HHS Public Access

Author manuscript

Matern Child Health J. Author manuscript; available in PMC 2016 April 01.

Published in final edited form as:

Matern Child Health J. 2015 April ; 19(4): 819–827. doi:10.1007/s10995-014-1579-8.

Healthy Start: Description of a Safety Net for Perinatal Support during Disaster Recovery

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Abstract

Objectives—Publicly funded programs and safety net organizations have key roles during post disaster recovery to care for vulnerable populations, including pregnant women with low resources. The objective of this study was to compare the health of prenatal women who accessed the New Orleans Healthy Start program to those women who only used traditional prenatal care (PNC) during long-term recovery from the Hurricane Katrina disaster.

Methods—During 2010-2012, this descriptive, cross-sectional study recruited 402 prenatal women (24-40 weeks) from prenatal clinics and classes. All women were enrolled in PNC, with 282 experiencing only traditional PNC, while 120 women added Healthy Start participation to their usual PNC. Measures were obtained to determine, past hurricane experience, hurricane recovery, perceptions of prenatal care, mental health, and birth outcomes.

Results—Women accessing Healthy Start-New Orleans were more socially “at risk” (younger, lower income, not living with a partner, African American), lived through more hurricane trauma, and had a higher incidence of depression (40%) and PTSD (15%) than women in traditional PNC (29% depression; 6.1 % PTSD). Women using Healthy Start reported more mental health counseling and prenatal education than did women in only traditional PNC. Birth outcomes were similar in the two groups.

Conclusions—The Healthy Start participants with less resources and more mental health difficulties after disaster, represented a more vulnerable population in need of additional support.

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This study underscores the necessity for community and governmental programs to develop disaster response plans that address needs of vulnerable populations during prolonged recovery.

Long term disaster recovery has a significant impact on the well-being of people who live in the community. The rebuilding of physical, social, and economic environments is a chaotic and non-linear process where not all individuals, families, or groups recover at the same pace or face the same problems [1]. Years following the August 2005 Hurricane Katrina devastation of New Orleans, childbearing women living in the recovering communities were bombarded with stressors including unstable health care and neighborhood services, high crime, repetitive disasters such as the BP oil spill in 2010, and hurricane threats again in 2008 and 2012 [2, 3]. Additionally, after disasters the potential loss of social support systems which are important in buffering stress during pregnancy, is a major concern. Relocation of the extended family system, and disruption of informal networks of social support through churches, workplaces, and community meeting places, all contribute to lack of support and more stress for pregnant women [4, 5].

High stress and low social support have long been associated with negative pregnancy outcomes such as depression, preterm birth (PTB), low birthweight (LBW) and pre-eclampsia [6, 7]. How the prevalence and timing of stress following disasters impact risk for poor pregnancy outcomes is unclear. Several studies of natural and environmental disasters and terrorist attacks found decrease in birthweights, gestational ages, or fetal growth as a result of living close to the event [8, 9]. Many studies confirmed maternal PTSD or depression after disasters and some found an association of PTSD with altered fetal growth, making mental health status of women following disasters a primary concern [10-12]. On the other hand, other studies found minimal or no associations of disaster events with pregnancy outcomes [13].

The impact of long term disaster recovery on pregnant women living in the affected community is less clear. Birth data analyzed for three years after the 1997 Red River Flood indicated significant increases in low birthweight, and preterm births, eclampsia and uterine bleeding [14]. Although most longitudinal post-disaster studies found PTSD symptoms to diminish over time, there have been studies that indicated individuals lived with PTSD up to three decades after a disaster event. Risk for long-term psychological distress and PTSD is increased for persons with highest exposure to the disaster event, coexisting depression, low income, a history of trauma and abuse, and other negative life events [15-19].

The magnitude of flooding, destruction and trauma caused by the 2005 Hurricane Katrina disaster put vulnerable populations in New Orleans at high risk for psychological distress [20]. This disaster was described as one of the worst catastrophic events in US history, displacing over a million people [21]. The massive devastation prevented migration of people back to New Orleans until adequate temporary housing and infrastructure were restored. Those families with less resources struggled to return and find jobs, rebuild homes or find affordable rental housing. State, federal, and local consensus about levee mitigation, changes in the city footprint, and implementation of the Road Home program to assist uninsured property owners, all preceded the rebuilding in the most devastated neighborhoods [3]. As citizens slowly returned, oftentimes the family did not return as a

whole unit, but rather retuned in a fragmented manner [4]. People who returned learned to live in the “new normal,” of disaster recovery, including less available social networks and services. Notably, the limited services for health care resulting from the destruction of community hospitals and clinics was a serious challenge [22].

Healthy Start was one safety net community organization that remained available in New Orleans to assist pregnant women to negotiate the traditional prenatal health system and to supplement prenatal care with additional social services, education, and referrals. The federal Healthy Start program, first funded by Congress in 1991, seeks to reduce disparities in the access and utilization of health services in communities with high infant mortality. Program goals to improve birth outcomes are achieved through the core services of direct community outreach, case management, health education, interconceptional care, and screening for depression [23].

In 2005, the New Orleans Healthy Start had the unique opportunity to serve childbearing families in the immediate aftermath and as women returned to live in a community devastated by the Hurricane Katrina disaster. New Orleans Healthy Start is administered through the City of New Orleans Health Department. In the immediate days and months post-Katrina, operations were set up in a temporary housing area for citizens who evacuated to Baton Rouge. Before Healthy Start returned to New Orleans new sites for services had to be secured. Being affiliated with city government was an asset in relocating to a building in the Central Business District. Although the program was originally funded to target services to women in Orleans parish, the Health Resources and Services Administration (HRSA) approved a change that allowed the program to serve women living in surrounding parishes because many women found housing more available in suburban areas.

The purpose of this study was to compare differences in hurricane experience, recovery, mental health, and birth outcomes in pregnant women who accessed prenatal care plus the New Orleans Healthy Start program from those women who only used the traditional prenatal care (PNC) system during two years of long-term disaster recovery (2010-2012) from Hurricane Katrina. The study seeks to describe a vulnerable population of childbearing women who lived through long-term recovery from disaster and sought assistance from a safety net provider during pregnancy. The findings can inform governmental and community organizations in how to improve disaster response for the most vulnerable populations.

Methods

Study participants were recruited using convenience sampling from prenatal clinics, Healthy Start, and hospital-based prenatal classes in the greater New Orleans area for a study of hurricane recovery, prenatal care models, birth outcomes, and mental health. Of the 402 women who participated, 120 added Healthy Start services to routine prenatal care and 282 used only traditional PNC.

Outcomes

Prenatal Care

Aspects and quality of prenatal care were adapted from the Pregnancy Risk Assessment Monitoring System (PRAMS) questionnaire, including access and barriers to PNC, content of PNC, and satisfaction with PNC, using questions adapted from the PRAMS questionnaire [24]. This form also included questions to assess social support during the pregnancy.

Hurricane Experience

The hurricane experience score was based on answers to 11 questions, including whether participants ever felt their life was in danger during the storm, if they or a family member became ill or injured as a result of the storm, if they walked through floodwaters, whether their house flooded, severity of damage to their home and possessions, if anyone close to them died, or if they witnessed anyone die. The scale was based on a previous study of Hurricane Andrew by Norris, et al [25] and was associated with poorer mental health and birth outcomes in previous studies [26, 27] . A summary measure was created, categorizing the subjects who had experienced 3 or more events as “high hurricane exposure”, and <3 as “low hurricane exposure”.

Recovery Expectations

Each woman was also asked to rate her perception of life in her city and expectations for the future. The majority of the questions were taken from the Kaiser Foundation Survey “Giving Voice to the People of New Orleans” [28]. Questions included personal recovery from Katrina (somewhat/very disrupted vs. largely or completely back to normal); satisfaction with life in one's parish (very/somewhat dissatisfied vs. somewhat or very satisfied); optimism about future of the New Orleans area (pessimistic/optimistic); whether recovery in the community was going in the right direction (wrong direction/right direction). Women were also asked about progress in a series of areas (crime, health care, services, rebuilding neighborhoods, schools, streets, and levees); these scores were summed and categorized to three-level variables for perception of progress in recovery.

Depression

Depression was measured using the Edinburgh Postnatal Depression Index (EDSI), developed for the assessment of postpartum depression [29], but validated in pregnancy as well [30]. The EDSI has 10 items; each item is scored on a four-point scale (from 0 to 3), with a maximum score of 30. A cutoff value of 12 has been recommended to indicate significant postpartum depression, [31] and 8 for at risk of depression. A questionnaire error caused one question to be omitted and one to be repeated for 89 women. For these women, the mean value based on the scores of the other EDSI items was imputed for that item.

Post-traumatic stress disorder

PTSD was measured using the PTSD checklist (PCL), a commonly used, 17-item inventory of PTSD-like symptoms, with response alternatives ranging from 1 (not at all) to 5

(extremely). PTSD was defined as scoring above 50, a cut-off that has performed well against clinical PTSD diagnosis [32].

Pregnancy-specific anxiety

Pregnancy-specific anxiety was measured using the Revised Prenatal Distress Questionnaire. This instrument is a series of questions specific to time during pregnancy that asks about concerns related to health of mother and baby, symptoms of the pregnancy, medical care, and financial issues with the pregnancy. In a diverse sample of pregnant women, responses directly predicted preterm birth and indirectly predicted low birthweight [33].

Perceived stress

The Cohen Perceived Stress Scale was designed to measure “the degree to which situations in one’s life are appraised as stressful” and was used to measure stress [34]. Reliability for the 14-item scale version used was high (0.84) and concurrent validity was adequate, with scores correlating highly with trait anxiety (r = 0.65), and moderately with depression (r =0.46) and psychological disturbance (r = 0.51) [35].

Medical records could be located for 306 (76%) participants. Seven women had twin or triplet pregnancies, and complete data was available for 289 women on prenatal care model, at least one outcome (mental health, behavior, and pregnancy complications), and covariates (defined below). Low birthweight was defined as birthweight <2500 g. Preterm birth was defined as birth <37 weeks’ gestation. Small-for-gestational-age was defined as birthweight <10th percentile for gestational age by sex. Gestational diabetes mellitus and severe anemia during delivery were listed in the medical records among complications. Pre-eclampsia and pregnancy-induced hypertension were combined to create a single hypertensive disorders of pregnancy outcome. Mode of delivery was assessed as Caesarean section or not, and admission to the NICU was also examined. Birthweight, gestational age, length, and head circumference were also examined as continuous outcomes.

Covariates

Covariates were chosen a priori, as risk factors for the outcome that were also likely to be associated with the exposure. The covariates were based on the women's self-report: partnership status (modeled as married or living with partner/not), education (ordinal, as listed in Table 1) , race (Black/non-Black), smoking (yes/no), income (ordinal, as listed in Table 1), current employment (yes/no), and age at the interview (continuous). Pre-pregnancy BMI and weight gain were taken from the medical records.

Analysis

Frequency distributions and descriptive statistics were examined on all variables to check for small cells and outliers. Bivariate analysis used chi-square and t-tests to examine differences between the subjects in the Healthy Start and traditional prenatal care models. Linear (for continuous outcomes) and logistic (for dichotomous outcomes) models were used to examine relationships with adjustment. Models for mental health and health

behaviors also included adjustment for BMI, while for birth outcomes and pregnancy complications included weight gain during pregnancy as a covariate. To determine whether Healthy Start enrollment mitigated the effects of the hurricane, we examined the model with both Healthy Start and hurricane experience, and the product of the two, included. A more stringent alpha was set at 0.01 to account for multiple comparisons for the interaction analysis. Multiple imputation was used to impute values for missing confounders; most frequently missing were income, BMI, and weight gain.

The study was approved by the Institutional Review Boards of LSUHSC-NO, Loyola, Tulane, and all participants provided written informed consent.

Results

The Healthy Start population was younger, lower-income, more likely to be African-American, less likely to be Latina, and less likely to be employed than the comparison group (table 1). Traditional PNC subjects reported starting PNC earlier (first trimester) than the subjects attending Healthy Start. The reported satisfaction of PNC did not differ between the two groups. However, Healthy Start subjects did indicate significantly more prenatal self-care teaching by a health care provider than did the Traditional PNC only subjects in regards to (1) smoking and use of illegal drugs or alcohol (2) benefits of breastfeeding, proper seat belt use, contraceptive options after birth, and report of domestic abuse (table 2).

The Healthy Start subjects reported significantly more negative hurricane experience occurrences. More of them reported they feared for their life (45%), walked through floodwaters (33.3%), had much to enormous house damage (68.3%), and had house flooding (61.5%; all $p<0.01$), than did the women who only used traditional PNC (table 3). Healthy Start subjects were also more likely to say that their lives were still disrupted, that they were not satisfied with life in their parish, that they were pessimistic about the future of the New Orleans area, and that race relations had worsened since the storm. The subjects had mixed views concerning the city's progress since the storm, but overall, Healthy Start women reported less perceived progress in addressing the city's problems. Healthy Start subjects were more likely to be worried about their future income, but not about future hurricanes, pollutants, or the levees being built to strength (table 3).

The subjects who participated in Healthy Start had significantly more depression (40%) and PTSD (15%) as compared to the subjects who only participated in traditional PNC (27% and 6%, respectively, $p<0.01$; table 4). After adjustment, adjusted odds ratio (aOR) for likely depression fell to 1.46 (1.86-2.48), while the aOR for PTSD was 2.13 (0.96-4.71). However, the subjects using Healthy Start also had significantly more participation in support groups (26%) and counseling for depression (18%), as compared to women in traditional PNC only (table 4.). No difference was noted between the two groups in prescription medication intake. For other mental health measures, mean pregnancy-related anxiety score was higher in the Healthy Start group (adjusted difference 1.44, $p=0.05$), and perceived stress was also higher in this group, though non- significant (adjusted difference 1.28, $p=0.15$). No difference was determined in the dichotomized measures of these scales.

The two groups of women did not differ significantly in relation to lifestyle issues (smoking, drug use, taking prenatal vitamins, or eating > 3 servings of vegetables/fruits; table 5). Too few women reported drinking alcohol to analyze. Birth outcomes and pregnancy complications did not differ between women who used Healthy Start and those women who did not, with the exception of severe anemia, which was less common in women who used Healthy Start (aOR 0.28, 0.11-0.70) (table 6). Healthy Start subjects also had more tendency for preterm birth (aOR 2.87, 0.96-8.62). No interactions were determined between models of PNC and hurricane experience for predicting mental health, drug use, fruit and vegetable consumption, or vitamin use (data not shown). Walking in floodwaters was more strongly associated with smoking among the women who were in the traditional PNC only group than Healthy Start (p for interaction < 0.01).

Discussion

The purpose of this study was to describe and compare differences in prenatal women who accessed the Healthy Start New Orleans program during prenatal care from those women who only used the traditional prenatal care system (public and community clinics). This study indicated that the youngest, poorest, women with the worst Hurricane Katrina experience were more likely to be recipients of support from the Healthy Start program. The fact that women with significant social risk factors were recruited and received services indicated that the community outreach mission was successful in recruiting women who clearly needed additional social support services.

Both groups of women had higher depression rates (Healthy Start 40% and Traditional 29.9%) than the general prenatal population (10-15%), although Healthy Start participants were higher than women not in the program [36]. Rates of depression in the Healthy Start population was higher than commonly seen in similar studies with low income minority women [37]. PTSD rates, although closer to the general population rates (5-10%) were significantly higher in Healthy Start (15%) participants than in traditional care only participants (6.1%). Previous PTSD studies with pregnant women have found that traumatic experiences prior to pregnancy, anxiety, and cumulative socio-demographic factors are associated with higher PTSD [16, 36]. The significant increase in depression rates and PTSD rates seen in Healthy Start participants as compared to women in Traditional PNC is most likely a reflection of the demographics (less income, younger, higher percentage African American, less likely to live with a partner) and exposure to prior trauma. The Healthy Start women had significant indicators of trauma history associated with their hurricane experience, as more of them walked through flood water, feared for their lives, and had more damage to their homes than did the Traditional PNC group. The results of this study affirm the need for prenatal assessment for depression and PTSD in post-disaster women and a clear path for referral to mental health care, when indicated.

Ninety percent of women who were in Healthy Start Program reported using case management services (data not shown). The case management system of care supported women's restoration by providing referrals and guidance through stressful issues of housing, income, and education. Although challenging to measure direct benefits, case management strategies have shown success in improving maternal and infant health outcomes for socially

vulnerable women [38]. The intangible benefits of emotional support, coaching and encouragement by a personal provider may be especially helpful in post-disaster recovery [39]. Relationship building with other women in support groups and prenatal classes at Healthy Start were also a potential source of social support. Such interventions that mobilize social support are primary to offset what Kaniasty and Norris refer to as social support deterioration that occurs in long term disaster recovery communities [40]. Using their Social Support Deterioration Deterrence Model, Kanisty and Norris hypothesized that received social support positively affects perceived support and buffers emotional distress. Post-disaster studies have confirmed the hypothesis that bolstering perceived social support is protective of negative psychological outcomes [41, 42].

Healthy Start participation did not reduce the risk of important birth outcomes such as low birthweight below that of women in the Traditional model of PNC, and in fact the risk of PTB was higher in the Healthy Start group, although PTB risk did not reach statistical significance. However, given the high level of demographic and social risk, not to mention disaster exposure, in the Healthy Start group, the similarity in birth outcomes between the two groups can be seen as a positive indicator. Limitations of the study include the cross-sectional design that prevented measuring outcomes over the course of the pregnancy and disaster recovery. We could not determine changes in mental health status after continued exposure to Healthy Start interventions. Also, women not enrolled in prenatal care nor the Healthy Start Program were not studied.

Explaining differences and similarities among populations living in a disaster recovery is best understood through the vulnerability and resilience paradigm of disaster recovery. The ability to recover and become restored after a disaster differs within and between social groups (defined by gender, age, race/ethnicity) based on economic, cultural and social capital [43]. The pregnant women using Healthy Start represented a sub-population in need of resilience building to overcome social risks and cope with mental health problems. This study underscores the need for all community and governmental programs that care for vulnerable families on an everyday basis, to take a proactive effort aimed at prevention and reduction of risks before disasters and to respond and build resilience during post-disaster recovery. For example, flood mitigation programs must make the effort to assist low income families living in natural disaster prone areas to protect themselves and be better prepared for future events, including finding housing outside flood prone areas and planning resources for evacuation if indicated [44, 45]. Policies that build sustained resilience to disaster also call for more widespread social programs that empower women and promote resilience through life course decisions in areas such as in family planning and education. Likewise community stakeholders in disaster preparedness are called to be mindful of the social, medical, nutritional, and mental health needs of childbearing women and families with children when planning immediate and long term disaster responses [46-48].

All safety net organizations must be prepared for the unexpected. Disaster planning is an important responsibility for all health care organizations, but especially for those agencies who will have a role in caring for the most vulnerable following disaster [49]. Healthy Start New Orleans was able to adapt to the challenges of a post-disaster community and continued services in the worst of circumstances.

Acknowledgment

The study was funded by the National Institutes of Health, National Institute of Nursing Research (Models of Prenatal Care and Perinatal Health Indicators in Disaster Recovery Area 5R03NR012052-02).

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Table 1

Participants in a study of prenatal care in a disaster recovery environment, N=402.

	Healthy Start		Traditional PNC only		
	N	%	N	%	p
Age					<0.01
<20	19	15.7	17	6.1	
20-24	53	44.5	80	28.5	
25-29	28	23.5	81	28.8	
>30	19	16.0	103	36.7	
Language of interview					<0.01
Spanish	5	4.4	52	18.8	
English	110	95.7	224	81.2	
Race					<0.01
African-American	94	79.7	133	47.3	
Other	24	20.3	148	52.7	
Latina					<0.01
Yes	5	4.2	62	22.0	
No	115	95.8	220	78.0	
Currently employed					<0.01
Yes	26	21.9	124	44.1	
No	93	78.2	157	55.9	
Relationship status					<0.01
Married	13	11.2	99	35.4	
Living with partner	31	26.7	85	30.4	
Single	72	62.1	96	34.3	
Family income					<0.01
<$15K	74	67.9	121	45.5	
$15-29K	21	19.3	55	20.7	
$30K+	14	12.8	90	33.8	
Education					<0.01
Less than High School	33	27.7	56	20.1	
High School	42	35.3	70	25.1	
Greater than High School	44	37.0	153	54.8	
Smoking					0.93
Yes	11	9.3	27	9.6	
No	107	90.7	254	90.4	
Parity					<0.01
1	52	44.1	136	49.3	
2	37	31.4	45	16.3	
3+	29	24.6	95	34.4	

PNC, prenatal care

Table 2

Prenatal care services and characterize, Healthy Start + prenatal care vs Traditional prenatal care only, New Orleans, 2010-2012

	Healthy Start + PNC		Traditional PNC		P value
Start of prenatal care	N	%	N	%	
1st trimester	85	72.0	238	85.6	<0.01
2nd trimester	24	20.3	35	12.6	
3rd trimester	9	7.6	5	1.8	
Reported problems starting PNC (N, % saying yes)					
Couldn't get appointment	26	21.9	46	16.4	0.20
Money	10	8.4	32	11.4	0.37
Transportation	26	21.9	36	12.9	0.02
Time off	10	8.4	18	6.4	0.48
Not as early start as liked	13	10.9	19	6.8	0.16
No Medicaid card	14	11.9	61	21.9	0.02
No child care	6	5.0	19	6.8	0.51
Too many other things	11	9.2	29	10.4	0.74
Didn't want people to know pregnant	25	21.2	38	13.6	0.06
Learned about in PNC (N,% saying yes)					
Smoking	93	77.5	167	59.9	<0.01
Breastfeeding	97	80.8	188	67.4	<0.01
Alcohol	94	78.3	169	60.6	<0.01
Seat belt	76	63.9	103	36.9	<0.01
Birth control	76	63.3	121	43.4	<0.01
Medications to avoid	109	90.8	232	83.2	0.05
Illegal drugs	98	81.7	155	55.6	<0.01
Screening	104	86.7	219	78.5	0.06
Early labor	90	75.0	184	66.0	0.07
HIV test	102	85.0	207	74.5	0.02
Abuse	72	60.5	110	39.4	<0.01
<9 of above	46	38.3	172	61.7	<0.01
PNC satisfaction (N, % saying yes)					
Time waiting	80	66.7	207	74.5	0.11
Time with doctor	92	76.7	239	86.0	0.02
Advice given	106	88.3	252	90.3	0.55
Understanding of staff	108	90.8	265	95.0	0.11

PNC, prenatal care

Table 3

Experiences of Hurricane Katrina and rebuilding in women receiving Healthy Start and traditional prenatal care

	Healthy Start		Traditional PNC only		P Value
	N	%	N	%	
Hurricane experiences					
Feared for life	54	45.0	77	27.5	<0.01
Injured/ill	15	12.5	28	10.0	0.45
Household member injured	24	20.0	47	16.7	0.43
Walked through floodwater	40	33.3	54	19.3	<0.01
Much or enormous damage to house	82	68.3	140	49.8	<0.01
House flooded	72	61.5	115	41.2	<0.01
Death of close one	19	16.0	26	9.2	0.05
See someone die	29	24.2	39	13.8	0.01
3 or more serious experiences	31	25.8	42	14.9	0.01
Recovery experiences					
Life still very or somewhat disrupted	49	45.4	74	30.5	0.01
Not satisfied with life in parish	48	40.3	56	20.0	<0.01
Optimistic/pessimistic	23	39.7	30	18.0	<0.01
Recovery going in the wrong direction	31	42.5	52	29.4	0.05
Race relations are worse	14	12.7	58	22.0	0.04
Low progress in combating crime	63	56.3	121	48.8	0.19
Low progress in medical care	38	33.6	58	22.1	0.02
Low progress in services	7	6.4	20	7.6	0.67
Low progress in neighborhood	50	45.9	87	33.0	0.02
Low progress in schools	35	30.7	52	20.4	0.03
Low progress in streets	47	41.2	97	36.7	0.41
Low progress in levees	22	24.7	34	15.3	0.05
Overall progress since storm					0.02
Lots	39	33.3	127	45.7	
Medium	56	47.9	123	44.2	
Not much	22	18.8	28	10.1	
Worried about hurricanes	89	77.4	218	79.9	0.59
Worried about income	91	77.8	184	67.7	0.04
Worried about health care	73	64.6	171	63.3	0.81
Worried about pollutants	65	57.5	156	57.4	0.98
Worried about levees	83	76.2	201	74.7	0.77
Worried about place	81	71.7	173	63.6	0.13

Table 4

Models of prenatal care and mental health outcomes

	Healthy Start		Traditional PNC		difference	p-value	adjusted beta*	p-value
	mean	std	mean	std				
depression	10.5	6.7	9.0	5.8	1.5	0.03	0.77	0.25
PTSD	33.5	14.4	28.0	12.0	5.5	<0.01	3.21	0.02
pregnancy-related anxiety	12.7	6.3	10.9	6.2	1.7	0.01	1.44	0.05
perceived stress	18.7	7.5	16.6	7.9	2.1	0.01	1.28	0.15

	N	%	N	%	OR (95% CI)	p-value	aOR (95% CI)	p-value
likely depression (EDS>12)	48	40.3	75	26.6	1.87 (1.19-2.93)	<0.01	1.46 (0.86, 2.48)	0.16
at risk for depression (EDS>8)	69	58.0	143	50.7	1.34 (0.87-2.07)	0.18	1.03 (0.62, 1.70)	0.92
likely PTSD	18	15.0	17	6.1	2.73 (1.35-5.50)	<0.01	2.13 (0.96, 4.71)	0.06
high pregnancy-related anxiety	26	21.7	44	15.6	1.50 (0.87-2.57)	0.14	1.24 (0.68, 2.26)	0.47
high perceived stress	26	21.7	45	16.0	1.46 (0.85-2.50)	0.17	1.16 (0.63, 2.14)	0.64
Took prescription medicine for depression	9.0	7.6	17.0	6.1	1.27 (0.55-2.93)	0.58	1.16 (0.63, 2.14)	0.65
Counseling for depression	18.0	15.1	17.0	6.1	2.76 (1.37-5.56)	<0.01	2.82 (1.27, 6.30)	0.01

PTSD, post-traumatic stress disorder; PNC, prenatal care; EDS, Edinburgh depression scale; OR, odds ratio; CI, confidence interval

*adjusted for age, partnership, race, smoking, income, body mass index, and current employment

Table 5

Models of prenatal care and health behaviors

	Healthy Start		Traditional PNC				
	N	%	N	%	p-value	OR (95% CI)	aOR (95% CI)*
smoking	11	9.3	27	9.6	0.93	0.97 (0.46-2.02)	0.79 (0.35-1.78)
drug use	8	6.8	16	5.7	0.68	1.21 (0.50-2.90)	1.03 (0.36-2.99)
vitamins	99	83.2	240	85.4	0.57	0.85 (0.47-1.52)	1.41 (0.73-2.73)
>3 servings of fruits and vegetables	55	46.2	136	48.8	0.64	0.90 (0.59-1.39)	1.16 (0.72-1.88)

PNC, prenatal care; OR, odds ratio; CI, confidence interval

*adjusted for age, partnership, race, smoking, income, body mass index, and current employment

Table 6

Models of prenatal care and birth outcomes

	Healthy start vs. Traditional	
	OR (95% CI)	**aOR (95% CI)***
Low birthweight	1.80 (0.70, 4.64)	1.23 (0.43, 3.52)
Preterm birth	2.23 (0.87, 5.69)	2.87 (0.96, 8.62)
Small-for-gestational-age	1.96 (0.78, 4.93)	1.27 (0.44, 3.61)
Neonatal intensive care admission	1.69 (0.63, 4.60)	1.55 (0.51, 4.78)
Gestational diabetes	1.03 (0.38, 2.78)	1.95 (0.60, 6.32)
Pregnancy-induced hypertension	1.09 (0.56, 1.27)	0.90 (0.43, 1.92)
anemia	0.56 (0.25, 1.27)	0.28 (0.11, 0.70)
c-section	0.84 (0.50, 1.43)	0.92 (0.52, 1.67)

	beta	**p**	**adjusted beta***	**p**
birthweight	−88.1	0.14	−17.7	0.78
gestational age	−2.19	0.08	−2.29	0.09
birth length	−0.52	0.10	−0.19	0.57
head circumference	−0.32	0.13	−0.03	0.91

* adjusted for age, partnership, race, smoking, income, body mass index, and current employment