

# **Maternal characteristics of women who are screened and referred to the Florida Healthy Start Prenatal Program based on factors other than prenatal screen risk score**

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## **Introduction**

The Florida Healthy Start Prenatal Risk Screen was developed to assess factors that are associated with a pregnant woman's risk for a low birthweight delivery (birthweight < 2500 gm/ 5.5 lbs) or neonatal death (death < the first 28 days of life). In addition to assessing the risk of low birthweight delivery and neonatal death, the Healthy Start prenatal screen provides the basis for referrals into Florida's Healthy Start Program. Entry into the Healthy Start prenatal program can be based on risk score calculations using the Healthy Start Prenatal Risk Screen, by provider referral or by a pregnant woman's self-referral.

Currently, sixteen items on the prenatal screen are used to calculate a risk score<sup>(1)</sup>. These items have an assigned value that is used in the summation of the overall risk score. A woman with a risk score that is equal to or greater than the "at-risk" threshold value of four receives a mandatory referral into the Healthy Start Program as mandated in Section 383.216, Florida Statute. If a pregnant woman's calculated risk score is less than four on the prenatal screen, she may receive a referral into the Healthy Start program through self-referral or through referral of her prenatal care provider<sup>(1)</sup>. All referrals that are not based on a calculated risk score that is equal to or greater than the "at-risk" threshold value of four are called Referrals Based on Other Factors or BOOFs.

The Florida Department of Health conducts periodic analyses of demographics and factors associated with pregnant women who are assessed as "at-risk" for adverse outcomes by the score of the Healthy Start prenatal screening process<sup>(1,2)</sup>. For administrative and programmatic purposes, it is equally important to perform similar analyses on pregnant women that gain entry into Healthy Start through

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BOOF referrals. For most analyses, there is an inherent limitation on the variables that are available for analysis functions. For this analysis, the variables were limited to data collected from the Healthy Start Prenatal Screen, birth certificate, fetal death certificate and infant death certificate. These variables may or may not be the primary or supplemental reasons for BOOF referrals. Therefore, we chose to identify the maternal characteristics and factors from these data sources that may be associated with a BOOF referral to the Healthy Start program and to discuss the implications of these findings in regard to policy development, program planning and implementation.

We hypothesized that BOOF referrals are based on personal or medical assessments that infer the Healthy Start program would be beneficial to the pregnant woman despite having a score below the “at-risk” threshold. We also hypothesized that particular risk factors identified, by self-report or by provider documentation, on the screening instrument may influence the decision to provide a BOOF referral to the Healthy Start program.

### **Methods**

The data source for this BOOF referral analysis is the 2000-2001 birth certificates linked to fetal or infant death certificates and Healthy Start Prenatal Risk Screen. Records from the linked data file that were used in this analysis only included women that had completed a Healthy Start Prenatal Risk screen and had a prenatal screen risk assessment score below the “at-risk” threshold value of four. Of the 153,215 cohort of women that completed a Healthy Start screen in 2001- 2002, 99,936 women had a prenatal risk screen score below the “at-risk” threshold value of four. Records were excluded if the Healthy Start referral status was missing or if more than one referral status was indicated. After these exclusions, 75,356 (49.2%) records remained in the analysis file.

SPSS (Version 13.0) was used to create bivariate dummy variables for all prenatal screen factors (scored and not-scored), pregnancy plurality and BOOF referral status. Variable frequencies were calculated and multivariate logistic regression was performed to compute adjusted odds ratios on the likelihood of receiving a BOOF referral for each analysis variable. Logistic regression was also used to

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calculate the adjusted odds ratios for the likelihood of experiencing a low birthweight delivery, fetal death and infant death.

### **Results**

Table 1 displays the analysis variables, the frequency counts of each variable and the adjusted odds ratios obtained from the multivariate logistic regression. Of the 75,536 women in this analysis, 27,248 (36.2%) received a BOOF referral. The analysis variables with the highest prevalence were *Unmarried marital status* (40.5%), *First pregnancy* (35.1%), and *Medicaid insurance* (31.7%). The analysis variables with the lowest prevalence were *Experiences hunger in the home* (0.7%), *Adoption consideration* (0.9%), *Feels unsafe in home* (1.1%) and *Maternal age > 39 years* (1.2%).

Analysis variables with the highest adjusted odds ratios for the probability of a BOOF referral were *Maternal age < 18 years* (AOR = 2.63), *Maternal illness requiring continuing care* (AOR = 2.37), *Being hit or hurt by someone in the past year* (AOR=1.70), *Experiences hunger in the home* (AOR=1.62) and *Adoption consideration* (AOR=1.54). All of the sixteen Healthy Start Prenatal Screen factors used in the risk score calculation had increased odds of a BOOF referral. Fifteen of these sixteen scored factors had odds ratios that were statistically significant at a p-value < 0.05. *Maternal age > 39* was the only scored risk factor with increased odds that was not at a statistically significant level. Although pregnancy plurality is not on the prenatal screen and was obtained from the birth certificate, it was found to be significantly associated with increased odds of a BOOF referral (OR 1.43). Please refer to Table 1 for the complete list of the frequencies, odds ratios and associated p-values for variables used in this analysis.

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**Table 1: Analysis Variables, Frequencies and Adjusted Odds Ratios with p-values (n=75,356)**

Scored Item	Variables	Frequency ( Percent of N)	Adjusted ORs for BOOFs (Screened Women with Risk Score < 4 )	Adjusted OR P-values
---	BOOF Referral	27, 248 (36.2)	<b>Dependent/ Outcome Variable</b>	--
<b>Yes</b>	Maternal age < 18	1,642 (2.2)	<b>2.63</b>	<b>0.000</b>
<b>Yes</b>	Has an Illness that Requires Continuing Medical Care	3,960 (5.3)	<b>2.37</b>	<b>0.000</b>
<b>No</b>	Hit or Hurt by Someone in Last Year	1,456 (1.9)	<b>1.70</b>	<b>0.000</b>
<b>Yes</b>	Experiences Hunger in Home	490 (0.7)	<b>1.62</b>	<b>0.002</b>
<b>No</b>	Considering Adoption	714 (0.9)	<b>1.54</b>	<b>0.000</b>
<b>Yes</b>	Adverse Outcome Last Pregnancy	8,567 (11.4)	<b>1.53</b>	<b>0.000</b>
<b>Yes</b>	Black Maternal Race	9,981 (13.2)	<b>1.48</b>	<b>0.000</b>
<b>Yes</b>	Not Married	30,501 (40.5)	<b>1.47</b>	<b>0.000</b>
<b>NA – Birth Certificate Item</b>				
	Current Pregnancy Plurality > 1	2,127 (2.8)	<b>1.43</b>	<b>0.000</b>
<b>Yes</b>	Trouble Keeping Appointments	1,807 (2.4)	<b>1.37</b>	<b>0.000</b>
<b>Yes</b>	Feels Unsafe at Home	825 (1.1)	<b>1.34</b>	<b>0.010</b>
<b>Yes</b>	Tobacco Use	12,692 (16.8)	<b>1.28</b>	<b>0.000</b>
<b>No</b>	History of Mental Health Counseling	2,853 (3.8)	<b>1.27</b>	<b>0.000</b>
<b>No</b>	History or Current Depression	7,370 (9.8)	<b>1.27</b>	<b>0.000</b>
<b>Yes</b>	Has Moved More than 3 times in a Year	2,618 (3.5)	<b>1.26</b>	<b>0.000</b>
<b>Yes</b>	Maternal age > 39 years	893 (1.2)	1.22	0.061
<b>No</b>	1st Pregnancy	26,482 (35.1)	<b>1.20</b>	<b>0.000</b>
<b>Yes</b>	Less than High School Education	13,764 (18.3)	<b>1.27</b>	<b>0.000</b>
<b>Yes</b>	Timing of Pregnancy – Not at All	3,343 (4.4)	<b>1.19</b>	<b>0.002</b>
<b>Yes</b>	Maternal Drug or Alcohol use	9,522 (12.6)	<b>1.15</b>	<b>0.001</b>
<b>No</b>	Maternal Partner Unemployed	5,598 (7.4)	<b>1.14</b>	<b>0.000</b>
<b>Yes</b>	Maternal Pre-Pregnancy Weight < 110 lbs.	4,776 (6.3)	<b>1.13</b>	<b>0.020</b>
<b>No</b>	High Stress	9,003 (11.9)	<b>1.12</b>	<b>0.002</b>
<b>Yes</b>	2 <sup>nd</sup> Trimester Prenatal Care Entry	13,517 (17.9)	<b>1.09</b>	<b>0.007</b>
<b>No</b>	Medicaid Insurance	23,851 (31.7)	1.01	0.670
<b>No</b>	No Insurance	14,104 (18.7)	0.97	0.376

\*bolded values are significant at a p-value < 0.05

An indication that the BOOF referral process is based on a formalized risk assessment by the referring prenatal provider and not random referral is exemplified in Table 2, which displays the distribution of “low-risk” prenatal screen scores (scores 0-3) among women by BOOF referral status. The

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women who received a BOOF referral had a greater proportion of “high” low-risk scores than women that did not receive a BOOF referral.

**Table 2 Distribution of Low Prenatal Risk Scores by BOOF Referral Status**

Risk Score	BOOF Referral		Not a BOOF Referral	
	Count	%	Count	%
0	4,202	15.4%	11,865	24.7%
1	5,826	21.4%	13,088	27.2%
2	7,801	28.6%	12,712	26.4%
3	9,419	34.6%	10,443	21.7%
<b>Total</b>	27,248	100.0%	48,108	100.0%

The prevalence of the adverse outcomes of fetal death ( $\geq 20$  gestational weeks), infant death ( $< 1$  year of life), and low birthweight delivery ( $< 2500$  gm) in this analysis cohort of low-risk score women is displayed by BOOF referral status in Table 3. Table 3 also displays the unadjusted odds ratios for a BOOF referral by each of the three adverse outcomes. Low-risk score women who experienced any of the three adverse outcomes (fetal death, infant death, or low birthweight delivery) were found to have a higher association with the receipt of a BOOF referral.

**Table 3 Adverse Outcomes: Frequency of adverse outcome by BOOF Status and Unadjusted Odds Ratios for a BOOF referral**

Adverse Outcome	BOOF Referral		Odds Ratio (Unadj.)	P-value
	Yes	No		
<i>Fetal Death</i>	212	291	1.29	0.005
<i>Infant Death</i>	189	255	1.31	0.005
<i>Low Birthweight</i>	2,075	3,124	1.19	0.000

Table 4 displays the odds ratios for low birthweight, fetal death and infant death among pregnant women in the analysis, who were all screened as low-risk. The odds ratios are adjusted for BOOF referral, Healthy Start Prenatal Screen risk factors and pregnancy plurality. Women that received a BOOF referral were more likely to experience each of the three adverse outcomes, but these increased odds are not statistically significant. The insignificance of the adjusted BOOF variable indicates that factors associated with increased odds of an adverse outcome are being captured by the Healthy Start Screen risk factors and plurality variables. In other words, a BOOF referral was not a marker for, or

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associated with, any “residual” or added risk that was not accounted for by the screen risk factors and plural pregnancy status.

**Table 4 Adverse Outcomes: BOOF Status and Risk Adjusted Odds Ratios for Adverse Birth Outcomes BOOF referral**

Variables	AORs for Adverse Outcomes (* indicates AOR that is statistically significant at a p-value <0.05)		
	Low Birthweight AORs	Infant Death AORs	Fetal Death AORs
BOOF Referral	1.04	1.12	1.29
1st Pregnancy	<b>1.40*</b>	1.07	1.31
2 <sup>nd</sup> Trimester Prenatal Care Entry	1.88	0.95	1.00
Adverse Outcome Last Pregnancy	<b>1.90*</b>	1.43	<b>2.06*</b>
Black Maternal Race	1.94*	<b>2.33*</b>	1.15
Considering Adoption	1.42	<b>3.76*</b>	0.70
Current Pregnancy Plurality > 1	<b>22.59*</b>	<b>6.22*</b>	<b>4.72*</b>
Experiences Hunger in Home	0.50	0.00	0.00
Feels Unsafe at Home	0.83	1.60	1.75
Has an Illness that Requires Continuing Medical Care	<b>1.58*</b>	<b>1.76*</b>	0.84
Has Moved More than 3 times in a Year	0.89	0.65	0.83
High Stress	1.14	1.25	0.96
History of Mental Health Counseling	1.15	0.77	0.48
History or Current Depression	1.00	0.76	1.04
Hit or Hurt by Someone in Last Year	0.82	0.54	1.09
Less than High School Education	0.98	0.90	<b>1.46*</b>
Maternal age < 18	0.85	0.80	0.42
Maternal age > 39 years	1.33	1.03	1.92
Maternal Drug or Alcohol use	0.89	0.94	0.76
Maternal Partner Unemployed	1.13	1.12	0.80
Maternal Pre-Pregnancy Weight < 110 lbs.	<b>1.88*</b>	1.21	0.64
Medicaid Insurance	1.10	1.14	1.02
No Insurance	0.95	1.25	1.22
Not Married	1.05	1.08	1.27
Timing of Pregnancy – Not at All	0.90	0.49	0.69
Tobacco Use	<b>1.35*</b>	1.35	0.96
Trouble Keeping Appointments	0.79	0.65	<b>2.53*</b>

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### **Conclusions**

The two hypotheses stated earlier in this narrative were: (1) a BOOF referral is based on personal or medical assessment that a pregnant woman would benefit from participation in the Healthy Start program despite a low prenatal screen risk score and (2) certain factors identified through the prenatal risk screening process may have a varying influence on decisions to provide BOOF referrals to the Healthy Start program. The results of this analysis show the following:

1. Most factors on the prenatal screen instrument were found to have significantly higher associations with BOOF referrals with the exception of the variables *No insurance, Medicaid insurance and Maternal age > 39 Years*.
2. Pregnant women who were screened and experienced an adverse outcome of fetal death, infant death or low birthweight delivery did have a higher association with receiving a BOOF referral.
3. Conversely, women who did receive a BOOF referral had an increased likelihood of a low birthweight delivery, fetal death or infant death. This was statistically significant without adjusting for other risk factors, but the associations between the adverse outcomes and BOOF referrals became insignificant after adjusting for pregnancy plurality and other Healthy Start risk factors. In summary, after adjustment there was no increased risk.

Healthy Start program participation may be beneficial to pregnant women by improving the pregnancy and/or birth outcomes of pregnant women. This benefit may occur through care coordination that is based on the review and assessment of the factors identified in Healthy Start's prenatal risk screening process and the subsequent provision of risk-based medical and psychosocial services. The results of the prenatal screening process can lead to an automatic referral into Healthy Start for high-risk score women or a BOOF referral for low-risk score women. Moreover, women are assessed, receive low-risk standardized score and are referred based on other factors may become part of the case loads in the Healthy Start program. BOOF referrals produce additional demands on programmatic resources and expenditures, but additions to coalition caseloads can also lead to increases in reimbursement.

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One limitation of this analysis is the variables used were restricted to the fields in the data source, which was comprised of Healthy Start Prenatal Risk Screen, birth certificate, fetal death certificate and death certificate. As stated earlier, these variables may not entirely represent the reasons for a BOOF referral and can only be examined for associations with a BOOF referral. Another limitation is most of the analysis variables are self-reported and may be subject to misclassification or recall bias. Of the 153,215 women of the Healthy Start Prenatal Screen cohort, 50.8% of the records had missing or multiple Healthy Start referral statuses and could not be included in this analysis. This may have introduced selection bias into the analysis, although there does not appear to be a systematic pattern with these omitted records. The omission of records and the consequential reduction of the sample size may have reduced the precision of the calculated odds ratios. The use of additional years of Healthy Start screening cohorts may have increased our sample size, which may have resulted in the increased power of our statistical analysis. The lack of risk among BOOF women after adjustment for multiple births and Healthy Start screening may, in part, be due to the benefits of receiving Healthy Start services.

### **Recommendations**

Of Florida resident women who completed a Healthy Start Prenatal Screen and had a live birth or fetal death during 2000-2001, the referred proportion that had a risk score less than four and received a BOOF referral into the Healthy Start program was 23.9%. The proportion of women that received a referral based on a “high-risk” score was 29.5%. We recommend continued efforts to identify characteristics and to quantify risk of an adverse outcome associated with pregnant women by method of referral into the Healthy Start Program. In addition, we recommend continued evaluation of program entry based on standardized risk assessment score compared to program entry that is not based on the standardized risk assessment score. Finally, we recommend that supplemental qualitative analysis be conducted to further explore decision processes for BOOF referrals. Data collection from focus groups, interviews or surveys of prenatal providers and clients may assist in identifying additional factors associated with BOOF referrals.



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