



# Predicting Maternal Well-Being Outcomes for Washington State's TANF Population

Deleena Patton, PhD • Qinghua Liu, PhD • Barbara E.M. Felver, MPA

Report to DSHS Economic Services Administration, Office of the Assistant Secretary and the Economic Services Administration, Community Services Division

**R**DA completed an initial TANF Maternal Well-Being study in 2019 that described the population of women who gave birth while receiving Temporary Assistance for Needy Families (TANF). This follow-up study uses a predictive modeling approach to identify factors related to well-being outcomes for women who give birth while receiving TANF, and outcomes for their babies. We found that models using linked administrative data could adequately predict two outcomes of interest: infant out-of-home placement within the first year of life and the mother's use of the emergency department in the 12 months following the birth. This report discusses the findings from the predictive models and makes recommendations on how they can inform prevention and case management services.

## Key Findings

### 1. Several factors predicted out-of-home placement of infants born to mothers receiving TANF.

Factors associated with increased likelihood of out-of-home placement included maternal homelessness or housing instability, criminal justice involvement, substance use treatment need, smoking during pregnancy, having had two or more previous births, receiving disability services, and recent child welfare involvement.

**Recommendation:** Women with these risk factors who receive a Pregnancy to Employment assessment or who add an infant to their TANF assistance unit should be prioritized for prevention services such as home visiting, and for stabilization services such as housing assistance and substance use treatment. All of these supportive services involve Community Services Division (CSD) referrals to outside providers.

### 2. Over one-quarter (28 percent) of women who gave birth while on TANF visited the emergency department (ED) for outpatient treatment more than once in the 12 months following the birth, and a number of risk factors were associated with ED utilization.

Unsurprisingly, women who used the ED for outpatient services in the year prior to the birth had high rates of using the ED for outpatient services after the birth. Other factors that increased the likelihood of multiple outpatient ED visits included a diagnosis of chronic hypertension, high medical risk score, and indicators of mental health treatment need (e.g. diagnosis or prescription).

**Recommendation:** Women receiving TANF who give birth should be connected to primary care and specialty services, especially women with health issues such as hypertension and mental health diagnoses, so that health conditions can be managed without the need for emergency services. TANF women who give birth and have chronic health issues may also be prioritized for health care coordination through the Health Care Authority.

## Study Design

The cohort for this study consisted of 6,921 women who were TANF recipients during any month in Calendar Year (CY) 2015 who also gave birth in CY 2015 and were enrolled in Medicaid in any month of CY 2015. Only women with a live birth were included in the cohort. This study relied on integrated service and outcome information contained in the DSHS Integrated Client Databases (ICDB) as well as birth certificate and maternal/child health information contained in the First Steps Database (FSDB).

**Maternal factors** were measured at the time of the birth using the FSDB and included mother’s age, timing of prenatal care, smoking during pregnancy, number of prior births, maternal education, marital status, pregnancy weight gain, gestational diabetes, and gestational hypertension.

**Administrative data measures** were categorized as recent (measured in the 12 months prior to the birth) or childhood (measured when the mothers were under age 18).<sup>1</sup>

- **Recent factors** included domestic violence, criminal justice involvement, receipt of disability services, child welfare involvement, mental health treatment need, substance use treatment need, opioid use disorder diagnosis, high medical risk score, homelessness or housing instability, multiple injury treatment visits, multiple outpatient ED visits, diabetes, hypertension, Working Connections Childcare (WCCC) participation, limited English proficiency and number of accumulated adult TANF months as of the birth.
- **Childhood factors** included each of the following, measured during childhood: any TANF use, child welfare involvement, out-of-home placement, behavioral health need, criminal justice involvement, and homelessness.

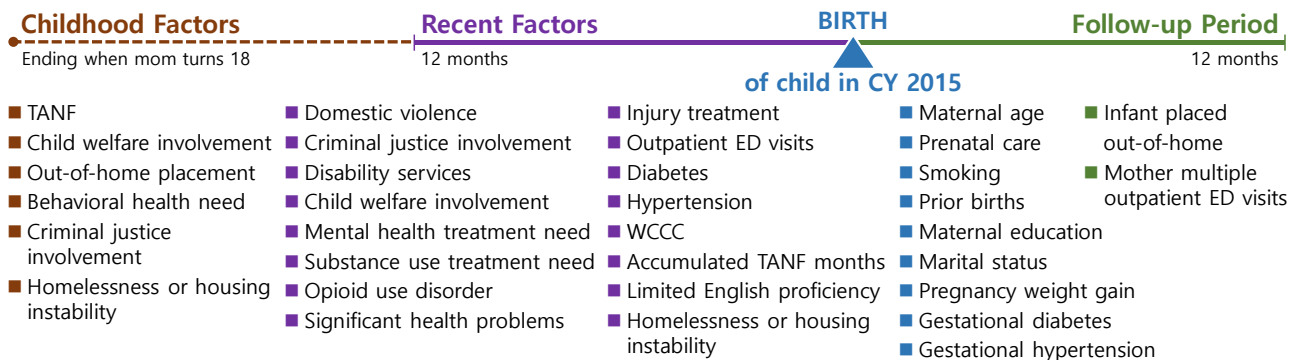
We used all of the factors in five separate models to predict five outcomes:

- Low birth weight as measured on the birth certificate
- Depression diagnosis in the 12 months following birth
- Infant out-of-home placement in the 12 months following birth
- Infant multiple outpatient ED visits in the 12 months following birth
- Mother multiple outpatient ED visits in the 12 months following birth

The performance of predictive models can be assessed with the c-statistic. A c-statistic above 0.7 indicates good prediction while a c-statistic above 0.80 indicates very good prediction. Only two predictive models had high enough c-statistics to indicate good prediction: *Infant out-of-home placement* ( $c = 0.85$ ) and *mother multiple outpatient ED visits* ( $c = 0.73$ ). Therefore, the rest of this report will focus on these two outcomes.

FIGURE 1

### Study Timeline



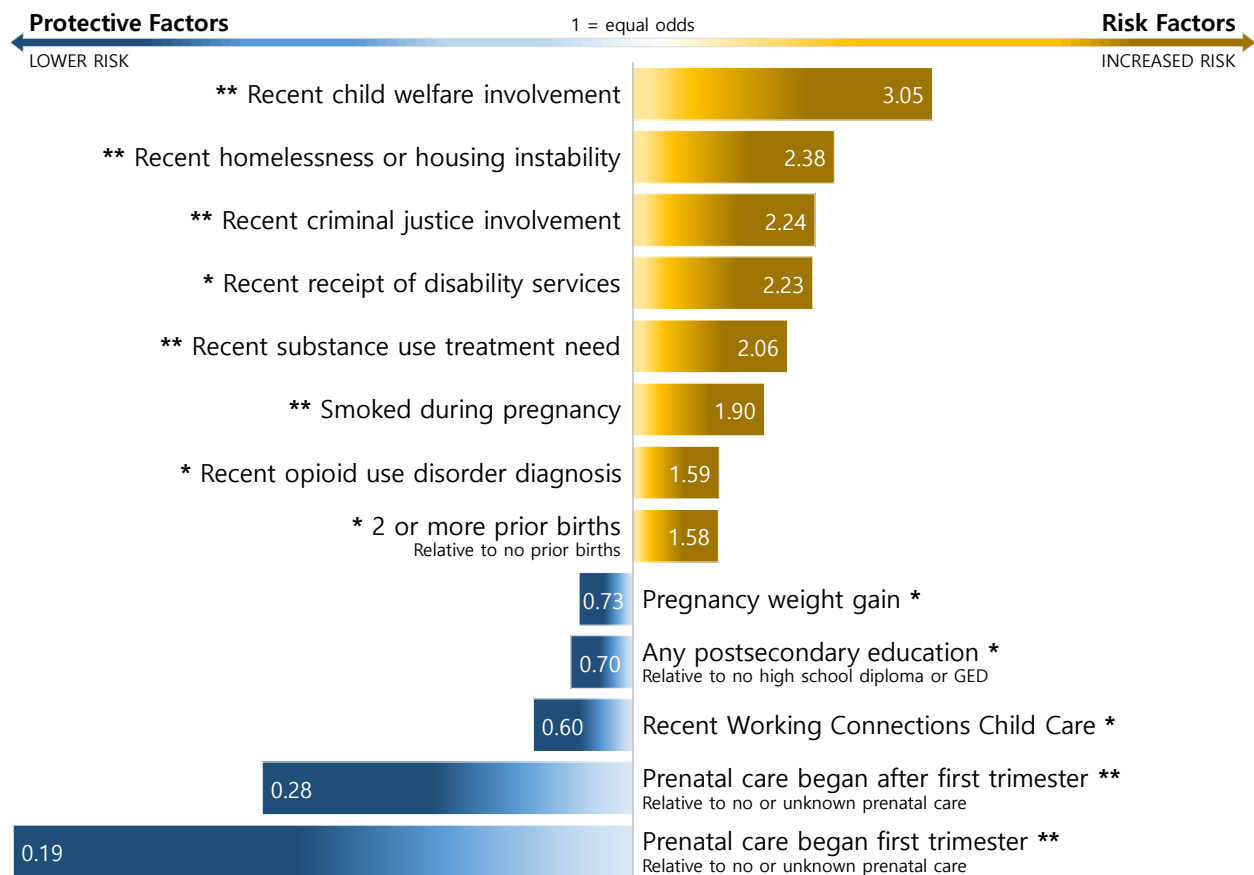
<sup>1</sup> Childhood measures were only available for a subset of mothers; see additional information in Technical Notes.

## Infant Out-of-Home Placement

Overall, 8 percent of infants were placed out-of-home within 12 months of birth. A number of factors were associated with the odds of an infant being placed out-of-home within 12 months of delivery (Figure 2). Controlling for all other factors in the model, the odds that mothers with recent child welfare involvement had their infant removed was three times higher than the odds for mothers without recent child welfare involvement (odds ratio (OR) = 3.05).<sup>2</sup> The following factors were associated with a 2-fold to 2.5-fold increase in odds: homelessness (OR = 2.38), criminal justice involvement (OR = 2.24), receipt of disability services (OR = 2.23), and substance use treatment need (OR = 2.06). Factors associated with a 1.5-fold to 2-fold increase in odds included smoking during pregnancy (OR = 1.90), having a diagnosed opioid use disorder (OR = 1.59), and having two or more previous births (OR = 1.58). Factors associated with reduced odds of infant removal included timely prenatal care (OR = 0.19 for care beginning in first trimester and OR = 0.28 for care beginning after first trimester), using Working Connections Childcare (WCCC) (OR = 0.60)<sup>3</sup>, any postsecondary education (OR = 0.70), and pregnancy weight gain (OR = 0.73).

FIGURE 2

### Factors Associated with *Infant Out-of-Home Placement* within 12 Months of Delivery



Only statistically significant odds ratios (OR) are shown. OR greater than 1 indicates higher risk. OR less than 1 indicates lower risk.

\* = Statistically significant at p < .05 | \*\* = Statistically significant at p < .001

<sup>2</sup> Since recent child welfare involvement was measured in the 12 months prior to birth, it would have involved another child in the household.

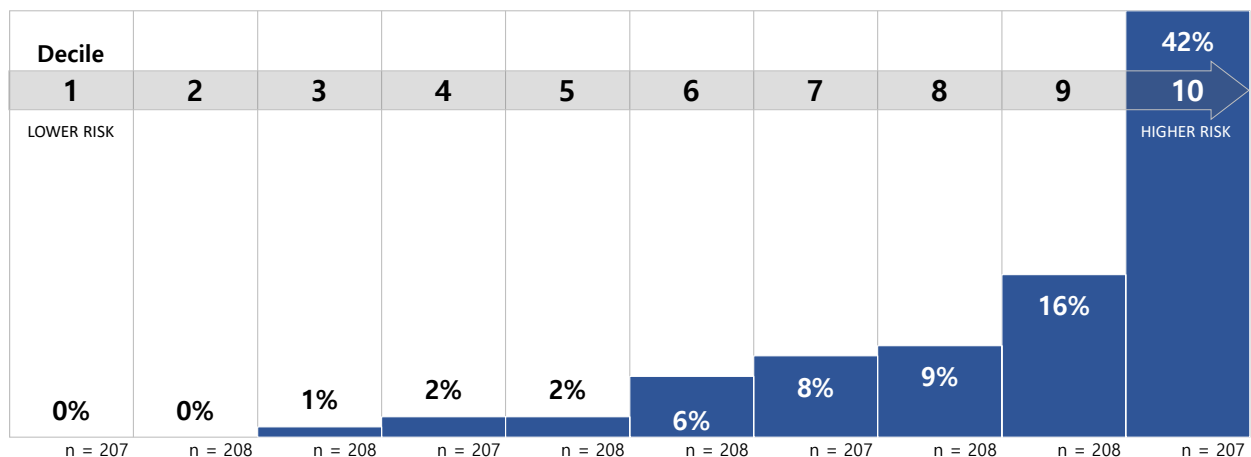
<sup>3</sup> To be eligible for WCCC, a parent must be employed, self-employed, or meeting all requirements of TANF/WorkFirst. Therefore, the effect of WCCC may be influenced by a correlation with employment or WorkFirst activity participation, which was not controlled for in the model.

It is notable that none of the childhood factors measured before the mother turned 18 were associated with infant out-of-home placement, net of recent risk indicators. While childhood factors were associated with infant out-of-home placement in bivariate comparisons (see Appendix), when more recent factors were included in a multivariate predictive model, childhood factors were not significantly related to *infant out-of-home placement*. This suggests that factors measured proximate to the birth are better predictors than historical factors for *infant out-of-home placement*.

To confirm the fit and performance of this predictive model, we fit the model on 70 percent of the data (N = 4,845) in order to preserve 30 percent (N = 2,076) for out-of-sample testing. For this test, each observation was given a risk score from 0 to 1, which corresponded to the predicted probability of the outcome based on observed factors. These predicted probabilities were then compared to the actual observed outcome (Figure 3). Mothers in the top decile (the 10 percent of mothers with the highest risk scores) were the most likely to have their infants placed out-of-home within 12 months of delivery: 42 percent. This placement rate is 82 times higher than the rate in the lowest decile (0.48 percent). This analysis indicates strong model performance.

FIGURE 3

### Percent of TANF Moms who had an Infant Placed Out-of-Home by Risk Decile



## Mother Multiple Outpatient Emergency Department Visits

Overall, 28 percent of mothers visited the emergency department (ED) more than once in the 12 months following delivery. High utilization of the ED for outpatient services is an indicator of a lack of access to primary care and unmanaged chronic health conditions.

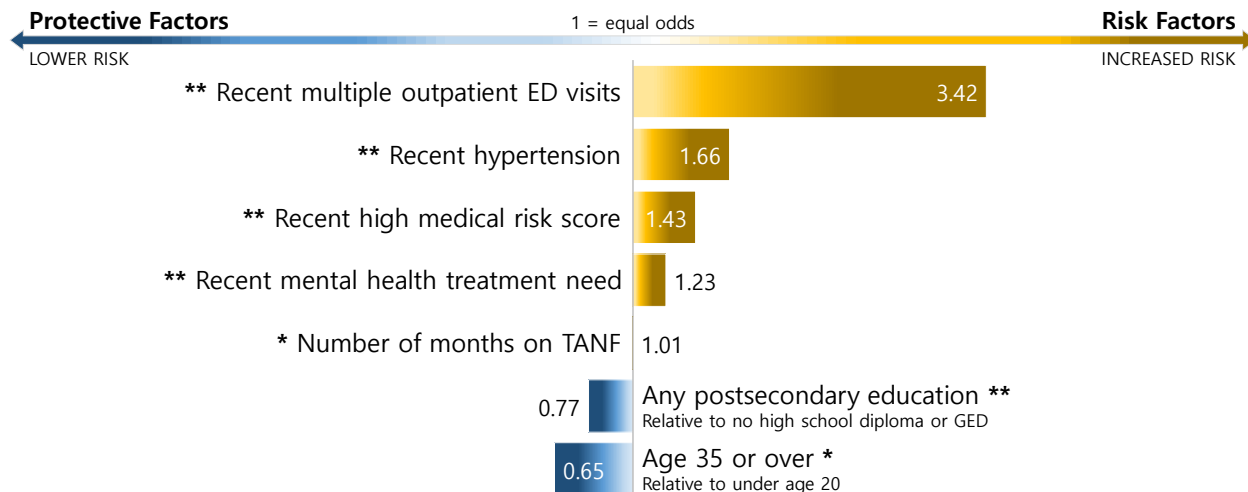
Unsurprisingly, mothers who have a history of high ED utilization prior to giving birth have elevated odds of high utilization after delivery (see Figure 4). Controlling for all other factors in the model, mothers who visited the ED for outpatient treatment two or more times in the 12 months prior to delivery had over 3 times higher odds of visiting the ED for outpatient treatment more than once in the 12 months following delivery (OR = 3.42). Other factors that increase odds of multiple outpatient ED visits included a diagnosis of hypertension (OR = 1.66), a medical risk score of greater than 1.0 (OR 1.43), and having a mental health treatment need (OR = 1.23).

The number of TANF months accumulated toward the 60-month time limit was also associated with higher odds of a mother having multiple outpatient ED visits; for every 12 months of TANF accumulated, the odds of more than one outpatient ED visit increased by about 7% (OR = 1.01 per month). Factors associated with reduced odds of more than one outpatient ED visit include maternal age over 35 (OR = 0.65) and any postsecondary education (OR = 0.77).

As observed with the *infant out-of-home placement* outcome, *mother multiple outpatient ED visits* was not related to the mother's childhood factors when factors proximate to the birth were included in the model. This suggests recent information is more useful when predicting utilization of the ED for outpatient services.

FIGURE 4

### Factors Associated with *Mother Multiple Outpatient ED Visits* 12 Months after Delivery

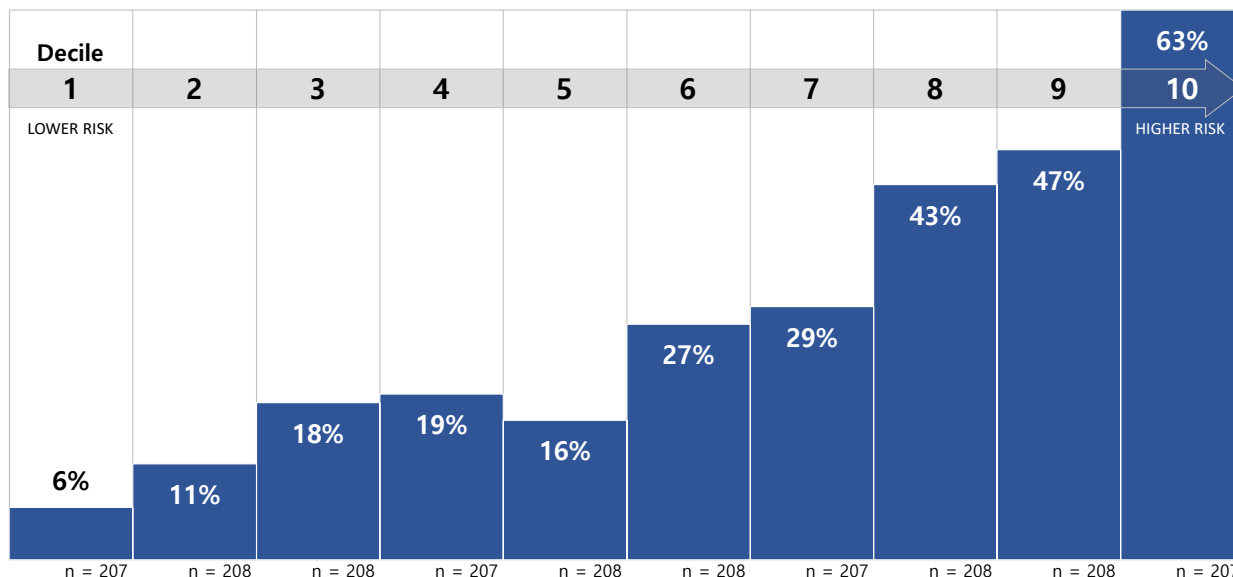


Only statistically significant odds ratios (OR) are shown. OR greater than 1 indicates higher risk. OR less than 1 indicates lower risk.  
 \* = Statistically significant at  $p < .05$  | \*\* = Statistically significant at  $p < .001$

To confirm the fit and performance of the model predicting *mother multiple outpatient ED visits*, we conducted the same out-of-sample testing procedure as for *infant out-of-home placement* (Figure 5). Mothers in the top decile (the 10 percent of mothers with the highest risk scores) were the most likely to visit the ED for outpatient treatment more than once: 63 percent. This multiple ED visit rate is 10 times higher than the rate in the lowest decile (6 percent). This indicates strong model performance.

FIGURE 5

### Percent of TANF Moms who had Multiple Outpatient ED Visits by Risk Decile



## Discussion

These analyses indicated that two outcomes for mothers who give birth while on TANF could be predicted using integrated administrative data: *infant out-of-home placement* and *multiple outpatient ED visits*. Some suggestions for incorporating the information from these analyses into practice are outlined below. Many of the supportive services recommended are not provided directly by CSD, but CSD provides the connection to services through referral. To make referrals the most effective, CSD staff must be skilled in coaching case management to help pregnant and new moms to set their own goals and to make warm referrals to service providers. Further, the collaboration of agencies and partners from other systems such as the Health Care Authority and Department of Children, Youth, and Families will be required to create an integrated network of supports that collectively meet the diverse needs of new mothers to offer the best chance at a healthy start.

- **Make supportive services available to pregnant women and those who have recently given birth.**

CSD should consider providing additional supportive case management or home visiting services to pregnant mothers and those who have recently given birth who have the risk characteristics outlined in the report. While CSD is not notified when a mother on TANF becomes pregnant unless the mother discloses that information, CSD may consider periodic communications about services available to pregnant mothers on TANF, allowing women who become pregnant to opt into services CSD believes could be helpful. Given the factors most associated with infant out-of-home placement, supportive services for mothers should include substance use treatment, housing supports, and legal help. All of these supportive services require CSD to refer to other systems, so caseworkers should establish good coaching communication skills and strive to make warm referrals to providers.

Education about child development, and prenatal development in particular, could be offered to all families on TANF, regardless of current pregnancy status, to encourage mothers to seek early prenatal care should they become pregnant during or after their time on TANF, as timely prenatal care is a strong protective factor for *infant out-of-home placement*.

Families could also be encouraged to enroll children in Working Connections Child Care, as these analyses provides some evidence that the program may have a protective impact for future children.

- **Identify and address barriers faced by pregnant women and those who have recently given birth to accessing primary care and managing health conditions.**

Receiving primary and preventative care treatment is associated with better health outcomes for individuals and reduced costs to healthcare systems. Therefore, CSD may use the Pregnancy to Employment assessment to connect mothers with primary care in the prenatal and postpartum period, assess the barriers to the mothers' use of primary care physicians, and strategize ways to overcome those barriers. CSD should especially focus on mothers who indicate that they already tend to seek care in emergency rooms and those with mental health needs, disabling conditions, or hypertension. High-risk mothers could also be prioritized for health care coordination and case management resources through the Health Care Authority, when available.

Prevention of infant out-of-home placement, promoting healthy prenatal development, and supporting maternal health through connections to primary care could be integrated into TANF's focus on self-sufficiency in order to more holistically support families.

## APPENDIX

### APPENDIX TABLE

## Prevalence of Predictive Factors and Bivariate Relationships Between Predictive Factors and Outcomes

Full Sample of TANF Moms		Comparison of Outcomes Across TANF Moms with and without Each Factor			
	Percent of ALL MOMS with factor	OUTCOME 1: Percent with <i>infant out-of-home placement</i> within 12 months after birth		OUTCOME 2: Percent with <i>mother multiple outpatient ED visits</i> within 12 months after birth	
Overall percentage with outcome		8%		28%	
<b>BIRTH CERTIFICATE FACTORS</b>		With factor	Without factor	With factor	Without factor
Age 20 or younger	20%	6%	9%	34%	27%
Age 21 to 34	73%	9%	7%	28%	30%
Age 34 or older	7%	9%	8%	19%	29%
No or unknown prenatal care	9%	23%	8%	26%	29%
Prenatal care began first trimester	51%	5%	12%	30%	27%
Prenatal care began after first trimester	40%	10%	8%	28%	29%
Smoked during pregnancy	28%	17%	5%	34%	26%
0 prior births	40%	6%	10%	27%	29%
1 prior birth	27%	8%	9%	30%	28%
2 or more prior births	31%	12%	7%	29%	28%
No high school diploma or unknown education	30%	11%	8%	33%	28%
High school diploma or GED	37%	8%	8%	28%	29%
Any postsecondary education	33%	6%	9%	25%	30%
Not married	78%	9%	6%	29%	25%
Pregnancy weight gain	69%	8%	10%	28%	29%
Gestational diabetes	6%	5%	9%	27%	29%
Gestational hypertension	7%	9%	8%	32%	28%
<b>RECENT MEASURES (12 months prior to birth)</b>					
Recent domestic violence	6%	16%	8%	36%	28%
Recent criminal justice involvement	16%	23%	6%	33%	28%
Recent receipt of disability services	1%	12%	8%	34%	28%
Recent child welfare involvement	15%	23%	6%	38%	27%
Recent mental health treatment need	36%	12%	7%	38%	23%
Recent substance use treatment need	22%	22%	5%	36%	26%
Recent opioid use disorder diagnosis	7%	28%	7%	32%	28%
Recent high medical risk score	44%	10%	7%	40%	20%
Recent homelessness or housing instability	44%	14%	4%	33%	25%
Recent multiple injury treatments	13%	13%	8%	44%	26%
Recent multiple outpatient ED visits	33%	9%	8%	50%	18%
Recent diabetes	4%	4%	9%	31%	28%
Recent hypertension	5%	11%	8%	47%	28%
Recent working connections child care	15%	5%	9%	31%	28%
Limited English proficiency	4%	1%	9%	16%	29%
<b>CHILDHOOD MEASURES (prior to mom's 18<sup>th</sup> birthday)</b>					
Any childhood TANF use	40%	10%	7%	36%	23%
Any childhood child welfare involvement	39%	11%	7%	37%	23%
Any childhood out-of-home placement	10%	16%	8%	39%	27%
Childhood behavioral health diagnosis	28%	11%	8%	38%	25%
Childhood criminal justice involvement	12%	15%	8%	37%	27%
Childhood homelessness or housing instability	30%	10%	8%	36%	25%



### STUDY DESIGN AND OVERVIEW

This study used a predictive modeling approach to identify factors related to outcomes for women who give birth while on Temporary Assistance for Needy Families (TANF). The cohort for this study consisted of 6,921 women who were TANF (or State Family Assistance) recipients during any month in Calendar Year (CY) 2015 who also gave birth in CY 2015 and were enrolled in Medicaid in any month of CY 2015. Only women with a live birth were included in the cohort.

The predictive models used logistic regression on 70 percent of observations to preserve a holdout sample of 30 percent of observations to test out-of-sample prediction. After assessing for multicollinearity and excluding variables highly correlated with another variable, all remaining factors were included in the model. Coefficients from the logistic regression on the 70 percent sample were then applied to the 30 percent sample to assess predictive accuracy using the c-statistic as outlined below.

The performance of predictive models can be assessed with the c-statistic. A c-statistic above 0.7 indicates a good prediction while a c-statistic above 0.8 indicates a very good prediction. While we predicted five different outcomes, only two outcomes had c-statistics from the out-of-sample test of an adequate magnitude to indicate good prediction. Below are all the outcomes we modeled; the two outcomes in bold type had c-statistics above 0.70 and were therefore the focus of this report. The c-statistics for the other outcomes are included for reference.

Outcomes (c-statistics for 30 percent out-of-sample tests)

- Low birth weight as measured on the birth certificate (c = 0.62)
- Maternal depression diagnosis in the 12 months following birth (c = 0.56)
- **Infant placed into out-of-home placement in the 12 months following birth (c=0.85)**
- Infant multiple outpatient ED visits in the 12 months following birth (c = 0.66)
- **Mother multiple outpatient ED visits in the 12 months following birth (c = 0.73)**

### DATA SOURCES AND MEASURES

This study relied on integrated service and outcome information contained in the DSHS Integrated Client Databases (ICDB) as well as birth certificate and maternal/child health information contained in the First Steps Database (FSDB). The ICDB are a collection of longitudinal databases with two decades of detailed risk, service utilization, expenditure, and outcome data for clients across multiple Washington State social service and health agencies. FSDB links the vital records (births and deaths) from Washington State Department of Health and Medicaid clients' claims and encounters from Washington's Health Care Authority.

We constructed predictive factors from two sources 1) the long-form birth certificate and 2) longitudinal integrated administrative data.

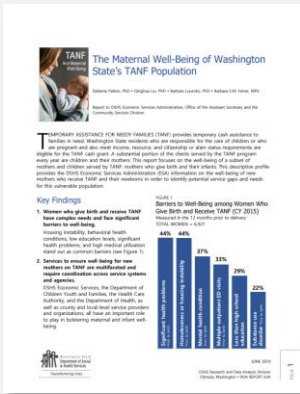
**Maternal factors** were measured at the time of the birth using the FSDB and included the following: mother's age, level of prenatal care, smoking during pregnancy, number of prior births, maternal education, mother's marital status, pregnancy weight gain, gestational diabetes, and gestational hypertension. Pregnancy weight gain is an FSDB-derived measure that compares weight gained during pregnancy to the Institute of Medicine (IOM) standard and codes whether the weight gain met that standard (value of 1) or did not meet the standard (value of 0).

**Administrative data measures** included recent measures, measured in the 12 months prior to the birth, and childhood measures, measured when the mothers were under age 18. Note that some women could not be observed for childhood measures because longitudinal data in the ICDB only goes back to 1997 resulting in an undercount of childhood measures for older women. We ran the same models with only mothers who were under age 25 as a sensitivity analysis and results remained consistent. For a small number of women who gave birth under age 18 (2% of the sample) childhood and recent measures overlap.

- **Recent measures**
  - Domestic violence (DV) was identified from the Automated Client Eligibility System (ACES) data warehouse, including DV identified in the comprehensive evaluation, participation in the address confidentiality program, or being granted permission not to cooperate with Division of Child Support due to DV or from DV arrests or convictions of the mother.
  - Criminal justice involvement was identified using arrest records from the Washington State Patrol and conviction records from the Administrative Office of the Courts.



- Receipt of disability services was identified using Developmental Disabilities Administration and Division of Vocational Rehabilitation service records or from eligibility for disability-related Medicaid.
  - Child welfare involvement was identified using service and case information contained in FamLink, DCYF's child welfare case management system, to identify women with involvement with any child welfare intake, program, or case management.
  - Mental health treatment need was identified using mental health-related diagnosis, prescription, and treatment records contained in the ICDB.
  - Substance use treatment need was identified using substance use-related diagnosis, prescription, and treatment records from medical claims data and substance-related arrests from Washington State Patrol, all contained in the ICDB.
  - Opioid use disorder diagnosis was identified using diagnosis codes related to abuse of opioids found in medical claims.
  - High medical risk score was identified using diagnosis and prescription information to score individuals on their medical risk. A score of greater than one indicates predicted medical costs above the average Supplemental Security Income (SSI) recipient and is a proxy for poor health.
  - Homelessness or housing instability was identified using living arrangement codes found in the ACES data warehouse.
  - Multiple injury treatment visits was defined as two or more injury treatment visits and was identified using medical claim information contained in the ICDB.
  - Multiple outpatient ED visits was defined as two or more outpatient ED visits and was identified using medical claim information contained in the ICDB. Outpatient ED visits are a proxy for using the ED for primary care and/or care that could have been prevented by use of primary care.
  - Diabetes was identified using diagnosis information from medical claims related to diabetes, one component of the medical risk score outlined above. The diagnosis code set did not include codes for gestational diabetes, so this measure more closely aligns with ongoing, non-pregnancy-related diabetes.
  - Hypertension was identified using diagnosis information from medical claims related to hypertension, one component of the medical risk score outlined above. The diagnosis code set did not include codes for gestational hypertension, so this measure more closely aligns with ongoing, non-pregnancy-related hypertension.
  - Working Connections Child Care (WCCC) participation was identified using WCCC payment records from the Social Service Payment System (SSPS). WCCC and SSPS are both overseen by DCYF.
  - Number of accumulated TANF months as of the birth: TANF tics tally the number of months of the 60-month lifetime time limit an individual has expended. TANF tics were measured using benefit information from the ACES data warehouse. Adult TANF recipients who reach the 60 month time limit are ineligible for further TANF benefits, unless they qualify for a TANF time limit hardship extension category. See WAC 388-484-0006 for TANF time limit extension categories and policies. Only months accumulated while an adult on a TANF assistance unit are counted in this measure.
- **Childhood measures**
    - Any childhood TANF use was identified using longitudinal service records in the ICDB.
    - Childhood child welfare involvement was identified using longitudinal child welfare service records contained in the ICDB and includes any involvement with any child welfare intake, program, or case management.
    - Childhood out-of-home placement was identified using out-of-home placement case records in the ICDB.
    - Childhood behavioral health need was identified using longitudinal service records in the ICDB and included both mental health and substance use need as outlined above.
    - Childhood criminal justice involvement included arrests and convictions as outlined above.
    - Childhood homelessness was identified using living arrangement codes from the ACES data warehouse as outlined above.



## RELATED FINDINGS

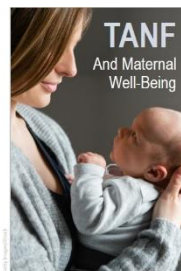
### The Maternal Well-Being of Washington State's TANF Population

Patton, Liu, Lucenko, Felver

JUNE 2019

Provides information on the well-being of new mothers who receive TANF and their newborns to identify potential service gaps and needs for this population. Findings indicate that women who give birth and receive TANF have complex needs and face significant barriers to well-being including housing instability, behavioral health conditions, low education levels, and significant health problems. Given these needs, services to ensure well-being for new mothers on TANF are multifaceted and require coordination across service systems and agencies.

<https://www.dshs.wa.gov/rda>



REPORT CONTACT: Alice Huber, PhD, 360.902.0707

VISIT US AT: <https://www.dshs.wa.gov/rda>

#### ACKNOWLEDGEMENT

We want to acknowledge the work of our colleagues throughout the research and data analysis division and our partner programs for all the work they do in serving Washington's vulnerable populations.