Comparison of Common High-risk Pregnancy Conditions Between Health Start and Non-Health Start Participants

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Doctor of Medicine

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Dedication

To my parents.

Without their continuous support and encouragement, I would not be where I am today.

Acknowledgements

I would like to acknowledge Sara Rumann and Dr. Khaleel Husseini at the ADHS Bureau of Women's and Children's Health and my mentor, Dr. Ana Maria Lopez, at the University of Arizona College of Medicine for their guidance. Without their help this project would not have been possible.

Abstract

Context: Health Start is a program run by the Arizona Department of Health Services (ADHS) that utilizes community health workers to educate at-risk pregnant women and new mothers throughout many of the underserved regions of Arizona. The Health Start Curriculum - the tool used to educate community health workers on prenatal and infant care - is currently undergoing a revision. This project is intended to examine medical risk factors and birth outcomes unique to Health Start participants in order to provide information that will be considered when revising the curriculum.

Objective: To compare the prevalence of medical risk factors and selected birth outcomes of women actively enrolled in Health Start to their age-matched, race/ethnicity-matched, and delivery method-of-payment-matched counterparts.

Methods: A cross-sectional study was conducted at the Arizona Department of Health Services Bureau of Women's and Children's Health using the birth certificate data from women who gave birth in Arizona in 2009. A relative risk for each medical risk factor and birth outcome parameter was tabulated using chi-square analysis, and the

statistical significance was determined utilizing a *p*-value of 0.05 as the cutoff for statistical significance.

Results: Overall the study revealed a significantly lower rates of anemia in active Health Start participants compared to inactive Health Start enrollees (1.4% vs. 7.2%, *p*-value = 0.001). The low relative risk of pre-term delivery for Health Start participants compared to matched controls approached statistical significance (5.8% vs. 10.1%, *p*-value = 0.057), but the power of the test was limited due to small sample size. Other medical risk factors and birth outcomes did not reveal a statistically significant difference between active Health Start participants and matched controls or active Health Start Participants and inactive Health Start enrollees.

Conclusions: Active enrollment in the Health Start program is associated with significantly lower rates of anemia and notably lower rates of pre-term delivery. A follow-up study with a larger sample size is indicated to increase the power of the study.

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Figures and Tables

Introduction

Numerous studies have confirmed the importance of prenatal care in determining health outcomes for neonates. Good prenatal care has been associated with decreased mortality as well as decreased incidence of low birth weights.[1,2] According to Healthy People 2020, it is recommended that prenatal care visits are initiated early in a women's pregnancy to maximize their impact on neonatal health.[3]According to a 2010 Needs Assessment published by the Arizona Department of Health Services (ADHS), only 79.4% of Arizona women were receiving prenatal care in their first trimester of pregnancy in 2008, and only 71.4% of pregnant women enrolled in the Arizona Health Care Cost Containment System (ACCCHS) – Arizona's Medicaid program - received early prenatal care.[4]

Past and current ADHS Needs Assessments have noted several variables associated with disparate rates of early prenatal care: ethnicity and geographic location. Women receiving lower rates of early prenatal care tended to be either Hispanic or American Indian, and they tended to reside in rural counties.[4,5] Lower rates of prenatal care in these communities may be attributable to sociocultural factors

that prevent women from seeking medical care in an American healthcare facility. Those who live in rural location may also have limited access to prenatal care resources because of geographical restrictions. The *Health Start* program was created with these disparities in mind.

Health Start is a program run by the ADHS that utilizes community health workers, also known as promotoras, to educate at-risk pregnant women and new mothers throughout many of the underserved regions of Arizona.[6] By relying on members of the community to reach out to women enrolled in Health Start, the program is able to overcome many of the cultural barriers that limit the impact of other intervention strategies.

The program was established by the Arizona Department of Health Services (ADHS) in 1992 in response to steadily increasing rates of women receiving inadequate or no prenatal care over the preceding decade. Health Start was then formalized and expanded in 1994 with the passage of the Arizona Children and Families Stability Act. It is currently funded solely by Arizona State Lottery funds and serves over 2,000 clients/year throughout the state of Arizona.

In order to qualify for enrollment into the Health Start program women needed to report having one or more of the "pregnancy risk factors" that are indicated on Health Start enrollment forms. At the core of the Health Start program is a curriculum used to educate promotoras on topics related to maternal and child health. The curriculum was developed and revised between 1995-2000. It included 61 distinct training modules and contained approximately 8 hours of total teaching content. Because of expansion of the Health Start program and advancements in medical knowledge, the old curriculum has become outdated, and a revision is currently underway. The new Health Start curriculum will be expanded to include around 80 modules in order to include modules covering relevant health topics that were not included in the first curriculum. Decisions about which modules to add will be made based on focus group discussions with Community Health Worker Liaisons (who train the promotoras), and the results of this study.

Study Aims

This study aims to examine the medical risk factor and birth outcome profiles of Health Start participants and compare these profiles to

women of a similar age, race/ethnicity and socioeconomic status who are not actively enrolled in Health Start. Study results will provide information about the role of Health Start in improving birth outcomes, and they will help guide the identification of modules to include in the curriculum revision.

Methods

A cross-sectional study was conducted at the Arizona Department of Health Services Bureau of Women's and Children's Health using the birth certificate data from women who gave birth in Arizona in 2009.

Permissions

Institutional Review Board approval was granted from the University of Arizona and the Arizona Department of Health Services. Human subjects training (CITI training) was completed by both the PI and the student researcher prior to beginning the project.

Participants

The sample consisted of 834 women who gave birth in 2009 in Arizona. Two hundred and seventy-eight of the women were actively enrolled in the Health Start program, 278 were enrolled but no longer active, and the remaining 278 participants part of a control group.

Study Design:

a) Creation of the Health Start Participant Group

To generate the group of Health Start participants who gave birth in Arizona in 2009, a random sample of 2000 Health Start participants enrolled in the Health Start program between 2008 and 2010 was generated from the ADHS Health Start Database using SPSS. Participants were then identified in the ADHS 2009 Arizona Birth Certificate database using last name, first name, maiden name, and date of birth. Of the 2000 Health Start participants enrolled in 2008-2010, 556 were successfully identified after delivery in the ADHS 2009 Arizona Birth Certificate Database.

The selection criteria for this group were then limited to Health Start participants who were *actively* enrolled in the program, meaning participants who were still receiving regular follow-up from their promotoras. The resulting sample size was decreased to 278 Health Start participants who were active in the program, as 278 participants who had enrolled in Health Start were no longer active at the time of the study for reasons that were subsequently explored.

b) Creation of Control Group

The study control group was matched to the Health Start group by age, which was categorized as <15, 18-19, 20-24, 25-29, 30-34, 35-39 or 40-44 years old at the time of delivery. The control group was also matched by race/ethnicity, and method of payment for delivery, which was either Arizona's Health Care Cost Containment System (AHCCCS) – Arizona's Medicaid program, Indian Health Service (IHS), private payment, or unknown.

Since there is no documentation of income bracket on the birth certificate registry, the method of payment for hospital delivery was used as a marker for the socioeconomic status of participants. Because Arizona residents with a low socioeconomic status are typically enrolled in AHCCCS, an evaluation of delivery payment method provided a rough estimation of the socioeconomic demographics of the Health Start population.

In order to create the matched control group, a matrix was created to profile the prevalence of age, race/ethnicity and method of payment. Then a sample of non-Health Start participates with an identical age/race/ethnicity/method-of-payment profile was generated by SPSS.

Analysis:

Comparison of Active Health Start Participants to Matched Controls

Using SPSS, the prevalence of medical risk factors and birth outcomes identified in Arizona birth records (listed in *Table 1*) was compared between the group of active Health Start Participants and the control group. A relative risk for each medical risk factor and birth outcome parameter was tabulated using chi-square analysis, and the statistical significance was determined utilizing a *p*-value of 0.05 as the cutoff for statistical significance.

Comparison of Active Health Start Participants to Inactive Participants

The prevalence of medical risk factors and birth outcomes listed in *Table 1* were then compared between the group of active Health Start Participants and the remaining inactive Health Start Participants identified in the 2009 Arizona Birth Certificate database that gave birth in Arizona in 2009. A relative risk for each medical risk factor and birth outcome parameter was tabulated using chi-square analysis, and the statistical significance was determined utilizing a *p*-value of

0.05 as the cutoff for statistical significance.

Table 1. Risk Factors/Birth Outcomes.

Anemia	Chronic HTN	Rh Sensitization
Cardiac Disease	Pregnancy-induced HTN	Uterine Bleeding
Lung Disease	Eclampsia	Tobacco Use
Diabetes	Incompetent Cervix	Alcohol Use
Genital Herpes	Prev. Infant >4000g	Gestational Age
Hydramnios	Preterm Infant	Birth Weight
Hemoglobinopathy	Renal Disease	

Results

Profile of Health Start Participants

The group of Health Start participants consisted of a random sample of 278 women who enrolled in Health Start between 2008 and 2010 and gave birth at an Arizona hospital in 2009. The age distribution of the sample is provided in *Figure 1*. Almost two thirds of Health Start participants were between the ages of 18 and 29 years old at the time of delivery, with the largest proportion (28.1%) ranging from 20-24 years at the time of delivery.

As displayed in *Figure 2*, over 60% of the Health Start participant group was comprised of women who specified themselves as Hispanic on birth certificate registration forms. The other highly represented race/ethnicities were Non-Hispanic Native Americans (18.7%) and Non-Hispanic Whites (16.5%).

Most Health Start participants paid for the delivery of their infant using AHCCCS (83.5%). Private payers (i.e. insurance companies) comprised 11.5% of the sample population, and a smaller number of participants either utilized IHS or were self-paying. The breakdown of method of payment for delivery is provided in *Figure 3*.

Figure 1. Age Distribution of Health Start Participants.

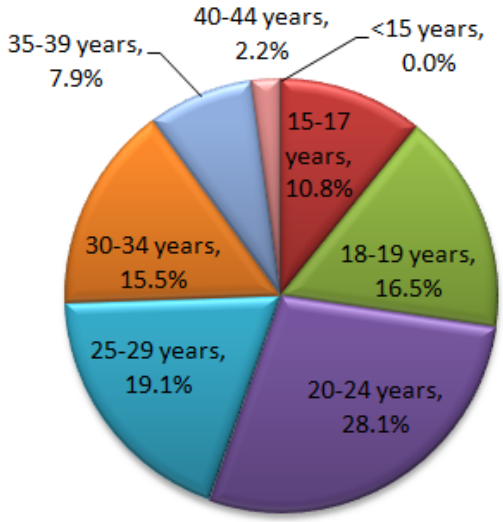


Figure 2. Race/Ethnicity Distribution of Health Start Participants.

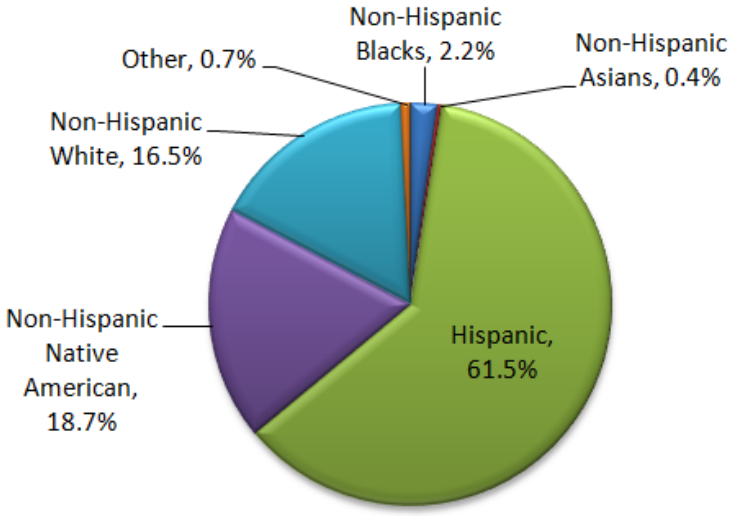
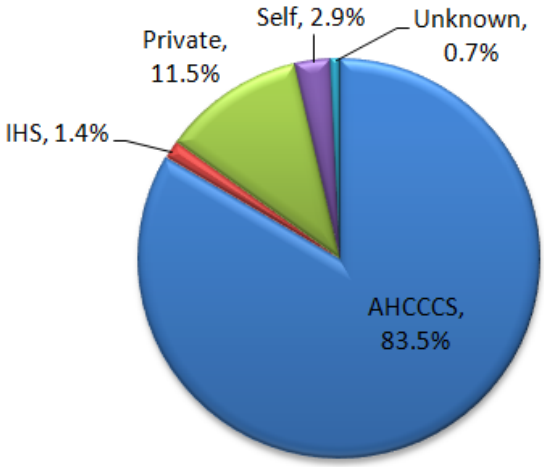


Figure 3. Distribution of Method of Payment for Delivery Utilized by Health Start Participants.



The most highly represented counties of residence of Health Start participants were Yuma, Maricopa, Coconino, and Cochise, which respectively contributed 26.3%, 14.7%, 14.4%, and 11.2% of the participants. As is displayed *Figure 4* and *Table 2*, this breakdown is markedly different than the counties of residence of the matched control population. Most of the matched controls came from Arizona's more densely populated counties, including Maricopa and Pima.

The frequency of pregnancy risk factors (required for enrollment into Health Start) self-reported by Health Start participants is portrayed in *Figure 5*. Over twenty different risk factors were reported by participants. The most commonly listed risk factors included history of urinary tract infection (29.1%), short stature (16.9%), poor dental hygiene (9.4%) and previous pregnancy termination (9.0%).

Comparison with Matched Controls

Table 3 and *Figure 6* provide a comparison of the prevalence of medical risk factors among Health Start participants and their matched controls. Rates of medical risk factors were relatively low for both groups. The most prevalent medical risk factors in the Health Start

Figure 4. County of Residence of Health Start Participants Compared to Matched Control Sample.

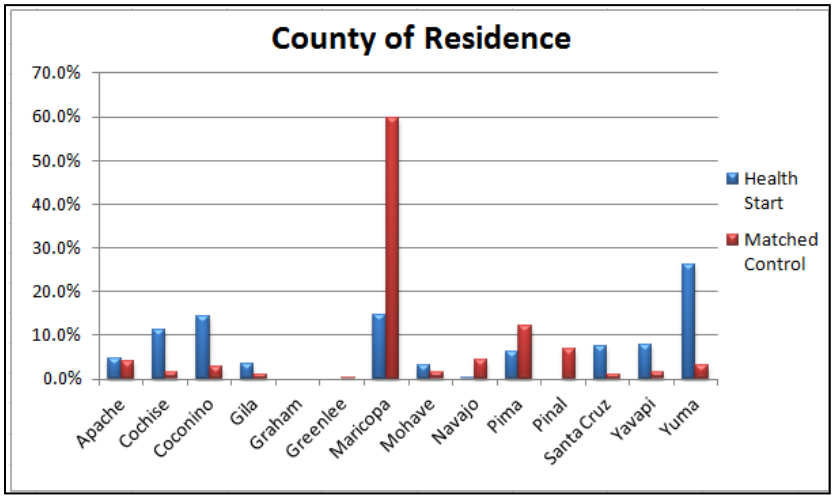


Table 2. County of Residence of Health Start Participants Compared to Matched Control Sample.

County	Health Start	Matched Control
Apache	4.7%	4.0%
Cochise	11.2%	1.4%
Coconino	14.4%	2.9%
Gila	3.6%	1.1%
Graham	0.0%	0.0%
Greenlee	0.0%	0.4%
Maricopa	14.7%	59.7%
Mohave	3.2%	1.4%
Navajo	0.4%	4.3%
Pima	6.1%	12.2%
Pinal	0.0%	6.8%
Santa Cruz	7.6%	1.1%
Yavapi	7.9%	1.4%
Yuma	26.3%	3.2%

Figure 5. Self-Reported Pregnancy Risk Factor Provided on Enrollment into Health Start Program.

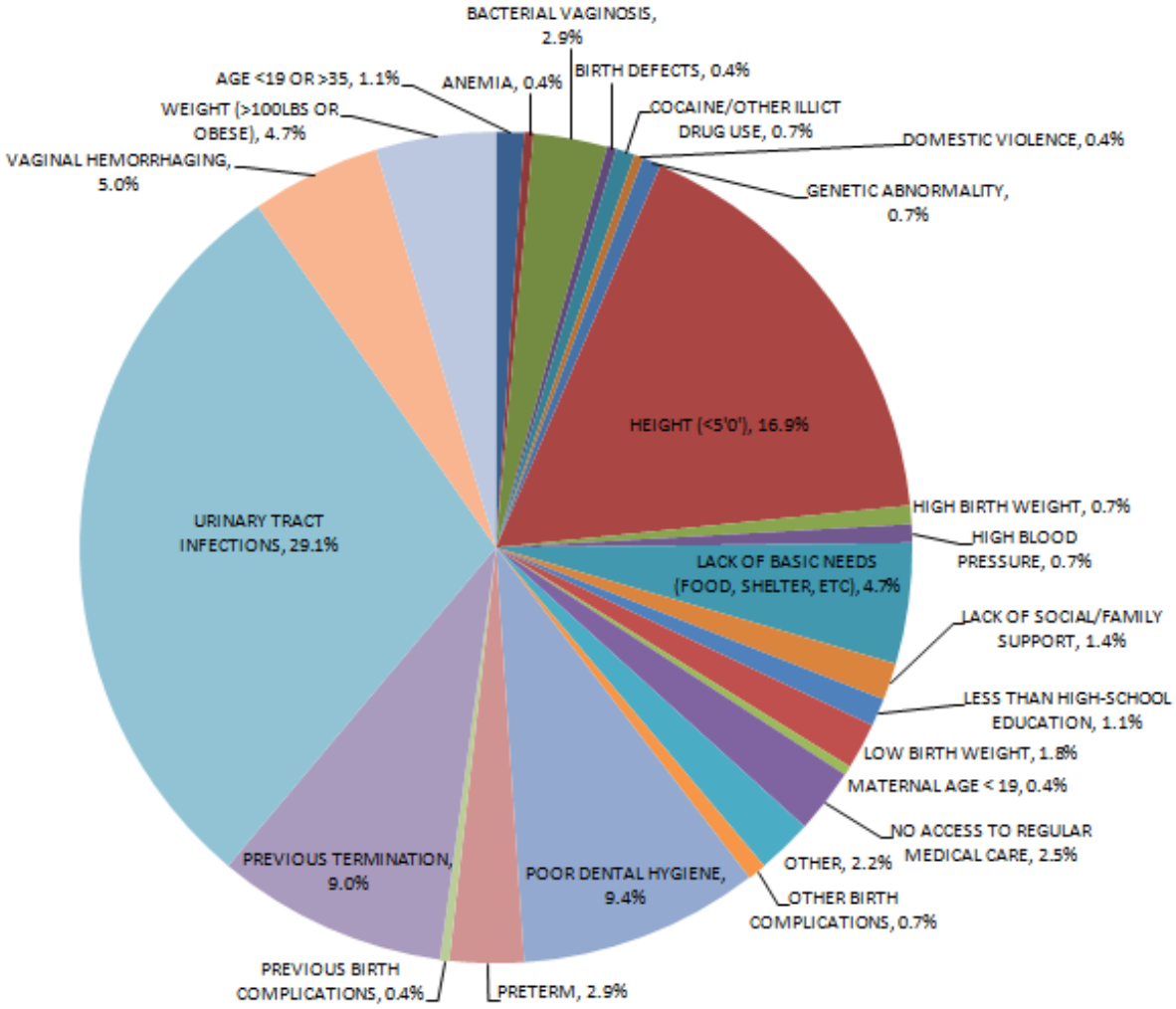
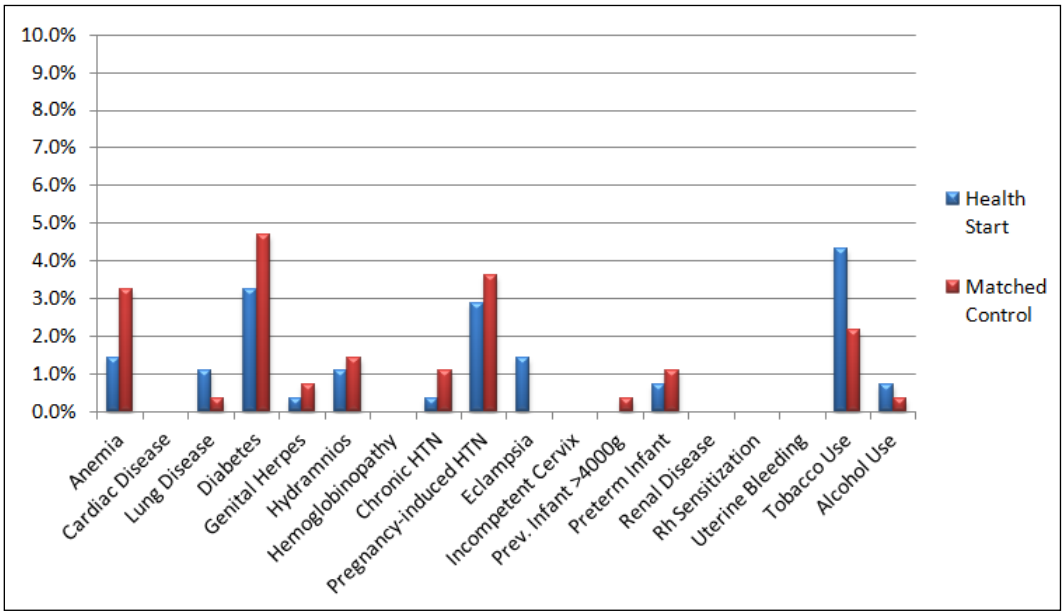


Table 3. Comparison of Medical Risk Factors between Health Start Participants and Matched Controls.

Medical Risk Factors	Health Start	Matched Control	Relative Risk	P-value
Anemia	1.4%	3.2%	0.44	.161
Cardiac Disease	0.0%	0.0%	n/a	n/a
Lung Disease	1.1%	0.4%	3.00	.316
Diabetes	3.2%	4.7%	0.69	.384
Genital Herpes	0.4%	0.7%	0.50	.563
Hydramnios	1.1%	1.4%	0.75	.704
Hemoglobinopathy	0.0%	0.0%	n/a	n/a
Chronic HTN	0.4%	1.1%	0.33	.316
Pregnancy-induced	2.9%	3.6%	0.80	.632
Eclampsia	1.4%	0.0%	n/a	.045
Incompetent Cervix	0.0%	0.0%	n/a	n/a
Prev. Infant >4000g	0.0%	0.4%	0.00	.317
Preterm Infant	0.7%	1.1%	0.67	.653
Renal Disease	0.0%	0.0%	n/a	n/a
Rh Sensitization	0.0%	0.0%	n/a	n/a
Uterine Bleeding	0.0%	0.0%	n/a	n/a
Tobacco Use	4.3%	2.2%	2.00	.151
Alcohol Use	0.7%	0.4%	2.00	.513

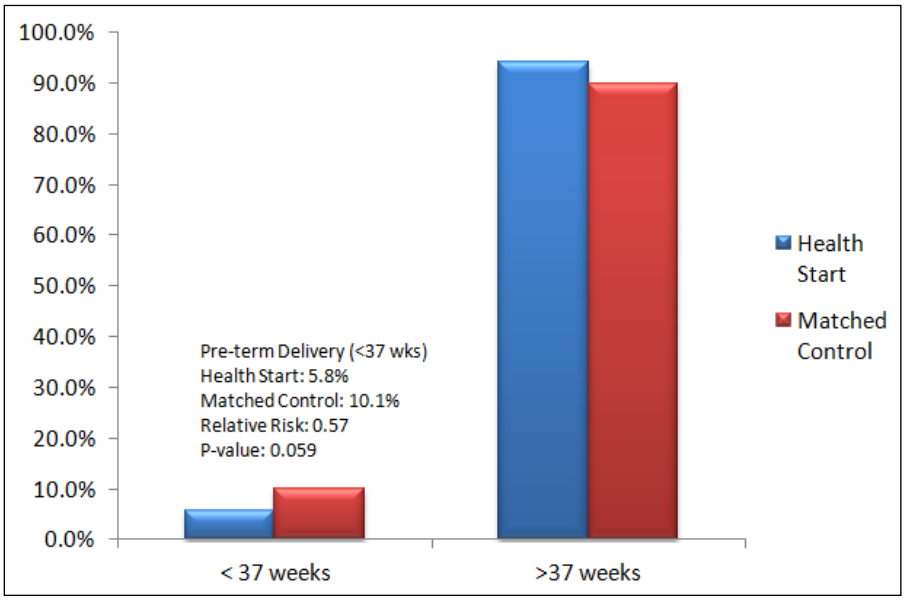
Figure 6. Comparison of Medical Risk Factors between Health Start Participants and Matched Controls.



group were tobacco use (4.3%), diabetes (3.2%), and pregnancy-induced hypertension (2.9%). For the matched controls, the most prevalent medical risk factors were diabetes (4.7%), pregnancy-induced hypertension (3.6%) and anemia (3.2%). The relative risk of each medical risk factor was calculated for Health Start participants vs. matched controls, but using a *p*-value of 0.05 as a cut-off for significance, there were no medical risk factors with a statistically significant difference between Health Start participants and controls. Though the prevalence of eclampsia among participants and controls had a *p*-value of 0.045, there were only 4 cases of cases of eclampsia in the participant group, and thus the sample size of cases was too small to accurately use chi-square analysis. There were several medical risk factors that trended toward significance, including lower rates of anemia among Health Start participants compared to their matched controls, and higher rates of tobacco use among Health Start participants compared to their matched controls.

Rates of pre-term delivery for women enrolled in Health Start were less than rates of pre-term delivery for their matched controls (5.8% vs. 10.1%). As is indicated in *Figure 7*, the relative risk for pre-term by a Health Start participant was 0.57, with a *p*-value of 0.059. Because

Figure 7. Rates of Preterm Delivery for Health Start Participants Compared with Matched Controls.



the *p*-value for significance was set at 0.05, this relationship is not statistically significant, though it is likely that the relationship would have been significant if a larger sample size had been obtained. This will be elaborated upon in the discussion section.

Rates of low birth weight deliveries (<2500 grams) were notably lower for Health Start participants compared to their matched controls. (see *Figure 8*) Though the relative risk for a low birth weight delivery for Health Start participants was 0.62 compared to matched controls, this value had a p-value of 0.182 and thus was not statistically significant according to the established p-value cutoff for significance.

Comparison with Inactive Health Start Enrollees

Of the 556 randomly selected women who enrolled in Health Start from 2008-2010 and gave birth in Arizona in 2009, exactly one half (278) of those women enrolled in the program but were inactive participants at the time of the study. These women were not included in the group of Health Start participants used in the preceding analyses, and their reasons for inactivity are listed in *Table 4*. Over half (55.0%) of the women were inactive because they had either been "lost to follow-up" or moved. Other common reasons included the

Figure 8. Rates of Low Birth Weight Deliveries (<2500 grams) for Health Start Participants Compared with Matched Controls.

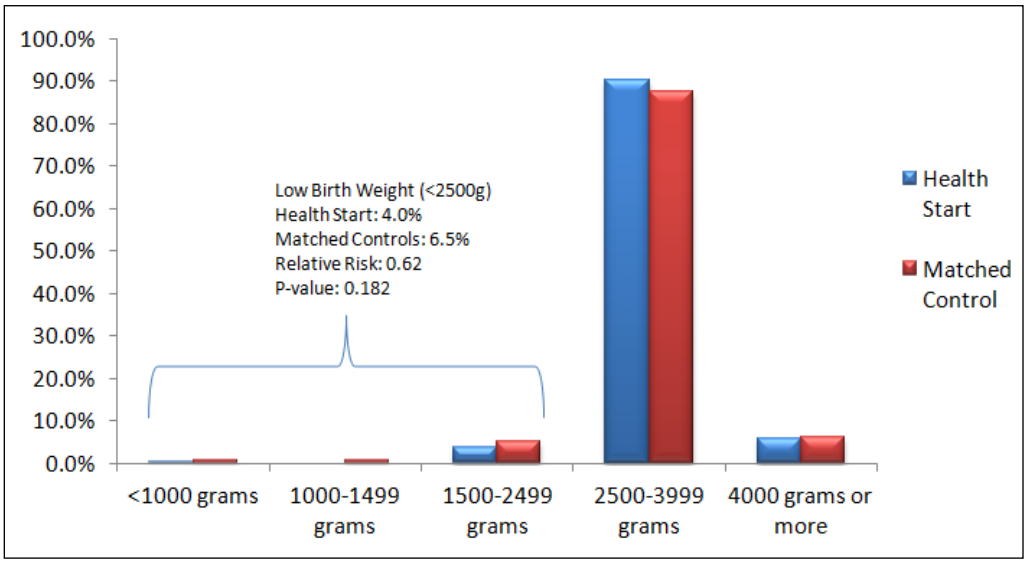


Table 4. Reason Given for Inactivity in Health Start Program by Inactive Enrollees.

Reason for Inactivity	Frequency	Percent
Administration closed	3	1.1%
Adoption	1	0.4%
Child removed from home	2	0.7%
Client declined program	38	13.7%
Completed family follow-up	9	3.2%
Death of child	2	0.7%
Lost to follow-up/moved	153	55.0%
Mother removed from home	1	0.4%
Not eligible	4	1.4%
Not pregnant; family planning	11	4.0%
Pregnancy loss	4	1.4%
Program closed	12	4.3%
Referred to specialized program	3	1.1%
Refused family follow-up	9	3.2%
Transferred out	1	0.4%
Withdrew from program	25	9.0%

following: participant declined the program after enrolling (13.7%), and participant withdrew from the program (9.0%).

As is indicated in *Table 5* and *Figure 9*, women who remained active in Health Start had significantly lower rates of anemia than those who enrolled in the program but were no longer active (1.4% vs. 7.2%, p-value = 0.001).

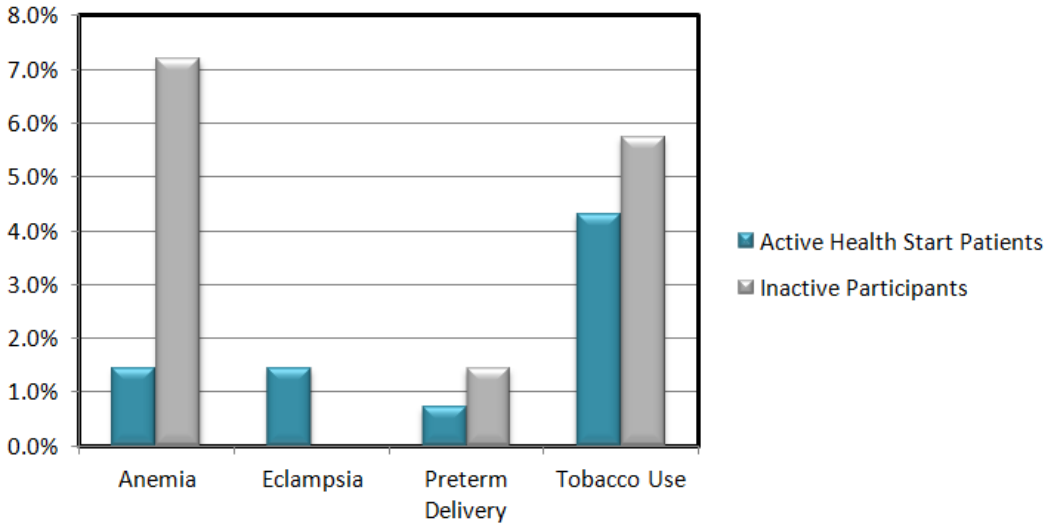
The number of active Health Start participants who developed eclampsia was unusually high compared to inactive participants (4 participants vs. 0 participants). Though the chi-square analysis of these results produced a p-value of 0.045, the relationship cannot be called statistically significant since the number of cases was low (<5).

A comparison of active vs. inactive Health Start participants also revealed that Health Start participants who remained active in the program had notably lower rates of pre-term delivery and notably lower rates of tobacco use than women who enrolled but did not remain active (depicted in *Table 5* and *Figure 9*). However, chi-square analysis of pre-term delivery rates and rates of tobacco use revealed p-values of >0.05, thus the relationships were not statistically significant.

Table 5. Prevalence of Medical Risk Factors /Selected Birth Outcomes for Active Health Start Participants Compared with Inactive Participants.

Medical Risk Factor	Active Health Start Patients	Inactive Participants	P-Value
Anemia	1.4%	7.2%	.001
Eclampsia	1.4%	0.0%	.045
Preterm Delivery	0.7%	1.4%	.412
Tobacco Use	4.3%	5.8%	.438

Figure 9. Prevalence of Medical Risk Factors /Selected Birth Outcomes for Active Health Start Participants Compared with Inactive Participants.



Discussion

The study aimed to compare the prevalence of medical risk factors and selected birth outcomes of women actively enrolled in Health Start to their age-matched, race/ethnicity-matched, and delivery method-of-payment-matched counterparts. Results revealed a notably lower rate of pre-term delivery among active Health Start participants compared to the control group. Results additionally revealed a significantly lower rate of anemia among active Health Start participants compared to inactive Heath Start enrollees.

Health Start Participant Demographics

The Health Start program was developed to ensure that at-risk pregnant women throughout underserved regions of Arizona had access to early and continuous prenatal, postpartum and early infant care.[6] In order to keep the revised Health Start curriculum relevant to its targeted communities, it is important to understand the make-up of these populations. Prior to this study, limited information had been published about the demographics of Health Start participants. The first portion of this study provides important information about the

age, residence, socioeconomic status and race/ethnicity of Health Start participants.

The breakdown of participant ages revealed that most participants were aged 18-29 at the time of delivery, which was expected since this is the most common age bracket for pregnancy nationwide.[7]

Over 80% of Health Start participants utilized AHCCCS to pay for their delivery, which is in line with the program's goal to reach women in underserved, low-resource regions of the state.[6]

A majority of Health Start participants identified themselves as being Hispanic in ethnicity, and over half of the Health Start sample population resided in counties along the US-Mexico border. (See *Figure 10.*) Other counties that were highly represented among Health Start participants were Coconino and Yavapi –counties covering remote regions in the Northern part of the state, and Maricopa – Arizona's most populous county. In contrast, over 70% of the control group came from in Maricopa and Pima, the most urban counties in the state. The differences in geographical distribution between Health Start participants and controls may account for some of the differences in study results.

Figure 10. Arizona Counties.

Source: http://quickfacts.census.gov/qfd/maps/arizona_map.html

In order to be enrolled in the Health Start program, women need to report having at least one pregnancy risk factor from listed on an enrollment form provided by the ADHS. The list of conditions defined as pregnancy "risk factors" is diverse, and, as *Figure 6* demonstrates, participants' responses were just as diverse. Most women selected history of urinary tract infection, short stature, previous pregnancy termination, or poor dental hygiene as their pregnancy risk factor. Because these risk factors are self-reported without objective validation from a health professional, it is possible that reported risk factors do not appropriately reflect the actual risk profiles of women being enrolled in Health Start. This information has prompted discussion by members of the ADHS to revise the Health Start enrollment process.

Medical Risk Factors among Health Start Participants

Measured medical risk factors were generally low for both the Health Start group and their matched controls. This may have contributed to the inability to identify any statistically significant differences in the risk factors in the Health Start group versus the matched control population.

Risk factors that were the most common among Health Start participants included tobacco use (4.3%) and diabetes (3.2%). While rates of diabetes were a bit lower for Health Start participants than their matched controls (3.2% vs. 4.7%, p-value = 0.384), rates of tobacco use were notably higher (4.3% vs. 2.2%). More research needs to be done to elucidate the cause for increased tobacco usage among Health Start participants. A possible cause for the increased rates may be related to the geographically-determined cultural differences or differential access to tobacco products, since the population of Health Start participants resides in different counties than their matched counterparts. Alternatively, it could also be possible that tobacco usage is the same in both populations, but Health Start participants are more likely self-report it than matched counterparts because they are made aware of the potentially adverse effects of tobacco use during pregnancy though their participation in Health Start. Regardless of the cause for the trend, it should be remembered that while the difference in tobacco rates between the two groups is notable, it is not statistically significant.

Tabulation of medical risk factors revealed that 1.4% of Health Start participants had developed eclampsia during their pregnancy, which

was significantly higher than the rate of eclampsia in the matched control group. However, since the absolute number of cases of eclampsia among Health Start participants was low (n=4), a chi-square test could not be performed, thus the p-value of 0.045 provided in *Table 3* is not an indicator of statistical significance. This said, further investigation into these individual cases is warranted, since eclampsia is a serious and potentially life-threatening condition, and the rate of eclampsia in the sample population was much higher than expected.

In a future study of medical risk factors among Health Start participants it would be helpful to examine rates of pre-eclampsia and gestational diabetes, since both are common complications of pregnancy. Unfortunately this study was limited to measuring medical risk factors pre-defined by the 2009 Arizona Birth Certificate Database, which did not include pre-eclampsia or gestational diabetes. A new revision of the Arizona Birth Certificate is currently underway, which will include said risk factors.

Selected Birth Outcomes among Health Start Participants

In order to compare birth outcomes of Health Start participants to those of matched controls, the study examined rates of pre-term

delivery and low birth weight, since both have been linked with increased morbidity and mortality in infants. Pre-term delivery was defined as any delivery at a gestational age of less than 37 weeks. Low birth weight was defined as any neonatal birth weight of less than 2500 grams.

The study revealed that Health Start participants had notably lower rates of pre-term delivery than their matched controls (5.8% vs. 10.1%, *p*-value = 0.059. Though this difference is not statistically significant utilizing a *p*-value cutoff of 0.05, it approaches significance and warrants further examination. It is likely that a larger sample size would have revealed a statistically significant difference in rates of pre-term delivery, and thus a larger follow-up study is recommended.

Pre-term delivery is understood to be associated with increased morbidity and mortality, increased utilization of the Neonatal Intensive Care Unit (NICU), and increased childhood disease.[8] According to the 2010 Health Start Policies and Procedures Manual, the Health Start program aims to reduce the incidence of infants requiring more than 72 hours of care in the NICU, and it aims to reduce the incidence of children affected by childhood disease.[6]

Favorable pre-term delivery rates for Health Start participants suggest that the program is meeting its goals and objectives specified in the Manual.

The study also revealed a notably lower incidence of low birth weight deliveries to Health Start participants compared to the control group (4.0% vs. 6.5%, *p*-value = 0.182). However, this value was not statistically significant, nor was the difference as considerable as the the difference in pre-term delivery rates. A future study with a larger sample size would likely elucidate the relationship between Health Start participants and low birth weight deliveries and is thus recommended.

Active versus Inactive Health Start Participants

Of the original 556 Health Start participants randomly selected for the study, only 278 of them were considered actively enrolled at the time of the study. This means that only 278 were actually still receiving regular visits from promotoras, a requirement specified in client enrollment contracts. The remaining 278 women had completed the Health Start enrollment paperwork, but, for one reason or another, their cases had been closed. Health Start participants with closed

cases were labeled as "inactive" and were unsuitable for comparison with the matched control group in this study. This prompted an analysis of the "inactive" Health Start participants. Reasons for participant inactivity were examined, and inactive participants were compared with active participants to look for any differences in pregnancy risk factors or birth outcomes.

The most commonly reported for reason for inactivity was "lost to follow-up/moved." Over half of inactive participants fell into this category, reflecting the generally transient nature of the Health Start population. In a focus group held with community liaisons who train Health Start promotoras, the liaisons were not surprised by this statistic.[9] They confirmed that this is a common problem for promotoras in their communities. According to the liaisons, many of the women who enroll in Health Start are Mexican citizen who have crossed the U.S.-Mexico border to deliver their child in a U.S. hospital. After the delivery of their child the women return to their families in Mexico. A follow-up study of this "lost to follow-up/moved" group would provide valuable information about risks faced by this vulnerable population of pregnant women.

It was also found that inactive Health Start participants commonly declined the program after filling out enrollment paperwork or withdrew from the program after one or more visits from their promotoras. The Health Start program requires a degree of responsibility and participation by the client. Some enrollees did not understand this requirement at the time of enrollment, and thus they declined or withdrew from the program once they learned what it would entail.

An analysis of medical risk factors revealed that actively enrolled Health Start participants had a significantly lower prevalence of anemia than the inactive group (1.4% vs. 7.2%, *p*-value = 0.001). It is interesting that the difference was observed in two groups with such similar demographic profiles. It is possible that Health Start participants who remained active in the program had better access to nutritional supplements like iron and thus had a lower prevalence of iron-deficiency anemia. According to one Health Start Community Liaison, the promotoras she worked with had been regularly supplying her active Health Start participants with prenatal vitamins, which could account for the significantly lower rates of anemia compared to inactive participants.[9]Preterm delivery and tobacco use were also more

prevalent in the inactive Health Start group than in active participants, but neither of these variables was statistically significant. A future study utilizing a larger sample warranted in order to better elucidate the relationship between active vs. inactive Health Start participation and preterm delivery and tobacco use.

Study Limitations

The study was limited by difficulties creating a sample population. Of the 2000 randomly selected active and inactive Health Start participants, only 556 could be identified in the 2009 birth certificate registry. The poor return may be attributable to several causes. Women may have enrolled in Health Start between 2008-2010 but delivered their babies either before or after 2009. They may also have married, divorced or changed their names between their enrollment and the delivery of their child. Recording errors at either enrollment or delivery may also have attributed to the low identification rate. Regardless of the cause, the aforementioned challenges establishing a sample led to a sample size that was in many cases too small to illustrate statistically significant differences. Had the sample size

been bigger, it is likely that the study would have yielded more statistically significant conclusions.

The study was also limited by the pregnancy risk factors defined by the ADHS 2009 Birth Certificate Registry Database. In particular, there was no record of several important pregnancy risk factors, including pre-eclampsia and gestational diabetes. Information about the prevalence of said variables in the Health Start group would have been informative and useful. If a similar follow-up study is completed using a newer version of the birth certificate registry (which will record pre-eclampsia and gestational diabetes), it is recommended that the aforementioned variables be included in the study.

Conclusions

The incidence of preterm delivery was notably less for active Health Start participants compared to a control group matched by age, race/ethnicity, and method-of-payment for delivery. The prevalence of anemia was significantly less for active Health Start participants than for women who enrolled in Health Start but did not remain active in the program. Because of study limitations due to small sample size, a larger follow-up study is recommended in order to better elucidate potential relationships between other risk factor or birth outcomes and participation in the Health Start program.

Works Cited

1. Vintzileos AM, A. C. (2002). The impact of prenatal care in the United States on preterm births in the presence and absence of antenatal high-risk conditions. *Am J Obstet Gynecol* , 1254-1257.

2. Vintzileos AM, A. C. (2002). The impact of prenatal care on neonatal deaths in the presence and absence of antenatal high-risk conditions. *Am J Obstet Gynecol* , 1011-1016.

3. U.S. Dept of Health and Human Services. (n.d.). *Healthy People 2020*. Retrieved 12 12, 2011, from healthypeople.gov: http://www.healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicId=26

4. Bureau of Women's and Children's Health. (2010). *Arizona Title V MCH Needs Assessment.* Retrieved 12 12, 2011, from Arizona Department of Health Services: http://www.azdhs.gov/phs/owch/pdf/mch/Arizona%20Maternal%20Child%20Health%20Needs%20Assessment%202010.pdf

5. Bureau of Women's and Children's Health. (2005). *Title V: Maternal Child Health Five Year Needs Assessment 2005.* Retrieved 5 1, 2009, from Arizona Department of Health Services: http://www.azdhs.gov/phs/owch/pdf/mchna_2005.pdf

6. Bureau of Women's and Children's Health. (2010). *Arizona Health Start Program Policy and Procedure Manual.* Retrieved December 7, 2011, from ADHS: http://www.azdhs.gov/phs/owch/pdf/pubs/HEALTH%20START%20Policy%20Procedure%20April%202010.pdf

7. Martin JA, Hamilton BE, Ventura SJ, Osterman MK, Kirmeyer S, Mathews TJ, Wilson EW. (n.d.). *National Vital Statistics Reports: Births: Final Data for 2009*. Retrieved December 7, 2012, from CDC: http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_01.pdf

8. Behrman RE, B. A. (2007). Mortality and Acute Complications in Preterm Infants. In B. A. Behrman RE, *Preterm Birth: Causes,*

Consequences, and Prevention (pp. 313-345). Washington D.C.: National Academic Press.

9. Health Start Community Liaisons. (2011). Health Start Curriculum Update Progress Meeting. (Stump M, Rumann S, Interviewers)