Diabetes, Prenatal Depression, and Self-Rated Health in Latina Mothers

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ABSTRACT

Background. Latinas in the United States have elevated rates of diabetes and prenatal depression (PND). The presence of diabetes and PND can also have a negative effect on women's self-rated health (SRH), a commonly used indicator of health that is consistent with objective health status and is a predictor of mortality. However, the associations between PND, diabetes, and SRH have not been tested, particularly among Latinas, who have elevated risk of both medical conditions. To address this gap, this pilot study tested the association between PND and diabetes using data from Latinas enrolled during their third trimester of pregnancy and explored whether these health conditions were associated with SRH in these women.

Methods. For this study, the Edinburgh Postnatal Depression Scale was used to determine PND status, self-reported medical history to determine diabetes status, and SRH before and during the current pregnancy in a sample of 34 prenatal Latinas. Participants were invited to take part in the study in their third trimester of pregnancy. Bivariate analyses and logistic regressions were used to test associations between demographic variables, PND, diabetes, and SRH.

Results. There was no significant association between PND and diabetes status in this sample of Latinas. There was a significant difference in SRH from pre-pregnancy to pregnancy, with worse ratings reported during pregnancy. Furthermore, women with PND or diabetes reported worse SRH, even after controlling for pre-pregnancy SRH.

Conclusion. SRH is an important and robust variable associated with PND and diabetes in prenatal Latinas, making it an important factor to assess when treating this high-risk group.

The prevalence of diabetes in pregnancy (type 2 diabetes and gestational diabetes mellitus [GDM]) is growing in the United States and globally, making it an international public health priority (1–8). Women who develop GDM (i.e., glucose intolerance first detected during pregnancy [9]) are more than seven times as likely to develop type 2 diabetes than women who have had a normoglycemic pregnancy (10,11). Another complication in pregnancy is prenatal depression (PND), estimated to occur in 5% (12,13) to 51.4% (13,14) of the general population. Rates of these two medical complications are high among Latinas in the United States—an important fact because Latinas are the fastest-growing ethnic minority group (15), have the highest fertility rate in the United States (16), experience high rates of PND (32% [17]), and are at least twice as likely to develop diabetes in pregnancy than white women

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(1,18,19). Given the comorbidity of PND and diabetes in pregnancy among Latinas and their potential long-term effects on mother and child, it is imperative to further explore these two medical conditions in this population.

Several studies have found associations between diabetes in pregnancy and PND (20–22). Examining PND in the context of diabetes (type 2 diabetes and GDM) is important because both conditions act as risks for postpartum mothers and their children (23). In mothers, both diabetes and PND are risk factors for postpartum mood disorders (21,24–30). Depressive symptoms in mothers have been associated with poor overall health (31) and pregnancy complications (32,33). PND has also been associated with a host of negative outcomes for the child, including preterm birth (34,35), low birth weight (35), negative reactivity/affect (36–39), sudden infant death syndrome (40), and developmental delay (41). Furthermore, women with diabetes in pregnancy are at increased risk for hypertensive disorders and are more likely to need cesarean delivery (42,43). These health risks are particularly important for Latinas, who have been shown to have increased risks of obesity (44) and preeclampsia (45), which have been associated with diabetes. Infants of women with diabetes in pregnancy, including pregestational diabetes, are at increased risk for fetal macrosomia (being large for gestational age), obesity, glucose intolerance, and diabetes later in life (42,46–48). High rates of several of these infant risk factors, such as macrosomia (49) and child obesity (50), have been found in Latino offspring.

The presence of diabetes and PND can also have a negative effect on women's self-rated health (SRH), a commonly used indicator of health that is consistent with objective health status (51,52) and is a predictor of mortality (53). Prior studies have also shown an association between poorer SRH during pregnancy and depressive symptoms (54–56), as well as between poor SRH and diabetes in pregnancy (28,57). However, it is unclear how SRH is associated with PND and diabetes, particularly among Latinas who are diverse in countries of origin, nativity, immigration status, and acculturation. These factors are particularly important to examine given the complex stressors and risk factors immigrant (58) and more acculturated Latinas (59) experience.

Given the predictive role of SRH and the long-term implications of poor health in pregnancy for maternal and child outcomes, it is important to explore the effects of diabetes and PND on SRH in prenatal Latinas. Yet, these associations have not been well explored. To address this gap in the literature, we tested the association between diabetes and PND and explored whether SRH was associated with these two health conditions in a sample of 34 Latinas enrolled in their third trimester of pregnancy. Because the relationship between PND and diabetes may be moderated by key demographic characteristics, we also explored associations between immigrant status, age, education, income, marital status, employment, and our outcomes of interest. This work extends prior research conducted with Latinas (60,61) by exploring associations between two important perinatal health factors (e.g., diabetes and depression), maternal characteristics, and SRH.

Methods

We used data from SEPAH Latina (Study of Exposure to Stress, Postpartum Mood, Adverse Life Events, and Hormonal Function Among Latinas), which collected health information from 34 Latina women from their third trimester of pregnancy to 8 weeks postpartum between July 2013 and April 2014 (see Lara-Cinisomo et al. [62] for study details). The study was approved by the University of North Carolina Chapel Hill institutional review board. All participants gave written informed consent. Interviews were conducted in Spanish or English, and all women were compensated for their participation.

Measures

Demographic information, self-reported medical conditions, and medication use were collected at enrollment. Depression status was determined using the Edinburgh Postnatal Depression Scale (EPDS), a reliable measure of prenatal depressive symptoms (63); a score >10 indicated PND (64). The EPDS was validated with prenatal (65) and Spanish-speaking Latinas (66).

SRH was determined from answers to two social comparison questions in two time periods: "Compared to other people your age, how would you describe the state of your physical health during the year before your pregnancy?" or "Compared to other people your age, how would you describe the state of your physical health since you've been pregnant?" Responses were chosen from a five-point Likert scale (poor to excellent) (67).

Data Analysis

Participant characteristics were summarized using descriptive statistics. Using SPSS 23 (IBM, Armonk, N.Y.), Fisher exact tests were used to determine associations between dichotomous variables (e.g., education, diabetes status, and PND status), and χ^2 tests determined associations between categorical variables (e.g., SRH and type of medication). Nonparametric tests for paired data determined differences in pre-pregnancy and pregnancy SRH. Binary logistic regressions were used to determine the effect of diabetes on PND. Ordinal logistic regressions were implemented to test associations between SRH during pregnancy (dependent variable) and diabetes status (e.g., any diabetes and GDM). We also controlled for PND, pre-pregnancy SRH, and demographic characteristics to determine the unique contributing effect

of these variables. Only significant predictors were retained in the final model. An α level ≤0.05 was used to determine significant findings.

Results

Table 1 summarizes descriptive statistics and shows that 26.5% of women reported a diagnosis of diabetes, 14.7% reporting a diagnosis of GDM, 76.7% were overweight or obese, and 32.4% had PND. Less than one-fourth (23.5%) rated their pre-pregnancy health as fair or poor, but this proportion nearly doubled during pregnancy (41.2%). Results show that SRH was significantly lower during pregnancy compared to pre-pregnancy ($P = 0.022$). No significant associations were found between demographic characteristics, diabetes status (any diabetes or GDM), any SRH, or PND.

Among women with any type of diabetes (type 2 diabetes or GDM) during pregnancy, 33% had PND, but this proportion was higher among women with GDM (40%). Results from the logistic regression indicated that there was no significant association between any diabetes or GDM and PND (Table 2). Pregnancy SRH was significantly associated with PND [χ^2 (df 4, $n = 34$) = 12.40, $P = 0.015$]. There were significant differences in pre-pregnancy [H(1) = 5.266, $P = 0.022$] and marginal differences in pregnancy [H(1) = 7.761, $P = 0.055$] SRH by PND status. There were also significant differences in pre-pregnancy [H(1) = 6.021, $P = 0.014$] and pregnancy [H(1) = 7.251, $P = 0.007$] SRH by any type of diabetes. Differences in pregnancy SRH by GDM status were also significantly different [H(1) = 4.317, $P = 0.038$]; pre-pregnancy ratings differed only marginally [H(1) = 2.780, $P = 0.095$].

Results from the ordinal logistic regressions indicated that there was a significant and negative association between any diabetes and pregnancy SRH ($P = 0.008$) (see Model 1, Table 3). GDM was also negatively associated with pregnancy SRH ($P = 0.021$) (see Model 1, Table 4). Given our interest in the association between diabetes status and pregnancy SRH, individual predictors were added to the primary model. Results revealed that PND was negatively associated with pregnancy SRH ($P = 0.002$); the effect of any diabetes on pregnancy SRH remained statistically significant ($P = 0.002$) (see Model 2, Table 3). Similar results were observed for

TABLE 1. Descriptive Statistics of Study Participants ($n = 34$)

Immigrant status	
Immigrant	85.3 (29)
U.S.-born	14.7 (5)
Marital status	
Single	26.5 (9)
Married or cohabitating	73.5 (25)
Education level	
Less than high school	55.9 (19)
High school or more	44.1 (15)
Employment	
Unemployed	79.4 (27)
Employed full-time	20.6 (7)
Annual household income	
<$20,000	50.0 (17)
>$20,000	41.2 (14)
Did not know	08.8 (3)
Diabetes diagnosis	
Any type	26.5 (9)
None	73.5 (25
Gestational	14.7 (5)
Non-gestational	85.3 (29)
Medication/vitamin use	
Diabetes-related	23.5 (8)
Other medications or prenatal vitamins	47.0 (16)
None reported	23.5 (8)
Missing	5.9 (2)
Prenatal depression status	
Depressed	32.4 (11)
Not depressed	67.6 (23)
BMI	
Underweight or normal (BMI ≤24.9 kg/m^2)	23.3 (7)
Overweight or obese (BMI ≥25.0 kg/m^2)	76.7 (23)
Pre-pregnancy self-rated health	
Poor	0 (0)
Fair	23.5 (8)
Good	20.6 (7)
Very good	35.3 (12)
Excellent	20.6 (7)

TABLE CONTINUED ON P. 162 →

TABLE 1. Descriptive Statistics of Study Participants (*n* = 34), *continued from p. 161*

Pregnancy self-rated health	
Poor	8.8 (3)
Fair	32.4 (11)
Good	17.6 (6)
Very good	20.6 (7)
Excellent	20.6 (7)
Age (years), mean (SD)	29.3 (5.9)

Data are n *(%) unless otherwise noted. BMI is based on 30 women. Four women were lost to follow-up and did not attend the laboratory visit where weight and height were recorded.*

TABLE 2. Results From the Logistic Regressions for Diabetes Status by PND (*n* = 34)

	Any Diabetes			GDM Only		
	β (SE)	95% CI	*P*	β (SE)	95% CI	*P*
PND	0.061 (0.48)	0.21–5.37	0.942	0.393 (1.00)	0.21–10.46	0.693

GDM (see Model 2, Table 4). Adding pre-pregnancy SRH to the model testing the effect of diabetes (any diabetes or GDM) on pregnancy SRH rendered its effect nonsignificant (see Model 3, Tables 3 and 4); pre-pregnancy SRH ratings were significantly associated with pregnancy SRH. The final models in Tables 3 and 4 show that diabetes status was significantly and negatively associated with pregnancy SRH after controlling for PND and pre-pregnancy SRH, which was also statistically significant with the exception of "good" ratings in the any diabetes model. Demographic characteristics did not yield any significant effects.

Discussion

Close to one in three women in our sample reported diabetes, a higher proportion than the general prenatal population (68). No significant associations were found between demographic characteristics, diabetes, and PND, possibly because this was a rather homogenous group. We did not find an association between diabetes and PND, which supports previous findings (69,70). A possible explanation might be that women in our study had high self-efficacy and felt they were successfully managing their disease. The majority of women with diabetes were taking diabetes-related medication (Table 1), which we hypothesize might increase confidence or self-efficacy and reduce the potential negative effects of diabetes status on their mental health because they are actively managing their condition. There is evidence to suggest that diabetes self-care and management is associated with self-efficacy and better mental health outcomes (71,72). It will be important to test our hypothesis with a larger sample of prenatal Latinas diagnosed with diabetes. However, PND was significantly associated with pregnancy SRH.

On average, participants rated their pregnancy health worse than pre-pregnancy health, suggesting that women felt worse during gestation. Others have found a similar trend, with the proportion of poor or fair SRH increasing in the third trimester (55). This shift in their perception, from good health pre-pregnancy to poorer health in pregnancy, might be an expression of pregnancy-related issues that were not assessed in this study, including poor sleep and uncomfortable weight gain, or risk factors, such as substance and/or tobacco use and economic hardship (55).

Similar to previous studies (54,55), we found that women with PND and diabetes rated their health significantly worse than individuals without these conditions. To further explore these associations, we tested the effect of PND and diabetes on pregnancy SRH and found a significant and negative association. To determine the effect of pre-pregnancy SRH, we controlled for this variable in our regression models and found that pre-pregnancy SRH reduced the effect of diabetes on pregnancy SRH, suggesting that pre-pregnancy SRH is a robust variable that may capture latent variables associated with diabetes in pregnancy. However, when PND and pre-pregnancy SRH were added to the diabetes models, we found that pre-pregnancy SRH did not reduce the effect of diabetes on pregnancy SRH, suggesting that these two variables make unique contributions that should be explored further. Others have found that as depressive symptoms increase during pregnancy, SRH worsens (56). However, these associations were not explored in the context of diabetes in prenatal women. Future studies should look at specific health conditions, maternal mood, and SRH, as well as beliefs about those conditions, to help further understand the relationships found in this study.

Although this study sheds light on the relationship between PND, diabetes, and SRH, it has some limitations. First, the study had a small, homogenous sample, making the results more specific to Latinas with similar demographic characteristics. Future studies should use larger cohorts of Latinas from diverse socioeconomic backgrounds. Additionally, subsequent studies should include non-Latinas with similar demographic characteristics to this sample to determine whether cultural beliefs or perceptions are associated with feelings about diabetes in pregnancy. Subsequent studies should explore the

TABLE 3. Results From the Ordinal Logistic Regressions With Pregnancy SRH as the Outcome and Any Diabetes as the Main Predictor (*n* = 34)

	Model 1			Model 2			Model 3			Model 4		
	B (SE)	95% CI	*P*	B (SE)	95% CI	*P*	B (SE)	95% CI	*P*	B (SE)	95% CI	*P*
Any diabetes	–2.167 (0.82)	–3.77 to –0.56	0.008	–2.638 (0.853)	–4.31 to –0.97	0.002	–1.355 (0.85)	–3.04 to 0.33	0.115	–2.301 (0.95)	–4.15 to –0.45	0.015
PND				–2.368 (0.78)	–3.90 to –0.84	0.002				–2.323 (0.88)	–4.05 to –0.59	0.008
Pre-pregnancy SRH												
Poor							—	—	—	—	—	—
Fair							–4.994 (1.37)	–7.68 to –2.31	0.000	–4.375 (1.42)	–7.15 to –1.60	0.002
Good							–3.236 (1.24)	–5.67 to –0.81	0.009	–2.309 (1.24)	–4.74 to 0.12	0.062
Very good							–2.83 (1.06)	–4.45 to –0.31	0.024	–2.499 (1.08)	–4.61 to –0.39	0.020

The reference groups were no diabetes, no PND, and excellent SRH.

TABLE 4. Results From the Ordinal Logistic Regressions With Pregnancy SRH as the Outcome and GDM as the Main Predictor (*n* = 34)

	Model 1			Model 2			Model 3			Model 4		
	B (SE)	95% CI	*P*	B (SE)	95% CI	*P*	B (SE)	95% CI	*P*	B (SE)	95% CI	*P*
GDM only	–2.383 (1.03)	–4.91 to –0.36	0.021	–2.434 (1.03)	–4.45 to –0.41	0.018	–1.825 (1.07)	–7.85 to –2.64	0.087	–2.230 (1.11)	–4.41 to –0.05	0.045
PND				–2.016 (0.75)	–3.49 to –0.54	0.007				–1.816 (0.84)	–3.46 to –0.17	0.031
Pre-pregnancy SRH												
Poor							—	—	—	—	—	—
Fair							–5.191 (1.36)	–7.85 to –2.54	0.000	–4.716 (1.38)	–7.41 to –2.03	0.001
Good							–3.252 (1.22)	–5.65 to –0.86	0.008	–2.595 (1.21)	–4.97 to –0.26	0.032
Very good							–2.429 (1.05)	–4.49 to –0.37	0.021	–2.526 (1.06)	–4.60 to –0.45	0.017

The reference groups were no diabetes, no PND, and excellent SRH.

mediating effects of pre-pregnancy exercise, substance use, and poverty on associations between PND, diabetes, and SRH. Additionally, this study lacked pre-pregnancy metabolic data, which prevented us from exploring whether they are associated with PND and SRH. Given previous research showing a relationship between high pre-pregnancy BMI and perinatal depression (73,74), it is likely we would have had similar results. However, this speculation should be confirmed empirically. Because less is known about the association between pre-pregnancy BMI and SRH, future studies should include pre-pregnancy BMI to assess its effect on SRH. Finally, this study did not measure glucose control, which has been shown to be associated with depression during the perinatal period (75) and SRH (76) in non-perinatal populations. Therefore, future studies should include the collection of blood glucose levels from participants to test the association of glycemic status with mood and women's own health perceptions. Finally, subsequent investigations should include a qualitative component to further understand the challenges pregnant women with diabetes face as they relate to cultural expectations and needs to allow for more culturally sensitive care and self-management.

Clinical Implications

Given findings regarding the associations between SRH, PND, and diabetes, health care providers should assess SRH throughout the course of pregnancy in women with PND to identify women who are experiencing additional effects on self-assessments because of poor mental health. Screening for poor SRH may offer providers an opportunity to educate women at risk of depression and provide coping strategies or treatment as needed.

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Duality of Interest

No potential conflicts of interest relevant to this article were reported.

Author Contributions

S.L.-C. conceptualized the project, secured funding, collected the data, led the data analysis, and supervised all aspects of the manuscript. C.S. contributed to the data analysis and introduction. D.M. assisted with the methods and results. H.H. contributed to the discussion. S.L.-C. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

References

1. Lawrence JM, Contreras R, Chen W, Sacks DA. Trends in the prevalence of preexisting diabetes and gestational diabetes mellitus among a racially/ethnically diverse population of pregnant women, 1999–2005. Diabetes Care 2008;31:899–904

2. Ferrara A. Increasing prevalence of gestational diabetes mellitus: a public health perspective. Diabetes Care 2007;30(Suppl. 2):S141–S146

3. Ferrara A, Kahn HS, Quesenberry CP, Riley C, Hedderson MM. An increase in the incidence of gestational diabetes mellitus: Northern California, 1991–2000. Obstet Gynecol 2004;103:526–533

4. Dabelea D, Snell-Bergeon JK, Hartsfield CL, Bischoff KJ, Hamman RF, McDuffie RS. Increasing prevalence of gestational diabetes mellitus (GDM) over time and by birth cohort. Diabetes Care 2005;28:579–584

5. Thorpe LE, Berger D, Ellis JA, et al. Trends and racial/ethnic disparities in gestational diabetes among pregnant women in New York City, 1990–2001. Am J Public Health 2005;95:1536–1539

6. Chen L, Magliano DJ, Zimmet PZ. The worldwide epidemiology of type 2 diabetes mellitus: present and future perspectives. Nat Rev Endocrinol 2012;8:228–236

7. Hu FB. Globalization of diabetes: the role of diet, lifestyle, and genes. Diabetes Care 2011;34:1249–1257

8. DeSisto CL, Kim SY, Sharma AJ. Prevalence estimates of gestational diabetes mellitus in the United States, pregnancy risk assessment monitoring system (PRAMS), 2007–2010. Prev Chronic Dis 2014;11:E104

9. Proceedings of the 4th International Workshop-Conference on Gestational Diabetes Mellitus. Chicago, Illinois, USA: 14–16 March 1997. Diabetes Care 1998;21(Suppl. 2):B1–B167

10. Cheung NW, Byth K. Population health significance of gestational diabetes. Diabetes Care 2003;26:2005–2009

11. Bellamy L, Casas JP, Hingorani AD, Williams D. Type 2 diabetes mellitus after gestational diabetes: a systematic review and meta-analysis. Lancet 2009;373:1773–1779

12. Affonso DD, Lovett S, Paul SM, Sheptak S. A standardized interview that differentiates pregnancy and postpartum symptoms from perinatal clinical depression. Birth 1990;17:121–130

13. Bennett HA, Einarson A, Taddio A, Koren G, Einarson TR. Prevalence of depression during pregnancy: systematic review. Obstet Gynecol 2004;103:698–709

14. McKee M. Health-related functional status in pregnancy: relationship to depression and social support in a multi-ethnic population. Obstet Gynecol 2001;97:988–993

15. InfoPlease. Hispanic Americans by the numbers. Available from https://www.infoplease.com/hispanic-americans-numbers. Accessed 20 May 2017

16. Passel JS, Livingston G, D'Vera C. Explaining why minority births now outnumber white births. 2013. Available from http://www.pewsocialtrends.org/2012/05/17/explaining-why-minority-births-now-outnumber-white-births. Accessed 20 May 2017

17. Lara MA, Le HN, Letechipia G, Hochhausen L. Prenatal depression in Latinas in the US and Mexico. Matern Child Health J 2009;13:567–576

18. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995–2025: prevalence, numerical estimates, and projections. Diabetes Care 1998;21:1414–1431

19. Chasan-Taber L, Fortner RT, Gollenberg A, Buonnaccorsi J, Dole N, Markenson G. A prospective cohort study of modifiable risk factors for gestational diabetes among Hispanic women: design and baseline characteristics. J Womens Health 2010;19:117–124

20. Bisson M, Sériès F, Giguère Y, et al. Gestational diabetes mellitus and sleep-disordered breathing. Obstet Gynecol 2014;123:634–641

21. Kozhimannil KB, Pereira MA, Harlow BL. Association between diabetes and perinatal depression among low-income mothers. JAMA 2009;301:842–847

22. Morrison C, McCook JG, Bailey BA. First trimester depression scores predict development of gestational diabetes mellitus in pregnant rural Appalachian women. J Psychosom Obstet Gynaecol 2016;37:21–25

23. Pawluski JL, Lonstein JS, Fleming AS. The neurobiology of postpartum anxiety and depression. Trends Neurosci 2017;40:106–120

24. Goodman JH, Watson GR, Stubbs B. Anxiety disorders in postpartum women: a systematic review and meta-analysis. J Affect Disord 2016;203:292–331

25. Martini J, Petzoldt J, Einsle F, Beesdo-Baum K, Höfler M, Wittchen HU. Risk factors and course patterns of anxiety and depressive disorders during pregnancy and after delivery: a prospective-longitudinal study. J Affect Disord 2015;175:385–395

26. Milgrom J, Gemmill AW, Bilszta JL, et al. Antenatal risk factors for postnatal depression: a large prospective study. J Affect Disord 2008;108:147–157

27. Silverman ME, Reichenberg A, Savitz DA, et al. The risk factors for postpartum depression: a population-based study. Depress Anxiety 2017;34:178–187

28. Dalfrà MG, Nicolucci A, Bisson T, Bonsembiante B, Lapolla A. Quality of life in pregnancy and post-partum: a study in diabetic patients. Qual Life Res 2012;21:291–298

29. Heron J, O'Connor TG, Evans J, Golding J, Glover V. The course of anxiety and depression through pregnancy and the postpartum in a community sample. J Affect Disord 2004;80:65–73

30. Rubertsson C, Waldenström U, Wickberg B, Rådestad I, Hildingsson I. Depressive mood in early pregnancy and postpartum: Prevalence and women at risk in a national Swedish sample. J Reprod Infant Psychol 2005;23:155–166

31. Marcus SM, Flynn HA, Blow FC, Barry KL. Depressive symptoms among pregnant women screened in obstetrics settings. J Womens Health 2003;12:373–380

32. Larsson C, Sydsjö G, Josefsson A. Health, sociodemographic data, and pregnancy outcome in women with antepartum depressive symptoms. Obstet Gynecol 2004;104:459–466

33. Kurki T, Hiilesmaa V, Raitasalo R, Mattila H, Ylikorkala O. Depression and anxiety in early pregnancy and risk for preeclampsia. Obstet Gynecol 2000;95:487–490

34. Dayan J, Creveuil C, Marks MN, et al. Prenatal depression, prenatal anxiety, and spontaneous preterm birth: a prospective cohort study among women with early and regular care. Psychosom Med 2006;68:938–946

35. Steer RA, Scholl TO, Hediger ML, Fischer RL. Self-reported depression and negative pregnancy outcomes. J Clin Epidemiol 1992;45:1093–1099

36. Davis EP, Glynn LM, Schetter CD, Hobel C, Chicz-Demet A, Sandman CA. Prenatal exposure to maternal depression and cortisol influences infant temperament. J Am Acad Child Adolesc Psychiatry 2007;46:737–746

37. Davis EP, Snidman N, Wadhwa PD, Glynn LM, Schetter CD, Sandman CA. Prenatal maternal anxiety and depression predict negative behavioral reactivity in infancy. Infancy 2004;6:319–331

38. Diego MA, Field T, Hernandez-Reif M. Prepartum, postpartum and chronic depression effects on neonatal behavior. Infant Behav Dev 2005;28:155–164

39. Huot RL, Brennan PA, Stowe ZN, Plotsky PM, Walker EF. Negative affect in offspring of depressed mothers is predicted by infant cortisol levels at 6 months and maternal depression during pregnancy, but not postpartum. Ann N Y Acad Sci 2004;1032:234–236

40. Howard LM, Kirkwood G, Latinovic R. Sudden infant death syndrome and maternal depression. J Clin Psychiatry 2007;68:1279–1283

41. Deave T, Heron J, Evans J, Emond A. The impact of maternal depression in pregnancy on early child development. BJOG 2008;115:1043–1051

42. American Diabetes Association. Gestational diabetes mellitus. Diabetes Care 2003;26(Suppl. 1):S103

43. Wier L, Witt E, Burgess J, Elixhauser A. Hospitalizations related to diabetes in pregnancy, 2008. HCUP statistical brief #102. Rockville, Md., Agency for Healthcare Research and Quality, 2010

44. Bryant AS, Worjoloh A, Caughey AB, Washington AE. Racial/ethnic disparities in obstetric outcomes and care: prevalence and determinants. Am J Obstet Gynecol 2010;202:335–343

45. Wolf M, Shah A, Jimenez-Kimble R, Sauk J, Ecker JL, Thadhani R. Differential risk of hypertensive disorders of pregnancy among Hispanic women. J Am Soc Nephrol 2004;15:1330–1338

46. Evers I, De Valk H, Mol B, Ter Braak EW, Visser G. Macrosomia despite good glycaemic control in type I diabetic pregnancy; results of a nationwide study in The Netherlands. Diabetologia 2002;45:1484–1489

47. Persson M, Pasupathy D, Hanson U, Norman M. Birth size distribution in 3,705 infants born to mothers with type 1 diabetes: a population-based study. Diabetes Care 2011;34:1145–1149

48. Yang J, Cummings EA, O'Connell C, Jangaard K. Fetal and neonatal outcomes of diabetic pregnancies. Obstet Gynecol 2006;108:644–650

49. Wojcicki J, Hessol NA, Heyman MB, Fuentes-Afflick E. Risk factors for macrosomia in infants born to Latina women. J Perinatol 2008;28:743

50. Ogden CL, Carroll MD, Flegal KM. High body mass index for age among US children and adolescents, 2003–2006. JAMA 2008;299:2401–2405

51. Wu S, Wang R, Zhao Y, et al. The relationship between self-rated health and objective health status: a population-based study. BMC Public Health 2013;13:320

52. Undén AL, Elofsson S, Andréasson A, Hillered E, Eriksson I, Brismar K. Gender differences in self-rated health, quality of life, quality of care, and metabolic control in patients with diabetes. Gender Med 2008;5:162–180

53. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. J Health Soc Behav 1997;38:21–37

54. Schytt E, Waldenström U. Risk factors for poor self-rated health in women at 2 months and 1 year after childbirth. J Womens Health 2007;16:390–405

55. Haas JS, Jackson RA, Fuentes-Afflick E, et al. Changes in the health status of women during and after pregnancy. J Gen Intern Med 2005;20:45–51

56. Orr ST, Blazer DG, James SA, Reiter JP. Depressive symptoms and indicators of maternal health status during pregnancy. J Womens Health 2007;16:535–542

57. Rumbold AR, Crowther VA. Women's experiences of being screened for gestational diabetes mellitus. Aust N Z J Obstet Gynaecol 2002;42:131–137

58. Cavazos-Rehg PA, Zayas LH, Spitznagel EL. Legal status, emotional well-being and subjective health status of Latino immigrants. J Natl Med Assoc 2007;99:1126

59. Pérez-Escamilla R, Putnik P. The role of acculturation in nutrition, lifestyle, and incidence of type 2 diabetes among Latinos. J Nutr 2007;137:860–870

60. Chasan-Taber L, Braun B, Whitcomb BW. Review of self-reported physical activity assessments for pregnancy: summary of the evidence for validity and reliability. Obstet Gynecol 2015;126:676–677

61. Pineda Olvera AE, Stewart SM, Galindo L, Stephens J. Diabetes, depression, and metabolic control in Latinas. Cultur Divers Ethnic Minor Psychol 2007;13:225

62. Lara-Cinisomo S, Plott J, Grewen K, Meltzer-Brody S. The feasibility of recruiting and retaining perinatal Latinas in a biomedical study exploring neuroendocrine function and postpartum depression. J Immigr Minor Health 2016;5:1–9

63. Murray D, Cox JL. Screening for depression during pregnancy with the Edinburgh Depression Scale (EDDS). J Reprod Infant Psychol 1990;8:99–107

64. Cox JL, Holden JM, Sagovsky R. Detection of postnatal depression: development of the 10-item Edinburgh Postnatal Depression Scale. Br J Psychiatry 1987;150:782–786

65. Yonkers KA, Ramin SM, Rush AJ, et al. Onset and persistence of postpartum depression in an inner-city maternal health clinic system. Am J Psychiatry 2001;158:1856–1863

66. Jadresic E, Araya R, Jara C. Validation of the Edinburgh postnatal depression scale (EPDS) in Chilean postpartum women. J Psychosom Obstet Gynaecol 1995;16:187–191

67. Kraus MW, Adler N, Chen TWD. Is the association of subjective SES and self-rated health confounded by negative mood? An experimental approach. Health Psychol 32:138–145

68. King H, Rewers M. Global estimates for prevalence of diabetes mellitus and impaired glucose tolerance in adults. Diabetes Care 1993;16:157–177

69. Engberg E, Stach-Lempinen B, Sahrakorpi N, et al. A cross-sectional study of antenatal depressive symptoms in women at high risk for gestational diabetes mellitus. J Psychosom Res 2015;79:646–650

70. Katon JG, Russo J, Gavin AR, Melville JL, Katon WJ. Diabetes and depression in pregnancy: is there an association? J Womens Health 2011;20:983–989

71. Williams K, Bond M. The roles of self-efficacy, outcome expectancies and social support in the self-care behaviours of diabetics. Psychol Health Med 2002;7:127–141

72. Ciechanowski PS, Katon WJ, Russo JE, Hirsch IB. The relationship of depressive symptoms to symptom reporting, self-care and glucose control in diabetes. Gen Hosp Psychiatry 2003;25:246–252

73. Bodnar LM, Wisner KL, Moses-Kolko E, Sit DK, Hanusa BH. Prepregnancy body mass index, gestational weight gain and the likelihood of major depression during pregnancy. J Clin Psychiatry 2009;70:1290

74. LaCoursiere D, Barrett-Connor E, O'Hara MW, Hutton A, Varner MW. The association between prepregnancy obesity and screening positive for postpartum depression. BJOG 2010;117:1011–1018

75. Lustman PJ, Anderson RJ, Freedland KE, De Groot M, Carney RM, Clouse RE. Depression and poor glycemic control: a meta-analytic review of the literature. Diabetes Care 2000;23:934–942

76. Nielsen AB, Gannik D, Siersma V, de Fine Olivarius N. The relationship between HbA1c level, symptoms and self-rated health in type 2 diabetic patients. Scand J Prim Health Care 2011;29:157–164