

Disparities in Timing of Gestational Diabetes Screening in Hispanic and Caucasian, non-Hispanic Women

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A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Public Health

University of Washington

2012

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Program Authorized to Offer Degree:

School of Public Health – Health Services

## Abstract

### Disparities in Timing of Gestational Diabetes Screening in Hispanic and Caucasian, non-Hispanic Women

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**Introduction:** Gestational Diabetes Mellitus (GDM) is a common condition of pregnancy affecting 7% of pregnant women. The prevalence of GDM is higher in certain ethnic groups, such as Hispanics and overall prevalence is rising. GDM has implications for the health of both mother and baby. Screening for GDM leads to identification of the condition early enough in pregnancy to prevent potential complications. Prenatal care health disparities are known to exist in previous research studies comparing Hispanic women to Caucasian, non-Hispanic women. An example is in the initiation of prenatal care. Hispanic women tend to initiate prenatal care later in pregnancy than Caucasian women.

**Purpose:** Our primary objective was to determine if Hispanic women were screened for GDM later in pregnancy than a comparable Caucasian group. Our secondary objectives were to determine if disparities existed in the initiation of prenatal care and in the acquisition of six recommended procedures during the first two prenatal visits.

**Methods:** This study utilized a retrospective cohort design based on data extracted from medical records of women delivering at Good Samaritan Regional Medical Center between January 1, 2007 and June 30, 2011. Criteria for inclusion included complete medical record

available, insured by Medicaid services, and identification as either Caucasian or Hispanic. Exclusion criteria included having an incomplete medical record, transferring into prenatal care later, and being privately insured.

Variables were extracted from the medical records related to the gestational age at which they obtained GDM screening and initiated prenatal care. The acquisition of the six recommended procedures during the first two visits were also recorded for each subject. Variables related to GDM risk were also recorded such as pre-pregnancy BMI and weight gain during pregnancy.

In order to describe the groups, they were compared on a number of variables such as age, weight gain during pregnancy, pre-pregnancy BMI, and birthweights of their babies. For the primary research objectives, independent samples t-test was used to determine if there were disparities in gestational age of GDM screening, initiation of prenatal care and in the six recommended procedures. For variables related to GDM risk (pre-pregnancy BMI and weight gain during pregnancy), independent samples t-test were also used to determine differences between the two groups. Binary logistic regression was used to determine if there was a difference in the prevalence positive GDM screen between the two groups.

**Results:** There was no statistically significant difference in the gestational age at which GDM screening was done between the two groups. There was no statistically significant difference in the timing of initiation of prenatal care or the acquisition of six recommended procedures. The rates of positive GDM screens were similar between the two groups after controlling for age. The groups were similar in pre-pregnancy BMI and pregnancy weight gain. The Hispanic women were statistically significantly older than the Caucasian group by 1.8 years.

**Conclusions:** In this study, representing Caucasian and Hispanic women in Corvallis, Oregon, no disparities were seen in gestational age at which GDM screening occurred, in the initiation of prenatal care, or in the acquisition of six recommended procedures. Further study is needed in other measures of prenatal care such as dietary counseling, smoking cessation, labor support, and newborn outcome. Local factors related to collaboration between obstetric care and health department services could have contributed to the lack of disparities seen.

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## **Introduction**

Gestational Diabetes Mellitus (GDM) is a common disorder of pregnancy that can impact the health of both mother and baby. It is defined as an intolerance to carbohydrate that begins during pregnancy (Hedderson, Darbinian, & Ferrara, 2010). This condition occurs in 7% of all pregnancies and prevalence rates are on the rise (The American College of Obstetricians and Gynecologists, 2011). Prevalence rates are increasing in all ethnic groups. However, there is an increased risk and prevalence of GDM in Hispanic and Asian women (Hedderson, Darbinian, & Ferrara, 2010). In addition to ethnicity, other factors associated with increased risk for GDM are advanced maternal age, abnormally high body mass index (BMI) prior to pregnancy, and family history of diabetes. (The American College of Obstetricians and Gynecologists, 2011). GDM has both short term and long-term consequences for mothers and their newborns.

Pregnancies complicated by GDM are at increased risk for both obstetrical and medical problems such as hypertension and pre-eclampsia, cesarean section, obstetrical trauma, and increased risk of developing type II diabetes later for both mother and baby (The American College of Obstetricians and Gynecologists, 2011).

GDM increases the rate of morbidity and mortality in the newborn. The most common consequence of GDM in newborns is macrosomia, which contributes to obstetrical trauma and shoulder dystocia. Other immediate consequences to the newborn include hyperbilirubinemia, hypoglycemia, and respiratory distress syndrome (The American College of Obstetricians and Gynecologists, 2011). Long term fetal and neonatal complications include major congenital malformations, central nervous system anomalies, birth asphyxia, and cardiovascular anomalies. Being an infant of a diabetic mother has been implicated in being

a risk factor for type 2 diabetes or impaired glucose tolerance as the offspring ages (Sobngwi, et al., 2003) (Hunt & Schuller, 2007).

Pre-pregnancy BMI and gestational weight gain have been implicated in the risk of developing gestational diabetes. Studies have shown increased risk of GDM with increasing pre-pregnancy BMI while gestational weight gain is not necessarily a consistent risk factor (Heude, et al., 2011).

Prenatal screening and treatment of GDM decreases these risks to the mother and newborn (Langer, Voge, Most, & Xenakis, 2005). Diagnosis of GDM may be important not only for the pregnancy and newborn period, but also in managing the ongoing health of the mother during the postpartum, interconception, and postreproductive periods, as well as the health of the newborn and its postneonatal development. Given the alarmingly high and increasing rate of childhood obesity, it is becoming increasingly important to assess risk factors associated with obesity in utero environment and targeting prenatal care to ensure that all pregnant women receive appropriate and timely screening, which can then lead to appropriate treatment and management to prevent complications in both mother and baby.

GDM screening is one of the many components of prenatal care. Prenatal care statistics that are nationally monitored include timing of initiation of prenatal care, duration of prenatal care, and quality of prenatal care. Because only a small percentage of women are at low risk for diabetes, The American College of Obstetrics and Gynecology (ACOG) recommends screening all women during pregnancy. Local obstetricians use ACOG guidelines. Screening should take place between 24 to 28 weeks gestation for all women. The initial screening test consists of a 50-g, 1-hour glucose challenge that may be administered regardless of time of last meal. The standard threshold is 140 mg/dl. If the 1-

hour test is abnormal, a 3-hour glucose challenge test is administered. This one is done after an overnight fast. Levels of glucose are obtained fasting and 1, 2, and 3 hours after a 100-g dose of glucose is ingested. A diagnosis requires that 2 or more thresholds are met or exceeded (The American College of Obstetricians and Gynecologists, 2011). If a diagnosis is made, treatment may include diet modification, exercise, or prescription medications.

Prenatal health care disparities exist among Hispanics using measurements of maternal and child health indicators such as recommended services for diabetes (Type II), initiation of prenatal care in the first trimester, and access to health insurance (Mead, Carwright-Smith, Jones, Ramos, Woods, & Siegel, 2008). Racial and ethnic disparities exist in the use of prenatal care services such as acquisition of ultrasound and standard prenatal laboratory tests even when individuals are given access to health care (Gavin, Adams, Hartmann, Benedict, & Chireau, 2004). Hispanics are almost twice as likely to receive inadequate prenatal care in terms of utilization than non-Hispanic Whites (Frisbie, Echevarria, & Hummer, 2001). Similar to national studies, smaller scale studies of health status indicators such as access to first trimester indicators, have validated the same results at the local level in Oregon (Duckart & Johnson, 2004). When pregnant women are asked if they received routine prenatal screening, such as Group B strep testing, disparities are noted demonstrating that Hispanic women are more likely to report not being tested for group B strep (Center for Disease Control, 2005). When evaluating other screening guidelines such as HIV testing, Hispanics are much more likely to be tested for HIV if receiving prenatal care in a public practice than if receiving care in a private practice setting indicating that social biases or cultural barriers may be interfering with implementation of a standard prenatal guideline (Pearlman, Averbach, Zierler, & Cranston, 2005). Disparities in prenatal care have

also been demonstrated among groups of women of undocumented status (Korinek & Smith, 2011). It is likely that multiple factors account for disparities in pregnancy including access and timing of prenatal care, cultural sensitivity of providers, and use of appropriate and optimal standards of care. No other studies have determined if there are disparities in the timing of GDM screening.

Given that Hispanic women have a higher prevalence of gestational diabetes and that disparities exist in the compliance of other forms of prenatal care, it is important to evaluate if and how screening guidelines are being implemented with respect to gestational diabetes in the Hispanic population in this community in order to determine if this component of care is susceptible to intervention.

The study was conducted in a small, University town in Corvallis , Oregon where the percentage of Hispanics is thought to be underestimated and is growing faster than other groups in the area. Most Hispanic women delivering here in Corvallis, Oregon lack health insurance and are typically eligible for Citizen Alien Waived Emergent Medical (CAWEM). This program provides emergency (labor & delivery) coverage to women who are uninsured and not eligible for Oregon Health Plan (Medicaid). This includes Hispanic women that may be undocumented. CAWEM provides coverage for any emergency occurring throughout the pregnancy and for the delivery. Until recently, this program covered only emergency medical but not including diagnostic services and ongoing medical treatment such as prenatal and postnatal care. Local obstetric practices and Samaritan Health Services have provided women in this group with prenatal visits. One ultrasound and basic prenatal labs, including GDM screening, were also provided at no cost.

The Benton County Health Department (BCHD), Benton Community Health Center (BCHC), and local obstetric practices work very closely with Hispanic pregnant women in Benton County to ensure that they receive adequate care. BCHD and BCHC do not have data available that demonstrates the adequacy, timing, or effectiveness of prenatal care delivered to these women. Although current Medicaid and CAWEM covers needed services, there may be some gaps in coverage, which can provide target areas for public health intervention.

The research was conducted to determine if prenatal health care disparities exist in the variables recorded. The primary aim researched in this study is the timing of GDM screening when comparing a group of Caucasian and Hispanic women in a community in Oregon. Secondary aims included determining if there were disparities in the initiation of prenatal care and in the acquisition of 6 required procedures in the first two prenatal visits. We also recorded data that are relevant to risk factors for GDM such as pre-pregnancy BMI and weight gain during pregnancy.

We hypothesized that there would be disparities in both the primary and secondary aims. These disparities would indicate that Hispanic women were screened later for GDM, initiated prenatal care later, and did not get as many as the required procedures as the comparable Caucasian group.

## **Methods**

### *Design*

This study is a retrospective cohort study comparing Hispanic and Caucasian, non-Hispanic pregnant women. The outcome measure being compared is the timing of their gestational diabetes screening based on an evaluation of their hospital medical record, which includes laboratory evaluations done and outpatient prenatal care obtained. Both groups represent a sample population of women from one community hospital. Good Samaritan Regional Medical Center is the regional medical center for the area.

### *Study Population:*

Charts were reviewed using the following inclusion and exclusion criteria.

1. Inclusion Criteria
  - a. Women delivering infants at Good Samaritan Regional Medical Center (GSRMC) between January 1, 2007 and June 30, 2011. This time period was chosen because charts from this time period were available for review. Standards of care for GDM screening remained consistent during this time period.
  - b. Hispanic or Caucasian, non-Hispanic only. The population of interest is Hispanic women delivering in Corvallis, Oregon. Hispanics are the largest minority group in the area. Hispanics were chosen because of higher rates of GDM and prenatal health care disparities. In addition, including other ethnic groups that are much smaller in number in this community would have included groups with small sample sizes and inadequate statistical power.
  - c. Availability of a complete medical record that includes all key variables necessary for the study.

- d. Singleton pregnancy. Multiple gestation pregnancies are at higher risk for gestational diabetes and other conditions of pregnancy. Because of multiple gestation, it is likely that they receive more frequent prenatal visits and undergo all the recommended screening tests during pregnancy without delay. Multiple gestation pregnancies and prenatal care cannot be generalized to a larger population.
2. Exclusion Criteria- Among the subjects who met the inclusion criteria, those meeting the following exclusion criteria were excluded from the study.
    - a. Women with type 1 diabetes. Glucose monitoring for these women is ongoing and they do not undergo the usual screening procedures. They also have a different set of risk factors based on their underlying condition.
    - b. Women who attempted home birth but delivered in the hospital. These women tend to obtain prenatal care from outside providers and medical records may not be readily available. This population may also frequently choose not to undergo standard screenings, which could skew results. They comprise a small percentage of the general population of women delivering at GSRMC.
    - c. Women with private insurance. The vast majority of Hispanic women delivering at GSRMC obtain public assistance for their prenatal care, either Oregon Health Plan (Medicaid) or CAWEM (Citizen Alien Waived Emergent Medical), which provides coverage for emergencies only, including labor and delivery. If there is a larger percentage of privately insured in the Caucasian group, this could skew the data in the direction of increasing disparities. Many studies have shown that individuals with public insurance are at risk for health disparities.

- d. Women who moved into the area and transferred their care from another facility after 28 weeks. Complete medical records are frequently not available on these patients. If so, it would be a different record than the one used locally and screening practices could differ depending on the care received at a previous facility, the type of state coverage they came from, or on circumstances surrounding the subject's move.

### *Sampling Method*

A list of all women who delivered during the defined time period was submitted to the medical records department at Good Samaritan Regional Medical Center. Because of the relatively lower percentages of Hispanics compared to Caucasians, all of the medical records from Hispanic women needed to be reviewed and screened for eligibility. For the Caucasian subjects, the charts were pulled in chronological order based on a list that was generated by billing specialists until we obtained the number of needed charts that met the criteria.

### *Representativeness of Study Sample*

GSRMC is the only hospital where women deliver in the immediate area (Corvallis, Oregon). In Corvallis, the population is comprised of 83.8% Caucasian and 7.4% Hispanic. Asian, Native American, and Blacks comprise a very small percentage of the county and city. The percentage of Hispanics is thought to be underestimated and is growing faster than other groups in the area. Most Hispanic women delivering here lack health insurance and are typically eligible for CAWEM.

### *Data Collection Methods:*

## 1. Data Collection

IRB approval was obtained from University of Washington IRB as well as the Samaritan Health Services IRB. There was one primary investigator who collected all the data from hospital medical records. Data were collected without recording patient identifiers. The following data were recorded:

Estimated date of confinement

Date of delivery

Gravida

Parity

Date of 1<sup>st</sup> prenatal visit

Delivery date/gestational age

Pre-pregnancy weight, as reported in medical record

Mother's weight at time of delivery

Mother's height from prenatal visits

Date of GDM screening

The coder recorded which of the following variables were reviewed during the first or second prenatal visits:

blood pressure

blood test

weight & height

urine test

pelvic exam

pregnancy history

Since height and weight are actually 2 variables, the number of recommended procedures was quantified as 7 (instead of 6) in the data analysis. Hence, the standard of care would be that women receive all 7 procedures during the first 2 prenatal visits.

## Results

### *Descriptive statistics*

There were 90 women in the Caucasian group and 89 in the Hispanic group. All women in the Caucasian group were covered under Oregon Health Plan or Medicaid. Of the Hispanic women, 82 were covered under CAWEM and 7 (8%) were covered under OHP or Medicaid. The Hispanic sample was significantly older than the Caucasian sample (Independent Samples t-test:  $t=2.3$ ;  $p=.03$ ). See Table 1. The mean age for the Hispanic group was 1.8 years older than the Caucasian group.

Hispanics had a statistically greater likelihood of a positive GDM result ( $r=0.14$ ;  $p=0.04$ ;  $N=177$ ); however, when Age and Parity were controlled for, Binary Logistic Regression showed Hispanics and Caucasians had no significant difference in GDM results, (Nagelkerke  $R^2=0.07$ ;  $N=174$ ;  $-2\text{LogLikelihood}=146$ ;  $p=0.06$ ).

The average birthweight of Hispanic and Caucasian infants was identical, controlling for age ( $R^2=0.02$ ;  $N=178$ ;  $p=0.15$ ). Age, but not ethnicity, predicted weight gain during pregnancy. Older mothers gained less weight compared to younger mothers ( $R^2=0.07$ ;  $N=177$ ;  $p=0.002$ ). Table 1.

Women who tested positive for the GDM screening gained less weight than women who tested negative (positive GDM screen: mean weight gain= $22.3\pm 10$ ; Negative GDM screen: mean weight gain= $27\pm 13$ ). Women who had a positive GDM screen gained 5 less pounds than women who had a negative GDM screen. However, the difference in weight gain is only marginally statistically significant ( $t=-1.9$ ;  $N=176$ ;  $p=0.058$ ). Table 2.

Table 1: Statistical comparisons between two groups

	Hispanic			Caucasian		
	N	Mean (sd)	Median	N	Mean (sd)	Median
Age	89	27.9 (6)	27	90	26.1 (4.5)	25.5
Pregnancy Weight Gain	88	24.5 (12.7)	23	90	28.2 (12.8)	28.9
GA GDM	88	27.5 (2.4)	27	87	27.6 (2.0)	28
Procedure Total	89	6.4 (0.8)	7	90	6.5 (0.8)	7
Birthweight	89	3451.7 (447)	3514	90	3585.1 (484.7)	3547
GA Visit 1	89	12.1 (4)	11	90	11.3 (4.8)	10

Table 2: Weight gain during pregnancy

	<b>B (sd)</b>	<b>T</b>	<b>P</b>
Ethnicity (0=Hispanic; 1=Caucasian)	2.7 (1.9)	1.4	.16
Age	-0.05	-3.0	.004

An independent-samples t-test revealed that Hispanic females had statistically similar pre-pregnancy BMI as Caucasians ( $t=-0.96$ ;  $d.f.=176$ ;  $p=0.34$ ). Table 3. An independent-samples t-test revealed that females who tested positive for GDM had statistically similar pre-pregnancy BMI as females who tested negative ( $t=0.85$ ;  $d.f.=174$ ,  $p=.4$ ). Table 4. Both the mean and median BMI for each group was above normal.

Table 3: Comparison of pre-pregnancy BMI

	N	Mean (sd)	Median	Min	Max
Hispanic	88	27.4 (5)	27	17.7	50.1
Caucasian	90	28.3 (7)	27	16	51.2

Table 4: Pre-pregnancy BMI comparison between GDM positive and GDM negative group

	N	Mean (sd)	Median	Min	Max
GDM Positive	28	28.8 (6)	27.7	19	51.2
GDM Negative	148	27.2 (6)	26.8	16	50.1

*Hypothesis 1: Timing of GDM screening*

Hispanics did not differ from the Caucasian women with regard to the gestational age at which they obtained GDM screening ( $t=0.2$ ;  $df=168.5$ ;  $p=0.9$ ). Age did not moderate the relationship ( $R^2<0.001$ ;  $N=174$ ;  $p=0.98$ ). Table 1.

*Hypothesis 2a: Hispanics will initiate prenatal care later than Caucasians.*

The gestational age at which Hispanics initiated prenatal care did not differ from that of Caucasians (Independent Samples-test:  $t=1.2$ ;  $df=174$ ;  $p=0.25$ ). Age did not moderate this relationship ( $R^2=0.01$ ;  $N=178$ ;  $p=0.4$ ).

*Hypothesis 2b: Hispanics will receive a lower number of the recommended procedures during the 1<sup>st</sup> 2 visits than the Caucasian group*

Hispanics receive identical care compared to Caucasians in reference to the number of recommended procedures obtained in the first two visits ( $R^2=0.004$ ;  $N=178$ ;  $p=0.7$ ). See Table 1.

## **Discussion**

Our results show that no disparities were seen in the gestational age at which GDM screening occurred, in the initiation of prenatal care, and in the six recommended procedures that should be obtained in the first two prenatal visits. This is contrary to our hypothesis and to what previous studies have demonstrated regarding prenatal care health disparities among groups such as Hispanics. Because this notably a high risk group, Hispanic women who were mostly undocumented, it is possible that efforts put forth by the local health department and local hospital and clinic system were effective in providing basic prenatal care to this group of Hispanic women. Possibly, the combination of providing health care services to women in this group by the local health system and good compliance demonstrated by this group resulted in similar results seen in these particular measures. The majority of the Hispanic women in this community and in this group are recent immigrants, so the 'healthy immigrant effect' or the 'epidemiological paradox' could be moderating the existence of health disparities. This effect, for example has shown that Mexican-born mothers have lower rates of low birth weight babies and lower neonatal mortality rates than US-born mothers of Mexican origin (Flores, Brotanek, & J, The Healthy Immigrant Effect, 2005).

With respect to other descriptive statistics, it is interesting to note that the Hispanic women had a much higher rate of positive GDM screens but when this was controlled for age, the rate was similar between the two groups. Many other studies have demonstrated that Hispanics have a higher rate of GDM. However, this is not found in all studies and the differences seen in some studies were not as large as between Caucasians and other ethnic groups, such as Asians.

We also investigated factors related to GDM such as pre-pregnancy BMI and gestational weight gain. We did not find that the women with positive GDM results demonstrated a difference in their pre-pregnancy BMI. However, the average pre-pregnancy BMI was above normal for women in both groups, GDM positive or GDM negative. This is contrary to other studies that have identified this strongly associated with GDM. The above normal pre-pregnancy BMI seen in both groups could be indicative of the nature of the population with respect to all women qualifying for Medicaid services. This could indicate an overall higher rate of obesity in this population.

In our study, there was a marginally statistically significant difference in pregnancy weight gain. However, those with positive GDM results actually had less weight gain than those with negative GDM results. One could hypothesize that those women with a positive GDM screen received more dietary counseling than those with a negative screen.

Threats to the internal validity of the study include issues with data extraction from medical records. In some situations, a screening test or measure has been ordered and done but not noted in the provider's progress note. Incomplete medical records were not used in the study. Errors in the medical record can occur as well. An example would be if a patient incorrectly identifies herself as White or Hispanic. Another internal validity threat is in the recording of the record during data collection. This is minimized because one researcher collected all of the data and was familiar with the medical records of this facility.

Threats to the external validity include inability to generalize to communities that may differ in terms of population number and characteristics. The study only includes White, non-Hispanic and Hispanic women in a small community. However, the study could be generalized to many other communities in the regional area that have similar

demographics. In terms of the health care coverage provided to the Hispanic women, it is possible that with health care reform, this would change in the future, which may have subsequent effects on timing and quality of prenatal care. In the meantime, conclusions from the study could be used to improve programs currently being utilized.

In conclusion, although health disparities were not found in our primary aims, these only represent a few of many aspects of overall prenatal care. These measures were objective and fairly easy to extract from medical records. It might be advantageous to investigate other objective measures further. In addition, a number of subjective measures related to quality of prenatal care and satisfaction with labor and delivery services could be other potential areas of study. Disparities in neonatal outcomes were not studied either and are also another important area for further research. The Benton County Health Department in Corvallis, Oregon does have a number of staff members that are culturally proficient who enroll this population in CAWEM and ensure that these women initiate prenatal care. In addition, the local obstetric clinics have provided services that are not generally covered by CAWEM, such as the GDM screening, at no cost. These simple collaborative measures may have contributed to the lack of disparities seen in this research study.

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