**TRENDS IN PRE-TERM DELIVERIES AMONG MEDICAID WOMEN IN ALLEGHENY COUNTY**

by

**Catherine Mehta**

BA, Syracuse University, 201**1**

Submitted to the Graduate Faculty of

Health Policy and Management

Graduate School of Public Health in partial fulfillment

of the requirements for the degree of

Master of Public Health

University of Pittsburgh

2016

UNIVERSITY OF PITTSBURGH

GRADUATE SCHOOL OF PUBLIC HEALTH

This essay is submitted

by

Catherine Mehta

on

April 06, 2016

and approved by

Essay Advisor:

Gerald Barron, BS, MPH \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Health Policy and Management

Graduate School of Public Health

University of Pittsburgh

Essay Reader:

Eleanor Feingold, BS, PhD \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Associate Dean for Education

Office of the Dean

Biostatistics and Human Genetics

Graduate School of Public Health

University of Pittsburgh

Copyright © by Catherine Mehta

2016

**ABSTRACT**

Gerald Barron, MPH

**TRENDS IN PRE-TERM DELIVERIES AMONG MEDICAID WOMEN IN ALLEGHENY COUNTY**

Catherine Mehta, MPH

University of Pittsburgh, 2016

**Objective:** To determine possible health trends compared to prior years among female members of Gateway Health who all delivered prematurely from 2014-2015. Preterm birth (PTB) is a relevant public health concern due to the short and long term health effects of children born prematurely. PTB is the leading cause in the U.S. for infant mortality and newborn health complications and rates are much higher here than other developed countries. Identifying similar health trends within the Gateway member population can aid program development and targeted interventions to eventually decrease the amount of premature births in Allegheny County. Not only would this improve maternal and child health statistics in the area but also decrease associated hospital and insurance costs associated with premature birth.

**Methods:** This paper analyzed 618 female members from Gateway Health via claims information submitted during prenatal visits and time of delivery. A total of 54,455 claims were utilized to identify leading indicators for spontaneous preterm birth amongst nulliparous (first time pregnant) women. Most important risk factors are noted under DX\_1 and 2 claims and then sorted to find members who shared common risk factors indicating a possible health trend not already identified as high risk.

**Findings:** A large amount of members were found to have indicated tobaccos smoking, drug dependency, mental disorders, periodontal disease, and hypertension during at least one prenatal visits. Also the average age of preterm delivery is from ages 18-31 which is younger than previously expected.

**Conclusions:**  Allegheny County has a higher than national average rate of prenatal care visits and yet still sees high rates of preterm births. Quality of prenatal care seems to be the main issue over quantity of visits seen. A cost effective solution on part of the Medicaid insurer would be to implement better detection strategies of women who may be at high risk for preterm birth. Low cost, non-invasive tests could be cervical measuring and cholesterol testing within the first trimester. Then utilization of progesterone 17 and other intervention therapies could help decrease the amount of PTB seen in Allegheny County amongst Medicaid women.

TABLE OF CONTENTS

PREFACE ix

1.0 INTRODUCTION 1

1.1 METHODOLOGY 3

1.2 FINDINGS 4

1.4 NEXT STEPS IN RESEARCH 9

1.5 AGE, RACE, AND GESTATIONAL AGE TRENDS 9

2.0 DISCUSSION AND RECOMMENDATIONS 15

3.0 CONCLUSION 20

APPENDIX: SUPPLEMENTARY TABLES 22

BIBLIOGRAPHY 24

List of tables

Table 1. DX\_1 Top Diagnoses 4

Table 2. DX\_2 Top Diagnoses 7

Table 3. Gestational Age at Delivery 12

Table 4. DX\_3 Top Diagnoses 22

Table 5. DX\_4 Top Diagnoses 22

Table 6. DX\_5 Top Diagnoses 23

List of figures

[Figure 1. DX\_1 Top Diagnoses 5](#_Toc460580337)

[Figure 2. DX\_2 Top Diagnoses 7](#_Toc460580338)

[Figure 3. Gestational Age of Preterm Deliveries 12](#_Toc460580339)

[Figure 4. Number of Women Delivering Preterm by Age 14](#_Toc460580340)

[Figure 5. Number of Women Delivering Preterm by Age Range 14](#_Toc460580341)

preface

Thank you to Gateway Health for providing data crucial in identifying trends and outcomes amongst Medicaid women, insured by Gateway, in Allegheny County.

# Introduction

Pre-term birth (PTB) is the leading cause for infant mortality and health complications for newborns both worldwide and in the United States. While medical technology and treatment has improved significantly in recent years, PTB has actually increased more than 35% over the past 25 years [1]. Short and long-term health affects for preterm infants include physical and mental disabilities, higher rates of cerebral palsy, respiratory problems, and other chronic conditions [3]. Maternal complications are also much higher in premature births, and can result in increased risk for hemorrhage, infections, and other postpartum complications [3]. Medical advances for the care of PTB patients has decreased morbidity at delivery but unfortunately has also increased costs significantly. According to the Institute of Medicine, the U.S. estimates $26 billion spent yearly for preterm delivery, NICU admissions, and maternity care [1]. However, the financial burden does not stop at delivery but includes $32,000-$49,000 spent on medical costs throughout the first year of life [4][5]. In contrast, approximately $3,000 is spent on a full-term infant with a normal delivery [4][1].

 NICU admission is calculated to be 2-3 times more likely for infants, whose mothers are covered by Medicaid, placing a bigger cost concern for managed care companies providing Medicaid coverage. NICU length of stay averages about 20 days for 65-70% of infants born prematurely [1]. To help understand these expenditures, financial analysts have compared the average cost for a NICU admission to that of a patient admitted for spinal cord injury or a heart valve disorder [1]. In light of these increasing expenses and adverse health outcomes, many studies in recent years have addressed why PTB occurs and what can interventions target for prevention.

 Numerous risk factors are identified as associated with pre-term delivery. The three most widely screened for are; history of smoking, elderly prima or multigravida (a woman aged over 35 pregnant with first or multiple pregnancies), or had a prior history of preterm delivery [5]. The last risk factor is used as the most predictive indicator as recurrence of PTB is as high as 50% depending on the circumstances of the previous deliveries [2]. For physicians and other health officials, identifying at risk pregnancies before onset of labor, with or without the three common risk factors, is very difficult. Many proposals and cohort studies for predictive modeling have been conducted but more research and time is needed in order to understand root causes for PTB and accurately assess which women are the most at risk before their third trimester.

The purpose of this paper is to assess retrospectively a cohort of women from Allegheny County who all delivered prematurely through 2014-2015. All 618 women are covered under Medicaid and enrolled in Gateway Health, a multi-state managed care organization that delivers Medicaid and Medicare (D-SNP, C-SNP) to low-income individuals. The study will examine trends in maternal risk indicators for premature delivery, health disparity, and utilization patterns via claims data submitted during each prenatal visit or at time of delivery. This paper will attempt to discover top or emerging health trends common in this group of women and will take into consideration age, race and other variables.

## Methodology

A cohort of 618 women was analyzed using claims data submitted to Gateway insurance. Claims were collected by physician visits, the obstetrical needs assessment form (ONAF) form [6], and at delivery. A total of 54,455 claims were utilized to identify leading indicators for spontaneous preterm birth amongst nulliparous women. Women who were not undergoing their first pregnancy were omitted from this analysis due to the leading risk determinant for preterm birth is prior birth records. This analysis will attempt to identify underlying heath trends for women undergoing their first pregnancy to aid in intervention strategies targeting them specifically. Diagnoses trends were compiled by searching for high quantities of DX\_1 claims (diagnoses code 1) and DX\_2 claims (diagnoses code 2). A physician designates DX\_1 claims and typically are the most important factors derived from the visit. For instance, during an initial prenatal visit, the most important detail or risk will be noted under DX\_1 and the second most alarming detail or factor will be noted under DX\_2, DX\_3 and so on. For one member in this cohort, up to 5 claims can be made during one physician appointment. This analysis will focus on the two leading claims lines, DX\_1 and DX\_2. However, findings for the remaining three line items can be found in Appendix I. Further analysis was conducted on member age at time of delivery, race, and gestational age to identify current trends.

A search of the PubMed (<http://www.ncbi.nlm.nih.gov/pubmed>) database was conducted using search terms “((risk factor AND preterm birth) AND (Hypertension OR preeclampsia) AND (predictive modeling OR preterm prediction) AND (prenatal OR doula care) AND (preterm delivery) AND (maternal child health) AND (preterm birth complications) AND (maternal periodontitis) AND (Medicaid Maternal Child Health) AND (Medicaid preterm births))”. The search was limited to articles written in English and resulted in 104 titles for review. 77 articles were eventually excluded based on relevance or repetition of needed information. 27 scholarly articles plus two additional sources are utilized in the following report.

## Findings

After sorting the data down to DX\_1 claims, the information was further refined to omit claims such as, abdominal pain or tenderness, bleeding, fetal measurements and other claims more common in majority of normal pregnancies. Then the data was sorted to search for claims that exceeded the count of 50. This potentially identifies common factors of PTB amongst the cohort that could indicate more serious health trends. In addition, based on literature reviews and other studies, the claims were sorted by emerging health concerns such as mental disorders, drug dependency, and periodontal disease (see Table and Graph number 2). The ending results contained 434 women whose physicians denoted one or more of the claims in table 1. All 434 of these women had one or more common health factors and resulted delivering prematurely, showing possible common trends within the population.

Table . DX\_1 Top Diagnoses

|  |  |
| --- | --- |
| **Claim Description**  | **# of Members**  |
| Mental Disorder  | 22 |
| Drug Depend | 21 |
| Opioid Depend | 5 |
| Fetal DAMG D/T Drugs | 6 |
| Tobacco Use  | 8 |
| Asthma  | 8 |
| Hypertension | 49 |
| Transient Hypertension | 48 |
| BEH Complication | 29 |
| Tox w Pre-exist HTN  | 22 |
| Dental Disorder  | 7 |
| Obesity Comp | 10 |

Figure . DX\_1 Top Diagnoses

Immediately noticeable is the amount of claims for preeclampsia, hypertension, and transient hypertension. BEH Complication defines as benign essential hypertension and Tox w Pre-exist HTN means pre-eclampsia or eclampsia superimposed on pre-existing hypertension with delivery. Preeclampsia remains one of the most prevalent complications affecting pregnancies and causing early onset delivery [7]. Studies from 2014 showed an average of 5-7% PTB pregnancies were most likely a result of preeclampsia [7]. In Allegheny’s cohort of 618 preterm births from 2014-2015, over 79 members had a claim recorded for preeclampsia in third trimester, early onset preeclampsia or mild htn (hypertensive) preeclampsia. The cohort recorded over 10% experienced some form of eclampsia or preeclampsia during pregnancy and delivered prematurely. A significant factor in developing preeclampsia/eclampsia during pregnancy is high blood pressure, hypertension, and elevated BMI [7][8]. In 2004, a large study classified as much as 15% of pregnancies in the U.S. are complicated by hypertension, including eventual diagnoses of chronic and gestational preeclampsia [9]. The study went on to state, “women with chronic hypertension have an 8 fold higher risk of developing superimposed preeclampsia and are twice as likely to experience adverse neonatal outcomes”[9]. Unfortunately, there is not a national consensus on the number of pregnancies affected by hypertension or resulting in PTB at this time [7][8][9]. Due to hypertension being a leading cause for preeclampsia, this study only included hypertension and transient hypertension it its tables and graphs. The purpose is to show underlying health trends and risk factors, therefore hypertension and not preeclampsia is viewed as the more significant outcome to analyze.

Other interesting health trends seen in this PTB cohort include mental disorder and drug dependency. After passage of the Affordable Care Act, increased attention is spent on mental, behavioral disorders and drug/opioid abuse. Therefore it is no surprise to see claims relating to both issues. However, there are limitations when considering mental and drug disorders for PTB. The claims data relies on patient self-reporting and physician cataloging [6]. The ONAF is one of the most common utilized documentation by physicians to identify risk factors and understanding the whole picture surrounding a women’s health during pregnancy. The ONAF tries to be as comprehensive as possible but many times mental and drug disorders are not identified correctly or not self-reported by women fearing privacy violations or reimbursement consequences [10]. The claims noted in 2014-2015 may be a result of increased education and awareness by both physicians and patients to report certain health concerns. However, one or both issues may affect a larger number of women not designated in this cohort. More claims reported for mental health and drug use are seen under DX\_2, or the 2nd claims line. See Table and Graph 2.

Table . DX\_2 Top Diagnoses

|  |  |
| --- | --- |
| **Claims Description**  | **# of Members**  |
| Mental Disorder  | 37 |
| Drug Depend | 17 |
| Opioid Depend | 16 |
| Fetal DAMG D/T Drugs | 3 |
| Tobacco Use  | 59 |
| Asthma  | 56 |
| Hypertension | 49 |
| Transient Hypertension | 31 |
| BEH Complication | 55 |
| Tox w Pre-exist  | 12 |
| Dental Disorder  | 5 |
| Obesity Comp  | 35 |

Figure . DX\_2 Top Diagnoses

 The cohort also sees an increase in identified tobacco use (typically meaning cigarette smoking during pregnancy), asthma, obesity complication, drug or opioid dependency, and mental disorder. What is especially important to note that many of these factors are significant indicators for development of hypertension [8], which again we see as a leading DX\_2 claim. According to 2013 county statistics, 12.7% of mothers smoked at some point during pregnancy. The highest rates of smoking occurred in younger white females, aged 24 or younger, with a 31.4% rate in ages 20-24 and 36.5% in ages 19 and under [11]. However, this behavior changed to black females holding higher rates in older age brackets, highest being 24% in ages 35-39 [11]. While there are many county statistics and goals surrounding smoking cessation during pregnancy, there is very little on educating women about the affects of mental health, asthma or dental disorders during pregnancy.

 In recent years periodontal disease has emerged as a leading health area of concern in children and pregnant women [12]. Centers for Medicaid & Medicare services has designated an oral health initiative amongst all Medicaid/Medicare sponsored health plans and managed care organizations to improve access and affordability to dental insurance and services [13]. More attention is being spent on prior and current studies involving dental state and adverse pregnancy outcomes. An epidemiological study in 2006 analyzed a cohort of mostly Caucasian, higher socioeconomic status pregnant women to determine a correlation between periodontitis and preterm birth [14]. The study controlled for variables already known to increase risk of PTB, and attempted to see periodontitis as an independent risk factor. 6.4% of self-reported women in a small cohort of 1,635 with dental disease resulted in PTB [14]. Limitations to this study include error in self-reports and unawareness in patients who do not know the full state of their oral health or do not consider their poor oral health as a disease or disorder. Also, this is a preliminary epidemiological study among a small cohort of women. More similar studies suggest that there is a significant association of poor oral health and PTB among lower income, minority populations [12][14]. As a result of heightened attention on oral health, more claims are seen for periodontal disease in Table 1 and 2.

## next steps in research

The next step in this analysis is a comparative analysis between Gateway Health insured Medicaid women to all Medicaid sponsored females who delivered prematurely in Allegheny County. If similar claims are seen amongst the whole population of Medicaid women in this area, then a more narrow analysis is needed to determine if these claims are relevant health trends. The analysis should measure retrospectively the members’ health status (before and during pregnancy), prenatal care, and behavior during pregnancy. Furthermore, the identified health claims in tables 1 &2 should be compared against state statistics to determine if Allegheny County rates are different then what is being seen statewide. The March of Dimes and State Department of Health would need to be utilized, along with Medicaid insurers, in order to gather enough applicable data.

## Age, race, and Gestational Age trends

*Gestational age* is very important in understanding the full impact of health and financial costs on treating preterm births. The earlier a baby is born, the greater risk it faces in physical and mental development, extended stay in a NICU, and continued medical treatment throughout first year of life [4]. However, more studies are finding that the typical 37-week point for determining full term pregnancy is not indicative of infant maturity in certain races. A London based study involving 122,000 pregnancies with spontaneous onset of labor found a different average gestational age of delivery by ethnicity [15]. The study compared gestational length variations amongst a cohort of Black, White and Asian European women. Most notably Black, non-Hispanic, women with normal body mass index were delivering earlier, at a median rate of 39 weeks, compared to Caucasian women delivering at a median rate of 40 weeks [15]. While a one week difference may seem small to some it could have implications on reporting for Black women delivering prematurely at 37 weeks. Nationally it is recognized that Black women have significantly higher numbers of PTB compared to any other ethnicity [16]. The table below (figure 3) shows the large discrepancy between the Allegheny cohort of 618 women. Black/African American women had a total of 374 preterm deliveries in one year compared to 228 Caucasian women. The majority of preterm deliveries for both groups occurred at 37 weeks with 186 compared to 110 respectively. The London study draws attention to a key point for discussion when comparing these two ethnic groups, the point at which the baby is deemed fully mature and not premature. In various literature it is recognized that general motor skills develop in black infants earlier [17], one sign of earlier neonatal maturity but still disputable. The strongest argument for earlier maturation is the incidence of meconium passing *in utero* [16].The incidence of meconium fetal passage during labor is strongly related to gestational age and studies show an increasing rate of occurrence from 34 weeks on in white European women [16]. However, Black European women have shown neonatal meconium passage *in utero* at much earlier gestational periods indicating a stronger stance for earlier infant maturity. This line of reasoning is in line with other arguments such as small pelvic measurements in black women: a small pelvis is associated with complicated pregnancies and higher risk of preterm delivery.[18] It also provides more evidence to contribute to delivery statistics reported from many African and Caribbean countries showing a shorter gestational period amongst their populations [19].

The aim of comparing gestational lengths among ethnic groups in the Allegheny County cohort is to shed light on comparative costs and health outcomes for infants delivered at 37 weeks. There may be a significant number of black PTB deliveries at 37 weeks that result in full infant maturity and no additional medical care costs or adverse health outcomes. The difference between Caucasian and Black preterm births may not be as great from >34 weeks as current reports show [19]. More widespread studies of ethnic gestational lengths are highly needed as reported PTBs are used to determine local and national maternal health statistics, medical costs, and HEDIS scores for many insurers. Until more clarity is seen on this measurement, attention should be mainly focused on the very preterm pregnancies <32 weeks as these births bear the most NICU costs and adverse health outcomes [20]. In some studies, a consequential percentage of preterm births to African-American women are between 20 weeks and 34 weeks gestation, or nearly three times the percentage of premature births to Caucasian women [21]. In addition, African-American women were nearly four times as likely to deliver babies between 20 weeks and 28 weeks gestation than Caucasian women [21]. Clearly seen below in the figure, Black/African Americans have the most very preterm births in Allegheny County between 2014-2015. This is likely due to health disparities, prenatal care, and other risk factors besides genetic trends.

Figure . Gestational Age of Preterm Deliveries

Table . Gestational Age at Delivery

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Gestational Week @ Delivery** | **AMER INDIAN/ ALASKAN** | **BLACK/AFRICAN AMER** | **HAWAIIAN/PACIFIC IS** | **OTHER/SYSTEM DEFAULT** | **WHITE** | **Grand Total** |
| 17 |  | 1 |  |  |  | 1 |
| 21 |  | 1 |  |  |  | 1 |
| 22 |  | 2 | 1 |  |  | 3 |
| 23 |  | 3 |  |  |  | 3 |
| 24 |  | 5 |  |  | 1 | 6 |
| 25 |  | 4 |  |  | 1 | 5 |
| 26 |  | 6 |  |  | 2 | 8 |
| 27 |  | 2 |  |  | 1 | 3 |
| 28 |  | 3 |  |  | 3 | 6 |
| 29 |  | 5 |  |  | 1 | 6 |
| 30 |  | 3 |  |  | 2 | 5 |
| 31 |  | 5 |  |  | 2 | 7 |
| 32 |   | 14 |   |   | 6 | 20 |
| 33 |  | 13 |  | 1 | 3 | 17 |
| 34 |  | 22 |  |  | 21 | 43 |
| 35 | 1 | 42 |  |  | 23 | 66 |
| 36 | 1 | 57 |  | 2 | 52 | 112 |
| 37 |  | 186 | 3 | 7 | 110 | 306 |
| **Grand Total** | **2** | **374** | **4** | **10** | **228** | **618** |

*Age* is generally acknowledged as a large factor in determining likelihood of PTB. The three most utilized risk indicators for newly pregnant women are prior history of preterm delivery, smoking tobacco, and age. Typically the term multigravida or primagravida (multiple or first pregnancy at an elderly age) is used in claims for women pregnant over the age of 34. These women are then deemed at higher risk for PTB than normal. Very young ages >18 are also likewise classified at higher risk. Before analysis of this cohort was done, Gateway Health worked under the previous constitution that a large number of their preterm deliveries fell under one of the three standard, most seen characteristics of PTB. However, tables 3 and 4 show that out of the 618 women the most seen age bracket for PTB is 18-24 and 25-31, with 254 and 230 births respectively. The last birth statistics report for Allegheny County, conducted by the health department in 2013, showed overall birth rates highest among women aged 30-34 [22]. Smoking rates during pregnancy are highest among whites ages 20-24 [22] and claims for this behavior is still highly seen among premature births, refer to Tables 1 and 2. However, with a relatively high percentage of women receiving prenatal care, analysis is needed on the quality of prenatal care rather than the quantity. A more conclusive study on what health trends are linking the younger age bracket of women with premature deliveries can aid in developing new messaging or services to improve healthy pregnancies.

Figure . Number of Women Delivering Preterm by Age

Figure . Number of Women Delivering Preterm by Age Range

# Discussion and Recommendations

According to the March of Dimes 2015 Premature Report Card, Pennsylvania currently has a premature birth rate of 9.4%, falling short of the March of Dimes reduction goal of 8.1% [16]. Pennsylvania, along with 16 other states, holds a C grade and it is ranked 40 in its race and ethnicity disparity index for maternal and child health. The two major cities of PA, Philadelphia and Pittsburgh both received D grades further moving Pennsylvania down the rankings for maternal and child health [16]. Compared to the national goal of 8.1%, Pittsburgh had a premature birth rate of 10.4%. Overall Pennsylvania is currently ranked 50th in the United States for having a baby (counting the District of Columbia) [23]. The ranking takes into account budgetary costs maternal child care in the state, health outcomes, and baby friendly environment. As a result of PA’s poor performance, Allegheny County Health Department has made maternal and child health on of its top 5 health improvement goals in its 2015 Community Health Assessment [24]. Increasing prenatal care is the primary health intervention proven to aid in a healthy pregnancy. Insurers have made major efforts to develop incentive programs for new mothers to encourage early attendance and participation in all prenatal care requirements[[1]](#footnote-1). However, the Allegheny Health Department also conducts annual reporting on birth statistics showing 89% in 2013 of all mothers in Allegheny County received prenatal care within the first trimester. 8.9% of women started prenatal care in 2nd trimester, 2% in third, and only .4% of mothers received no prenatal care [22]. Focus now needs to be redirected to quality of prenatal care and additional screening tools for identifying higher risk women of spontaneous, nulliparous preterm delivery.

Alternative prenatal care options are now being considered to have positive results among Medicaid beneficiaries. Doula care in particular is associated with better birth outcomes among Medicaid women [25]. A doula is a trained professional who provides physical, emotional, and educational support to mothers before, during, and immediately after childbirth. Some insurance companies are including coverage of limited doula services in their Medicaid plans, but not all in Allegheny County are sure it’s cost effective. A preliminary study compared childbirth related outcomes for Medicaid recipients receiving doula care against outcomes from a national sample. Preterm birth rates were 6.1% amongst the doula care recipients and 7.3% in the national sample [26] suggesting a positive relation between doula care and lower rates of preterm delivery. Characteristics of women seeking doula services are lower socioeconomic status, more racially diverse, slightly older and had lower reports of gestational hypertension [25][26]. Women most likely to report that they wanted to utilize doula services but did not have access to this option are black, uninsured, or underinsured [25][26]. Doulas can be a new resource for women undergoing mental health issues or disorders, drug dependency, or lacking social support. Evidence suggests that the informal relationship between a doula and her patient increases encouragement and trust throughout the pregnancy, leading to increased self-efficacy by the mother [25]. Since there are no national standards on cost effectiveness of Doula services, it is up to insurance organizations to determine state-by-state costs savings for utilizing Doulas within their Medicaid population [26].

Along with consideration of alternative prenatal care, there are two low-cost screening tools used in prior studies that may help reduce the amount of preterm births. High blood pressure, claimed as gestational or transient hypertension, is consistently a leading reason for spontaneous delivery but it is also a common health developed seen in a vast number of pregnancies that deliver at a normal gestational week [8][9]. In a clinical study conducted by the Department of Pediatrics from the University of Iowa, predictive modeling for PTB was assessed from available clinical data and serum analytes [27]. Results concluded that serum screening markers were sufficient predictors of PTB even after controlling for maternal characteristics. Cholesterol at very low and high rates is associated with PTB, therefore testing for cholesterol during the first and second trimester may identify more women at risk for PTB and allow appropriate interventions to take place. The study collected serum measurements of pregnancy associated plasma protein (PAPP-A) and human chorionic gonadotropin (hCG) in the first trimester and estriol, AFP, inhibin A and hCG in the second trimester [27]. Relevant maternal information included education, ethnicity, race, smoking status, height, previous liver births, previous PTB, diabetes, pre-pregnancy hypertension and sexually transmitted diseases. Maternal serum was tested for the above analytes and an additional lipid panel included total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL) and triglycerides (TG) [27]. After statistical analysis the authors recorded “only first trimester cholesterol, as a continuous variable, showed a trend for association with PTB” [27]. The study identified that increased levels of cholesterol present in the first trimester of pregnancy, or a change in cholesterol measured between first and second trimesters, could be a strong indication of PTB. Since hypertension is a leading claim item seen in Tables 1 & 2, further consideration and research into serum screening tools could result in better reporting. However, limitations to the Iowan clinical study include the small sample size and demographics limit its generalizability, and there was no available validation set. However, the fact that this is a non-invasive, low-cost screening too merits its consideration for future studies and inclusion with other predictive measurements like cervical length [27][28].

Neither serum nor cervical measuring are widely used screening tools for predicting PTB [28][29]. However cervical length is increasingly noted as an accurate determining factor in early delivery. A population based prospective multicenter study involving 40,995 women in the UK utilized maternal factors and transvaginal sonographic measurement of cervical length to detect earlier rates of PTB [28]. Prior to the beginning of this trial, several small studies demonstrated that the risk of preterm delivery is inversely related to the length of the cervix. Combined data showed the detection rate for PTB (before 35 weeks) was 34% (false-positive rate of 5%) with a shorter cervix [28]. The UK based study decided to test preterm detection rates using three different methods; demographic characteristics and obstetric history, cervical measurement, and a combination of both obstetric history and cervical measurement. The objective was to predict PTB before 37 weeks and 32 weeks. Results consisted of 5.7% preterm deliveries (2,244 of 39,284 cases) of which .6% (n=235) were before 32 weeks. Findings from the three detection methods showed using an integrated method, of both maternal factors and cervical length measuring, was substantially more successful than screening with each method alone [28]. Data measured a 38% detection rate for maternal factors, 55% for cervical length and 69% for combined testing [28]. According to Gateway Health, the most used detection method for high-risk pregnancies is noting maternal factors on the ONAF. It is unknown by the insurer if individual physicians measure cervix length and if so how widespread it is used. The UK based study is one of the largest samples to measure cervical length detection methods but there are many smaller studies claiming similar positive outcomes [29]. A 69% detection rate compared to 38% utilizing maternal factors alone is a very significant difference and warrants an extensive cost – effective analysis for possible implementation among Medicaid beneficiaries. The equipment and infrastructure needed for cervical length screening are already readily available in maternity units and can be easily conducted during a routine prenatal visit [28][29].

# CONCLUSION

In this report, preliminary analysis shows possible underlying health trends amongst a cohort of Medicaid sponsored women who gave birth prematurely in 2014-2015. The report was conducted in order to shed light on certain health factors that could be affecting rates of PTB amongst Gateway female beneficiaries in Allegheny County. In addition these findings could potentially prompt continued analysis on why these factors are present and how to develop more targeted interventions. Hypertension and high blood pressure are continued factors of concern in preventing PTB. Mental disorders, drug dependency, and periodontal disease are also notable emerging health trends compared to past years within this population. The best recommendations thus far have promoted increased prenatal care and education. However, this paper proposes further research on two low cost screening tools, early cholesterol (serum) testing and measuring cervical length within the first trimester. Especially cervix length combined with maternal characteristics can help improve detection rates of PTB. While improving detection rates is a significant improvement in identifying PTB, quality of care could also be a risk factor in lowering PTB rates among Medicaid women. Doula care in particular is seeing more positive health outcomes and can be a viable, cost-effective supplement to services offered within Medicaid coverage.

Lastly, the age range of PTB is younger than previously expected highlighting the need for targeted messaging and increased focus on access to care within these age groups. Better data collection and availability is overall needed to understand causes of spontaneous preterm delivery and underlying health trends.

**APPENDIX: SUPPLEMENTARY TABLES**

Table . DX\_3 Top Diagnoses

|  |  |
| --- | --- |
| **Claims Description**  | **# of Members**  |
| Mental Disorder  | 49 |
| Drug Depend | 19 |
| Opioid Depend | 0 |
| Fetal DAMG D/T Drugs | 4 |
| Tobacco Use  | 52 |
| Asthma  | 68 |
| Hypertension | 46 |
| Transient Hypertension | 17 |
| BEH Complication | 20 |
| Tox w Pre-exist  | 2 |
| Dental Disorder  | 5 |
| Obesity Comp  | 47 |

Table . DX\_4 Top Diagnoses

|  |  |
| --- | --- |
| **Claims Description**  | **# of Members**  |
| Mental Disorder  | 55 |
| Drug Depend | 7 |
| Opioid Depend | 7 |
| Fetal DAMG D/T Drugs | 4 |
| Tobacco Use  | 54 |
| Asthma  | 50 |
| Hypertension | 26 |
| Transient Hypertension | 9 |
| BEH Complication | 15 |
| Tox w Pre-exist  | 1 |
| Dental Disorder  | 3 |
| Obesity Comp  | 37 |

Table . DX\_5 Top Diagnoses

|  |  |
| --- | --- |
| **Claims Description**  | **# of Members**  |
| Mental Disorder  | 46 |
| Drug Depend | 6 |
| Opioid Depend | 8 |
| Fetal DAMG D/T Drugs | 1 |
| Tobacco Use  | 38 |
| Asthma  | 36 |
| Hypertension | 13 |
| Transient Hypertension | 4 |
| BEH Complication | 2 |
| Tox w Pre-exist  | 1 |
| Dental Disorder  | 0 |
| Obesity Comp  | 35 |

bibliography

[1] Kornhauser, M., & Schneiderman, R. (2010, January). How Plans Can Improve Outcomes And Cut Costs for Preterm Infant Care. *Managed Care*.

[2] Goldenberg, RL. (2008, January). Epidemiology and causes of preterm birth. *The Lancet,* 371(9606), 75-84

[3] M. (2016). Long-term health effects of premature birth. Retrieved March 31, 2016, from

<http://www.marchofdimes.org/complications/long-term-health-effects-of-premature->birth.aspx#

[4] Landau, E. (2009, March 17). Study: Average preemie costs $49,000 in first year. *CNN*. Retrieved March 31, 2016, from http://www.cnn.com/2009/HEALTH/03/17/premature.babies/index.html?eref=rss\_us

[5] Vovsha et al., I. (n.d.). Predictive Preterm Birth Is Not Elusive: Machine Learning Paves the Way to Individual Wellness. *Columbia University Medical Center, Department of Obstetrics and Gynecology,* 82-89. Retrieved March 31, 2016. AAAI Spring Symposium

[6] Obstetrical Needs Assessment Form (ONAF). Retrieved from

<http://www.dhs.pa.gov/cs/groups/webcontent/documents/form/d_003632.pdf>

[7] George, E. M. (2014). New Approaches for Managing Preeclampsia: Clues From Clinical and Basic Research. *Clinical Therapeutics,* *36*(12), 1873-1881

[8] Sibai, B. M., Caritis, S. N., Hauth, J. C., Macpherson, C., Vandorsten, J., Klebanoff, M., . . . Roberts, J. (2000). Preterm delivery in women with pregestational diabetes mellitus or chronic hypertension relative to women with uncomplicated pregnancies. *American Journal of Obstetrics and Gynecology,* *183*(6), 1520-1524.

[9] Mcbride, C. A., Bernstein, I. M., Badger, G. J., Horbar, J. D., & Soll, R. F. (2015). The effect of maternal hypertension on mortality in infants 22, 29weeks gestation. *Pregnancy Hypertension: An International* *Journal of Women's Cardiovascular Health,* *5*(4), 362 366.

[10] Pickett, K. (2002). Neighborhood Socioeconomic Status, Maternal Race and Preterm Delivery A Case-Control Study. *Annals of Epidemiology,* *12*(6), 410-418.

[11] 2013 Allegheny County Birth Fact Sheet. (2016, March 17). Retrieved March 31, 2016, from http://www.achd.net/epi/pubs/pdf/2013\_Birth\_Trends\_Fact\_Sheet.pdf

[12] Pitiphat, W., Joshipura, K. J., Gillman, M. W., Williams, P. L., Douglass, C. W., & Rich Edwards, J. W. (2007). Maternal periodontitis and adverse pregnancy outcomes. *Commun Dent Oral Epidemiol Community Dentistry and Oral Epidemiology,* *0*(0).

[13] HHS ORAL HEALTH INITIATIVE 2010. (n.d.). Retrieved March 31, 2016, from http://www.hrsa.gov/publichealth/clinical/oralhealth/hhsinitiative.pdf

Department of Health & Human Services

[14] Offenbacher, S., Boggess, K. A., Murtha, A. P., Jared, H. L., Lieff, S., Mckaig, R. G., Beck, J. D. (2006). Progressive Periodontal Disease and Risk of Very Preterm Delivery. *Obstetrics & Gynecology,* *107*(1), 29 36.

[15] Patel, R. R. (2004). Does gestation vary by ethnic group? A London-based study of over 122 000 pregnancies with spontaneous onset of labour. *International Journal of Epidemiology,* *33*(1), 107-113.

[16] March of Dimes. (2015). 2015 Premature Birth Report Card. Retrieved March 31, 2016, from <http://www.marchofdimes.org/materials/premature-birth-report-card> united- states.pdf

[17] Iloeje SO, Obiekwe VU, Kaine WN. Gross motor development of Nigerian children. Ann Trop Paediatr 1991;11:33-39

[18] Aveyard P, Cheng KK, Manaseki S, Gardosi J. The risk of preterm delivery in women from different ethnic groups. Br J Obstet Gynaecol 2002;109:894-99

[19] Length of human pregnancies can vary naturally by as much as five weeks. (2013, August 3). Retrieved March 31, 2016, from https://www.sciencedaily.com/releases/2013/08/130806203327.htm Oxford University Press (OUP)

[20] Krans, E. E., & Davis, M. M. (2014). Strong Start for Mothers and Newborns. *Current Opinion in Obstetrics and Gynecology,* *26*(6), 511-515.

[21] Washington University School of Medicine. "African-American Mothers More Likely To Deliver Prematurely, Missouri Study Finds." Science Daily. Science Daily, 12 February 2007. <www.sciencedaily.com/releases/2007/02/070209074144.htm>.

[22] 2013 Allegheny County Birth Fact Sheet. (2016, March 17). Retrieved from http://www.achd.net/epi/pubs/pdf/2013\_Birth\_Trends\_Fact\_Sheet.pdf

[23] Bernardo, R. 2015’s Best and Worst States to Have a Baby. (2015). *Wallethub.* Retrieved from https://wallethub.com/edu/best-and-worst-states-to-have-a-baby/6513/#

[24] Allegheny County Health Department. (2015). 2015 Community Health Assessment. Retrieved March 31, 2016, from <http://www.achd.net/cha/CHA_Report-> Final\_42815.pdf

[25] Kozhimannil, K. B., Hardeman, R. R., Attanasio, L. B., Blauer-Peterson, C., & O’Brien, M. (2013). Doula Care, Birth Outcomes, and Costs Among Medicaid Beneficiaries. *Am J Public Health American Journal of Public Health,* *103*(4).

[26] Kozhimannil, K. B., Hardeman, R. R., Alarid-Escudero, F., Vogelsang, C. A., Blauer Peterson, C., & Howell, E. A. (2016). Modeling the Cost-Effectiveness of Doula Care Associated with Reductions in Preterm Birth and Cesarean Delivery. *Birth,* *43*(1), 20-27.

[27] Alleman, B. W., Smith, A. R., Byers, H. M., Bedell, B., Ryckman, K. K., Murray, J. C., & Borowski, K. S. (2013). A proposed method to predict preterm birth using clinical data, standard maternal serum screening, and cholesterol. *American Journal of Obstetrics and Gynecology,* *208*(6).

[28] To, M. S., Skentou, C. A., Royston, P., Yu, C. K., & Nicolaides, K. H. (2006). Prediction of patient-specific risk of early preterm delivery using maternal history and sonographic measurement of cervical length: A population-based prospective study. *Ultrasound in Obstetrics and Gynecology Ultrasound Obstet Gynecol,* *27*(4), 362-367.

[29] Kuhrt, K., Smout, E., Hezelgrave, N., Seed, P. T., Carter, J., & Shennan, A. H. (2016). Development and validation of a tool incorporating cervical length and quantitative fetal fibronectin to predict spontaneous preterm birth in asymptomatic high-risk women. *Ultrasound Obstet Gynecol Ultrasound in Obstetrics & Gynecology,* *47*(1), 104-109.

1. Insurance companies have developed incentive programs not only to compete for member enrollment but also to encourage members to attend all prenatal appointments. For example; Gateway offers a Moms Matter program that a pregnant member can acquire a new stroller or baby play pen if all prenatal appointments are completed. UPMC and other insurance companies offer similar rewards programs. [↑](#footnote-ref-1)