications for obesity prevention and treatment. *Curr Obes Rep.* 2015;4:182–90.
6. Incollingo Rodriguez AC, Nagpal TS. The WOMBS framework: a review and new theoretical model for investigating pregnancy-related weight stigma and its intergenerational implications. *Obes Rev.* 2021;22(12):e13322.
7. Incollingo Rodriguez AC, Dunkel Schetter C, Tomiyama AJ. Weight stigma among pregnant and postpartum women: a new context of stigmatization. *Stigma Health.* 2020;5(2):209.
8. Rodriguez ACI, Schetter CD, Brewis A, Tomiyama AJ. The psychological burden of baby weight: pregnancy, weight stigma, and maternal health. *Soc Sci Med.* 2019;235:112401.
9. Nagpal TS, Tomiyama AJ, Rodriguez ACI, Beyond BMI. Pregnancy-related weight stigma increases risk of gestational diabetes. *Prim Care Diabetes.* 2021;15(6):1107–9.
10. Incollingo Rodriguez AC, Tomiyama AJ, Guardino CM, Dunkel Schetter C. Association of weight discrimination during pregnancy and postpartum with maternal postpartum health. *Health Psychol.* 2019;38(3):226.
11. Dieterich R, Chang J, Danford C, Scott PW, Wend C, Demirci J. The relationship between internalized weight stigma during pregnancy and breastfeeding: a prospective longitudinal study. *Obes (Silver Spring).* May 2021;29(5):919–27. <https://doi.org/10.1002/oby.23139>.
12. Incollingo Rodriguez AC, Smieszek SM, Nippert KE, Tomiyama AJ. Pregnant and postpartum women's experiences of weight stigma in healthcare. *BMC Pregnancy Childbirth.* 2020;20(1):1–10.
13. Nagpal TS, Liu RH, Gaudet L, Cook JL, Adamo KB. Summarizing recommendations to eliminate weight stigma in prenatal health care settings: a scoping review. *Patient Educ Couns Nov.* 2020;103(11):2214–23. <https://doi.org/10.1016/j.pec.2020.06.017>.
14. Basinger ED, Quinlan MM, Rawlings M. Memorable messages about fat bodies before, during, and after pregnancy. *Health Commun.* 2022:1–11.
15. Basinger ED, Quinlan MM. She didn't think Fat Women deserved to have children: memorable messages from Healthcare providers in the context of Fat pregnancy. *Women's Reproductive Health.* 2023:1–15.
16. Heslehurst N, Evans EH, Incollingo Rodriguez AC, Nagpal TS, Visram S. Newspaper media framing of obesity during pregnancy in the UK: a review and framework synthesis. *Obes Rev.* 2022;23(12):e13511.
17. Twenge JM, Campbell WK, Foster CA. Parenthood and marital satisfaction: a meta-analytic review. *J Marriage Family.* 2003;65(3):574–83.
18. Bost KK, Cox MJ, Burchinal MR, Payne C. Structural and supportive changes in couples' family and friendship networks across the transition to parenthood. *J Marriage Family.* 2002;64(2):517–31.
19. Xie R-H, He G, Koszycki D, Walker M, Wen SW. Prenatal social support, postnatal social support, and postpartum depression. *Ann Epidemiol.* 2009;19(9):637–43.
20. Evans S, Shipton EA, Keenan TR. Psychosocial functioning of mothers with chronic pain: a comparison to pain-free controls. *Eur J Pain.* 2005;9(6):683–90.
21. Nagpal TS, Nippert KE, Velletri M, Tomiyama AJ, Incollingo Rodriguez AC. Close relationships as sources of pregnancy-related weight stigma for expecting and new mothers. *Int J Behav Med.* 2023;30(2):297–303.
22. The survey for this paper was generated using Qualtrics software. Version 2022. Copyright © Qualtrics. Qualtrics and all other Qualtrics product or service names are registered trademarks or trademarks of Qualtrics, Provo, UT, USA. <https://www.qualtrics.com>
23. Mottola MF. Pregnancy, physical activity and weight control to prevent obesity and future chronic disease risk in both mother and child. *Curr Women's Health Reviews.* 2015;11(1):31–40.
24. Nagpal TS, Mottola MF. Physical activity throughout pregnancy is key to preventing chronic disease. *Reproduction.* 2020;160(5):R111–8.
25. Heslehurst N, Hayes L, Jones D, et al. The effectiveness of smoking cessation, alcohol reduction, diet and physical activity interventions in changing behaviours during pregnancy: a systematic review of systematic reviews. *PLoS ONE.* 2020;15(5):e0232774.
26. National Institute of Child Health and Development. What are some common complications of pregnancy? <https://www.nichd.nih.gov/health/topics/pregnancy/conditioninfo/complications>
27. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: development of the 10-item Edinburgh postnatal depression scale. *Br J Psychiatry.* 1987;150(6):782–6.
28. Kaufman VA, Perez JC, Reise SP, Bradbury TN, Karney BR. Friendship network satisfaction: a multifaceted construct scored as a unidimensional scale. *J Social Personal Relationships.* 2022;39(2):325–46.
29. Hunsley J, Best M, Lefebvre M, Vito D. The seven-item short form of the Dyadic Adjustment Scale: further evidence for construct validity. *Am J Family Therapy.* 2001;29(4):325–35.
30. Zabriskie RB, Ward PJ. Satisfaction with family life scale. *Marriage Family Rev.* 2013;49(5):446–63.
31. SPSS Inc. Released 2007. SPSS for Windows, Version 27.0. Chicago, SPSS Inc.
32. Preacher KJ, Hayes AF. SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behav Res Methods Instruments Computers.* 2004;36:717–31.
33. Orr ST. Social support and pregnancy outcome: a review of the literature. *Clin Obstet Gynecol.* 2004;47(4):842–55.
34. Balaji AB, Claussen AH, Smith DC, Visser SN, Morales MJ, Perou R. Social support networks and maternal mental health and well-being. *J Women's Health.* 2007;16(10):1386–96.
35. Aktas S, Calik KY. Factors affecting depression during pregnancy and the correlation between social support and pregnancy depression. *Iran Red Crescent Med J.* 2015;17(9).
36. Prunty A, Hahn A, O'Shea A, Edmonds S, Clark MK. Associations among enacted weight stigma, weight self-stigma, and multiple physical health outcomes, healthcare utilization, and selected health behaviors. *Int J Obes.* 2023;47(1):33–8.
37. Olson KL, Landers JD, Thaxton TT, Emery CF. The pain of weight-related stigma among women with overweight or obesity. *Stigma Health.* 2019;4(3):243.
38. Bair MJ, Matthias MS, Nyland KA, et al. Barriers and facilitators to chronic pain self-management: a qualitative study of primary care patients with comorbid musculoskeletal pain and depression. *Pain Med.* 2009;10(7):1280–90.
39. Yamada K, Kimura T, Cui M, et al. Social support, social cohesion and pain during pregnancy: the Japan Environment and Children's study. *Eur J Pain.* 2021;25(4):872–85.
40. Semlali I, Merminod G, Weber O, et al. Friendship in later life: how friends are significant resources in older persons' communication about Chronic Pain. *Int J Environ Res Public Health.* 2022;19(9):5551.
41. Primomo J, Yates BC, Woods NF. Social support for women during chronic illness: the relationship among sources and types to adjustment. *Res Nurs Health.* 1990;13(3):153–61.
42. O'Hara MW. Social support, life events, and depression during pregnancy and the puerperium. *Arch Gen Psychiatry.* 1986;43(6):569–73.
43. Keely A. *A qualitative exploration of the experiences of clinically very severely obese women during pregnancy and the postnatal period.* 2018.
44. Dunn CL, Pirie PL, Hellerstedt WL. The advice-giving role of female friends and relatives during pregnancy. *Health Educ Res.* 2003;18(3):352–62.
45. Vogels-Broeke M, Daemers D, Budé L, de Vries R, Nieuwenhuijze M. Sources of information used by women during pregnancy and the perceived quality. *BMC Pregnancy Childbirth.* 2022;22(1):109.
46. Pearl RL, Puhl RM. Weight bias internalization and health: a systematic review. *Obes Rev.* 2018;19(8):1141–63.

Publisher's note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.