



## Addressing the Decline in the Uptake of the Iowa Maternal and Prenatal Screening Program

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## Background

In 1985, the first maternal screening test was offered in the state of Iowa. The Alpha-fetoprotein (AFP) pregnancy screening tested for neural tube defects, and was conducted at the State Hygienic Laboratory at The University of Iowa. In 1987, the Iowa Maternal and Prenatal Screening Program (IMPSP), a comprehensive maternal screening program, was established by the Iowa Department of Public Health (IDPH) to ensure quality testing and adequate follow-up services are available to all women in Iowa. The University of Iowa Hospitals and Clinics (UIHC) Department of Obstetrics and Gynecology collaborates with the State Hygienic Laboratory and IDPH to provide interpretation of test results and consultation.

This centralized system maximizes the delivery of services to Iowa families by providing uniform access to state-of-the-art maternal screening, medical consultation with experts in the field of maternal and prenatal health, and oversight through the Center for Congenital and Inherited Disorders, which was formed to represent Iowans in issues related to genetics, hereditary and congenital disorders.

The purpose of maternal screening is to identify women with an increased risk of having a baby with Down syndrome, Trisomy 18, or an open neural tube defect, such as spina bifida. The screening may also identify women with an increased risk to have a baby with other types of birth defects and women at risk to develop complications later in pregnancy. Through the IMPSP families and providers (1) learn of potential health challenges associated with pregnancies that test presumptive positive; (2) receive consultation from experts in prenatal and maternal health; and (3) are better prepared to select facilities and healthcare providers best suited to address special prenatal and neonatal health care needs. Maintaining consistent levels of participation in maternal screening is critical because early identification allows for improved pregnancy management and potentially better outcomes for neonatal health<sup>(1)</sup>.

Maternal screening is conducted with a blood serum specimen that is easily collected in rural and urban facilities throughout the state. This minimally invasive screening assists patients and healthcare providers with critical information related to maternal and prenatal health. This information assists in the determination of the need for further testing – such as ultrasound or amniocentesis – and allows providers, patients and their families time to prepare for addressing special health considerations. Assisting families to prepare for special birth and delivery circumstances should not be overlooked as a benefit prenatal screening provides to patients<sup>2</sup>.

**Decline in participation rates in the IMPSP:** The IMPSP has experienced a downward trend at an average rate of 2 percent per year in the number of screens performed. In 2007, for example, there were 40,835 births and 13,389 maternal screens. In 2014, 39,685 babies were born in Iowa; yet, only 9,084 maternal screens were performed by the State Hygienic Laboratory – the designated laboratory for this program. The number of pregnant women who receive maternal screening through the state-mandated program has steadily declined, from 38 percent in 2004 to an estimated 23 percent in 2014 (Table 1). The risk associated with this downward trend is that presumptive positives may be undetected and serious health challenges left unidentified if pregnant women are not participating in maternal screening either through the Iowa program or through laboratories outside of the state.

**Table 1. Women receiving prenatal screening 2004-2014**

Year	Iowa Births*	Women Screened	Percent of Women Screened
2004	38,368	14,694	38.3%
2005	39,275	14,395	36.7%
2006	40,592	14,120	34.8%
2007	40,835	13,389	32.8%
2008	40,221	11,797	29.3%
2009	39,662	10,928	27.6%
2010	38,514	10,362	26.9%
2011	38,204	9,518	24.9%
2012	38,686	9,511	24.6%
2013	39,013	9,082	23.3%
2014	39,685	9,084	22.9%+

\*Data from Vital Statistics of Iowa ([http://www.idph.state.ia.us/apl/health\\_statistics.asp#vital](http://www.idph.state.ia.us/apl/health_statistics.asp#vital)) ([http://www.idph.state.ia.us/apl/health\\_statistics.asp#vital](http://www.idph.state.ia.us/apl/health_statistics.asp#vital))

Possible explanations for the decline in participation are: (1) generalized decline in the number of women choosing screening due to provider, laboratory and/or patient characteristics; and/or (2) screening is occurring outside the program, and, therefore, potentially without the value of consultation and counseling services.

IMPSP usage has not been studied since 1996. The purpose of this of this project was to explore utilization patterns throughout Iowa in order to begin to address possible explanations for the decline in IMPSP program. We addressed the following questions in this report: (1) Is the utilization of maternal screening in decline across Iowa regardless of where the sample is tested or is there solely a decline in the use of the state program? (2) Do utilization patterns differ by clinician groups (e.g., OBs compared to midwives)? (3) Are there regional utilization patterns and does the provider type influence this? (4) What type of maternal/prenatal screening do clinicians order and where do clinician's send samples for analysis We examined three data sources to answer these questions: Medicaid claims data, Wellmark claims data, and a survey of providers who administer prenatal and obstetrical care.

## **Maternal/Prenatal Screening Rates and Utilization Patterns.**

To address maternal screening rates and identify utilization patterns (questions 1, 2, and 3 above) we utilized claims data from Iowa Medicaid (2006-2012) and Wellmark (2006-2011). The dataset used for this project included claims with a CPT code for an infant delivery to women who were enrolled in Wellmark or Medicaid for at least the eight months of their pregnancy immediately prior to the delivery. Only pregnancies that were full term were included in the dataset. CPT codes on claim lines throughout a pregnancy were used to determine if a woman received prenatal screening. Table 2 contains the list of variables and conceptual and operational definitions for each variable used for analyses.

**Table 2. Variables used in analyses.**

<b>Variable</b>	<b>Conceptual definition</b>	<b>Operational definition</b>	<b>Data are available in the Medicaid dataset Yes/No</b>	<b>Data are available in the Well-mark dataset Yes/No</b>
<b>Pregnancy</b>	Full term pregnancy of a live birth	Date of delivery and not the date of conception was used to determine trimesters. Trimesters are calculated by days before birth. 180 to 220 days before birth is considered 1 <sup>st</sup> trimester; 110 to 179 days before birth is considered 2 <sup>nd</sup> trimester.	Yes	Yes
<b>Year</b>	The calendar year in which the prenatal maternal screening took place	2006-2011 2006-2012	Yes	Yes
<b>Prenatal maternal screening</b>	Serum screening that occurs in the first and/or second trimester of each pregnancy	1. First trimester serum screen = both a PAPP-A (CPT code 84163) and a HCG (CPT code 87702 or 84704) within the first trimester. 2. Second trimester serum screen = combination of AFP (CPT code 82105), Estriol (CPT 82677), HCG, and Inhibin-A (CPT 86336) within the second trimester. 3. Integrated serum screening = having both 1 <sup>st</sup> and 2 <sup>nd</sup> serum screening. 4. No screening = Absence of claims data to support 1, 2, or 3 above.	Yes	Yes
<b>Mothers' Age</b>	A mother's age during each pregnancy	Calculated by subtracting the mother's birth year from the child's birth year. These ages are grouped into three categories: <ul style="list-style-type: none"> <li>• less than 21</li> <li>• 21 to 34</li> <li>• 35 and greater</li> </ul>	Yes	Yes

<b>Mothers' Race-Ethnicity</b>	Self-reported race-ethnic group for each pregnancy based on response from the Medicaid enrollment data.	<ul style="list-style-type: none"> <li>• White,</li> <li>• African American</li> <li>• American Indian</li> <li>• Asian</li> <li>• Hispanic*</li> <li>• Pacific Islander</li> <li>• Multiple-other</li> <li>• Unknown</li> </ul>	Yes	No
<b>Provider Type</b>	Provider type is formed by using the provider specialty code of the claim line for delivery. This code is a value indicating the field of healthcare that the provider practices.	<p>These codes have been grouped into categories:</p> <ul style="list-style-type: none"> <li>• Obstetricians and Gynecologists (includes perinatologists)</li> <li>• Family Practice (includes internal medicine, pediatrics, and general practice)</li> <li>• Nurses (includes advanced registered nurse practitioners and nurse midwives)</li> <li>• Other</li> <li>• Federally Qualified Clinic</li> <li>• Rural Health Center/ Maternal Health Center</li> </ul>	Yes Yes Yes No Yes Yes	Yes Yes Yes Yes No No
<b>Provider Age</b>	Provider's age at the time the claim was submitted	<p>Year and provider's age are taken directly from the delivery claim line. Provider's age is grouped into four categories:</p> <ul style="list-style-type: none"> <li>• less than 40</li> <li>• 40 to 49</li> <li>• 50 to 64</li> <li>• 65 and greater</li> </ul>	No	Yes
<b>Rurality</b>	Screening location rurality was based the 2013 Rural-Urban Continuum Codes (RUCC). RUCC distinguishes metropolitan counties by the population size of their metro area, and nonmetropolitan counties by degree of urbanization and adjacency to a metro area (citation <a href="http://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx">http://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx</a> 2/16/2015).	Matching the provider's city to one of Iowa's 99 counties, each county is assigned into one of nine RUCC groups. RUCC 1 is considered the most urban while RUCC 9 is the most rural.	Yes	Yes

<b>Metropolitan Statistical Areas (MSA)</b>	Screening location based on the 2013 MSA designation. A metro area contains a core urban area of 50,000 or more population. Each metro area consists of one or more counties and includes the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core (citation <a href="http://www.census.gov/population/metro/2/16/2015">http://www.census.gov/population/metro/2/16/2015</a> ).	Matching the provider's city to one of Iowa's 99 counties, each county is assigned into one of nine MSA. The counties that are not included in an MSA are categorized into three other groups based on population. <b>MSA</b> <ul style="list-style-type: none"> <li>• less than 10,000,</li> <li>• 10,000 to 20,000,</li> <li>• 20,000 to less than 50,000</li> <li>• Ames</li> <li>• Cedar Rapids</li> <li>• Davenport</li> <li>• Des Moines</li> <li>• Dubuque</li> <li>• Iowa City</li> <li>• Omaha- Council Bluffs</li> <li>• Sioux City</li> <li>• Waterloo-Cedar Falls</li> </ul>	Yes	Yes
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\* Multiple-Hispanic and Hispanic were pooled into a single category called Hispanic

Of note, MSAs Ames, Cedar Rapids, Davenport, Des Moines, Dubuque, Iowa City, Omaha- Council Bluffs, Sioux City, and Waterloo-Cedar Falls contain the respective counties:

- Ames: Story
- Cedar Rapids: Benton, Jones, Linn
- Davenport: Scott
- Des Moines: Dallas, Guthrie, Madison, Polk, Warren
- Dubuque: Dubuque
- Iowa City: Johnson, Washington
- Omaha- Council Bluffs: Harrison, Mills, Pottawattamie
- Sioux City: Woodbury
- Waterloo-Cedar Falls: Black Hawk, Bremer, Grundy

Rurality was obtained by matching provider's county to one of Iowa's 99 counties and using that county's Rural-Urban Continuum Code (RUCC). This categorizes each county into one of nine groups based on population and adjacency to a metropolitan area; the specific category descriptions are as follows:

- 1) Metro area with population greater than 1,000,000
- 2) Metro area with population between 250,000 and 1,000,000
- 3) Metro area with population less than 250,000
- 4) Non-Metro area (adjacent to a metro area) with population greater than 20,000
- 5) Non-Metro area (not adjacent to a metro area) with population greater than 20,000
- 6) Non-Metro area (adjacent to a metro area) with population between 2,500 and 19,999
- 7) Non-Metro area (not adjacent to a metro area) with population between 2,500 and 19,999
- 8) Non-Metro area (adjacent to a metro area) with population less than 2,500
- 9) Non-Metro area (not adjacent to a metro area) with population less than 2,500

For delivery claims in the Wellmark dataset that had a provider type that typically does not manage pregnancies (e.g. general surgeons or emergency medicine providers) we tabulated all the providers that occurred during the nine month pregnancy and chose the provider type that appeared most often during the first and second trimesters as the provider managing the pregnancy. When provider type could not be determined with this strategy, the provider type was classified as “other”. However, in the Medicaid dataset there is no “other” category for analysis because the number of provider types classified as “other” only constituted 0.2% of the data—these claims were excluded from analysis.

The Medicaid dataset included claims that listed a facility rather than a healthcare provider as managing the pregnancy and/or attending the delivery. It was not possible to link a single type of healthcare provider to these claims. For deliveries or pregnancies that were managed through a rural health clinic, maternal health center, or a federally qualified health center the provider type was coded as that specific type of center. For this report Maternal Health Center and Rural Health Center were pooled into a single category because no difference was detected in screening between the two types of centers (accounting for other covariates).

Both the Wellmark and Medicaid claims datasets include two types of nurse providers—advanced registered nurse practitioners and nurse midwives. In the Wellmark dataset the nurses were pooled into a single category because no difference was detected in screening between the two types. However, they were not pooled in the Medicaid dataset because differences were detected in screening between the two groups.

The final Wellmark dataset included information on 36,124 full term pregnancy (births) from 30,379 women. The final Medicaid dataset included information on 92,196 births from 73,942 women. The analyses for this report are based on each full term pregnancy of a live birth.

## Analysis and Results

See individual reports:

### Summary of the Findings

#### *Wellmark claims data*

The vast majority of pregnancies did not undergo maternal/prenatal screening. The trend for screening by year shows that the odds of screening increased significantly from 2006 to 2008, but leveled off and showed no significant differences in later years. Younger women are less likely to have screening than women between the ages of 21 to 34, while older women (35 and older) are significantly more likely to receive screening than women between the ages of 21-34. Overall the trend for mother’s age is that the probability of screening is increased as the mother ages.

We also wanted to see if utilization patterns differed in terms of where women received prenatal care. Using MSA as location, we found that providers located in MSA counties are more likely to have provided screening than providers from non-MSA counties, but there are a few exceptions. Screening by providers in counties with a population of 10,000 to 20,000 is not significantly different than screening by providers in counties with a population greater than 20,000. The Omaha-Council Bluffs area is also not significantly different than these counties. We can consider this the baseline from which to compare the other categories. Providers from Ames, Cedar Rapids, Davenport, Des Moines, and Sioux City are all significantly more likely to have provided screening than this group. Providers from non-MSA counties of less than 10,000 residents along with providers from Iowa City and Dubuque are less likely to have provided screening. Providers from the Cedar Falls-Waterloo area were less likely to have provided screening than any other area. Figure 5 (in the Wellmark report) shows the predicted probabilities from the MSA model averaged across each MSA and mapped out over the state.

Another way to account for location is to use RUCC codes. The parameter estimates from the RUCC codes show an overall trend that as the location of the delivering provider becomes more rural, the probability that the mother received prenatal screening decreased. Figure 6 (in the Wellmark data) shows the adjusted percentages from the RUCC model mapped across the state.

Provider age did not affect screening uptake in this dataset. However, provider type did matter. When the provider is an OB/GYN, women are most likely to be screened during her pregnancy, followed by family practitioners. Women are less likely to be screened when a nurse is her provider.

We did see a significant interaction between the geographical parameter and provider type in each model (MSA and RUCC) suggesting that screening is affected by the provider's location. Figure 7 (Wellmark report) shows the screening proportions of provider types based on where they are located. In Dubuque, there were no screenings performed by nurse or family practice providers, so all the screening was done by OB/GYNs. In contrast, in Sioux City most all the screening was performed by family practice providers. The overall trend of OB/GYNs providing the most screenings followed in order by family practitioners and nurses is not constant across all MSAs. The data by MSA is most interesting because it indicates that there may be local cultural nuances that influence maternal screening behaviors that are more complex than a simple rural urban dichotomy.

### *Medicaid claims data*

Similar to the Wellmark dataset, significantly more pregnancies are unscreened. However, the proportion of pregnancies receiving integrated screening is increasing, while the proportion of pregnancies receiving no screening is decreasing. The proportion of pregnancies receiving only trimester 1 screening or trimester 2 screening remains fairly stagnant. While we see trends of increased screening and decreased no screening over the period of 2006-2012, the differences between years is not always statistically significant. Women age 21-34 years old are more likely to have screening compared to women less than age 21. There was no difference in screening for women 21-34 compared to women 35 or older. This may be reflective of the fact that Medicaid subscribers are younger in general.

As with the Wellmark data, MSA as geographical parameter showed some interesting utilization patterns. Non-MSA counties where the population was less than 10,000 had significantly less screening than pregnancies in Davenport, Iowa City, and Waterloo-Cedar Falls MSAs. Also, Waterloo-Cedar Falls had significantly higher screening than non-MSA counties where the population was between 10,000 and 20,000 and also in non-MSA counties where the population was greater than 20,000. The remaining contrasts were not found to be statistically significant. Like the Wellmark data, as the location of the delivering provider becomes more rural (determined by RUCC), the probability that the mother received prenatal screening decreased.

In the Medicaid data we also find a significant interaction between the geographical parameter and provider type in each model (MSA and RUCC) suggesting that screening is affected by where the provider is located. Figure 5 (Medicaid report) shows the screening proportions of provider types based on MSA. In Sioux City, there were no screenings performed by Nurse Midwives. In Omaha-Council Bluffs there are no screenings performed by Rural or Maternal Health Centers. The overall trend of OB/GYNs performing the most screenings followed in order by Federally qualified clinics, Family practice/General practice/Internal medicine, Nurse midwives, ARNPs, Rural/Maternal health centers is not constant across all MSAs. Once again the data by MSA is more interesting to us because it indicates that there may be local cultural nuances that influence maternal screening behaviors that are more complex than a simple rural urban dichotomy.

These data give us descriptions of screening trends and utilization patterns for maternal/prenatal screening among Medicaid and Wellmark subscribers over a period of time. The utilization pattern in terms of trends of the uptake of screening differs from the pattern shown in the IMPSP data over the same period of time. While the vast majority of women chose not to screen, overall trends for the uptake of screening are not diminishing as shown by the IMPSP data. This suggests that samples are being sent to labs other than the State Hygienic Laboratory (SHL). We do not have access to other types of claims data and the pattern may be different among participants in other third party payer plans. We showed some regional patterns that are interesting and may warrant more followup.

## Clinicians' Practice and Maternal/Prenatal Screening

Introduction: To answer the question *What type of maternal/prenatal screening do clinicians order and where do clinician's send samples for analysis*, obstetricians, nurse midwives and advance practice nurse, family physicians, and physician assistants, were surveyed to gain insight into their decisions to offer screening and where to send samples for testing.

**Table 3. Participation rate for prenatal screening survey**

<b>Decline in Maternal Screening – Mail &amp; Web Results</b>		
Sample Size	393	
Web Completes	34	8.65%
Mail Completes	103	26.21%
Mail Undeliverables	24	6.11%
Email Undeliverables	17	4.33%
Incomplete	1	0.25%
Respondents Removed from Sample	17	4.33%
No Response / Unknown	197	50.13%
		100.00%

The initial sample included 464 names, titles and addresses of clinicians who practice obstetrics or manage prenatal care in the state of Iowa. The list of eligible clinicians was obtained through the IDPH. The list was cleaned by removing out of state providers and duplicate listings. The cleaned sample resulted in a total of 391 potential subjects. During fielding of the web survey, one respondent recommended two nurses take the survey and provided their email addresses to ISRC bringing the total sample size to 393.

The Iowa Social Science Research Center (ISRC) managed a multi-mode study that offered subjects a choice between a web-based or mailed survey. ISRC also provided the data entry for the mailed surveys. The ISRC conducted the web survey first in November 2013 then initiated a follow up mail survey in January 2014 to non-responders of the web-based survey. The study resulted in 137 completed surveys, for a 34.9% response rate (Table 3).

While a total of 137 completed the survey; 4 subjects were dropped from the analysis because their survey was not completed. Most were women (65%) and most identified as obstetricians/maternal fetal medicine practitioners (Table 4).

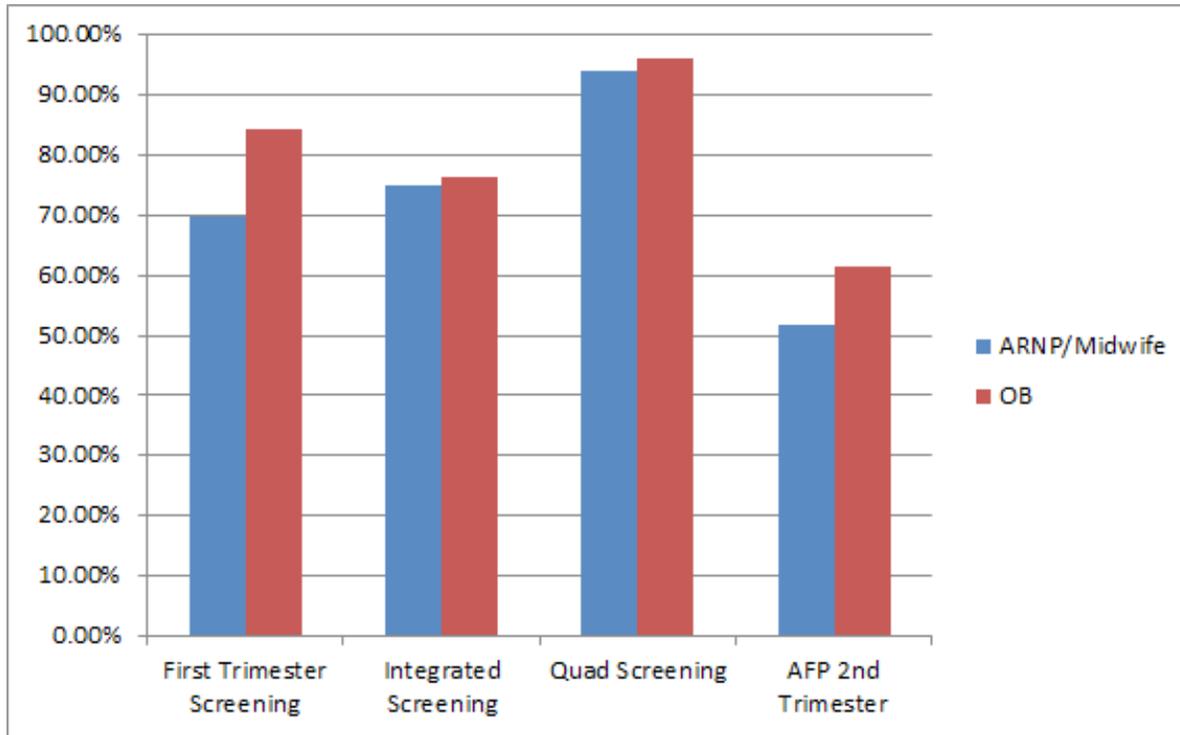
**Table 4. Subject participants by provider type.**

<b>Provider type</b>	<b>Number</b>	<b>Percent</b>
Obstetrician/MFM	92	69
Advance practice nurse/Certified nurse midwife	37	28
Physician Assistant	2	1.5
Family Practice/General practice	2	1.5
	133	100

All respondents who answered the survey provide at least one type of prenatal screen; the type of screening (ie quad, integrated, AFP only) was selected based on when women presented for prenatal care. Quad screening was most commonly ordered (figure 1).

While screening is offered and ordered, the State Hygienic Lab (SHL) is not consistently the lab of choice for analyzing samples among these participants. Of the 73.7% of all participants who offered first trimester screen, 60.6% used the SHL; of the 72.8% of all participants who offered integrated screening, 56.4% used SHL; of the 94.2% of all participants who offered quad screening, 66.9% used SHL; of the 53.3% of all participants who offered AFP in the 2nd trimester screen, 57.4% used SHL.

**Figure 1. Screening by Provider Type**



Reasons for not using the SHL included the practice contracted with a private lab for testing, patient insurance, another lab costs less, and other. Other explanations included that another lab (specifically Omaha) is closer, inefficiency in the process, electronic medical record coordination, and that an administrator decides where samples are sent for testing (Table 5). Due to the low response rate and small sample size we did not compare responses among provider types. While the sample is small, we begin to see some indication for why samples are not sent to the SHL.

**Table 5. Reasons for sending sample to another lab**

Screening type	Number who do not use the SHL for this test (n)	Reasons for not using SHL n(%):			
		Contract with a private lab	Insurance	Another lab costs less	Other
First trimester	35	12 (34)	4(11)	4(11)	13(37)
Integrated	27	10(37)	3(11)	4(14)	9(34)
Quad	27	9(33)	5(19)	4(15)	9(33)
AFP second trimester	21	7(33)	3(14)	2(10)	9(43)

## Conclusion

Based on claims data from Wellmark and Medicaid and from 2006-2011 and 2006-2012 respectively the utilization of maternal screening does not appear to be declining across the state although, the overall utilization rate of maternal prenatal screening is low. Obstetricians screen more frequently than other providers. While this may have to do with how providers approach the topic of screening, the decision to screen is complex and multifaceted. Who women seek care from may also reflect her general attitude toward pregnancy and pregnancy management—other factors and attributes that may influence screening choice were not assessed in this project. There are regional differences in the uptake of screening. We observed an interaction between provider type and geographical parameter. MSA is perhaps a more interesting way to think about the data because our findings indicate that there may be local cultural nuances that influence maternal screening behaviors that are more complex than a simple rural urban dichotomy. Clinicians who responded to our survey indicated that they offer screening to women and the type of screening offered depends on when a woman presents for her initial prenatal visit. While most indicated that they send samples to the SHL for testing, we did find that other labs are used. Qualitative interviews with women who had a baby in the last year are being conducted. This data will give additional insight into the reasons women choose to participate in or opt out of screening.

## References

- 1 Knight, George J. (2004) Improved Prenatal Down Syndrome Screening: Paired Testing. *Final Report for the Maternal and Child Health Research Program*, p. 6.
- 2 Gottfredsdottir, H., Sandall, J., & Bjornsdottir, K. (2009). 'This is just what you do when you are pregnant': a qualitative study of prospective parents in Iceland who accept nuchal translucency screening. *Midwifery*, 25(6), 711-720. doi:10.1016/j.midw.2007.12.004