Evaluation of 2021 Mississippi Medicaid Population Health Demonstration Project

Center for Community Research and Evaluation
University of Memphis
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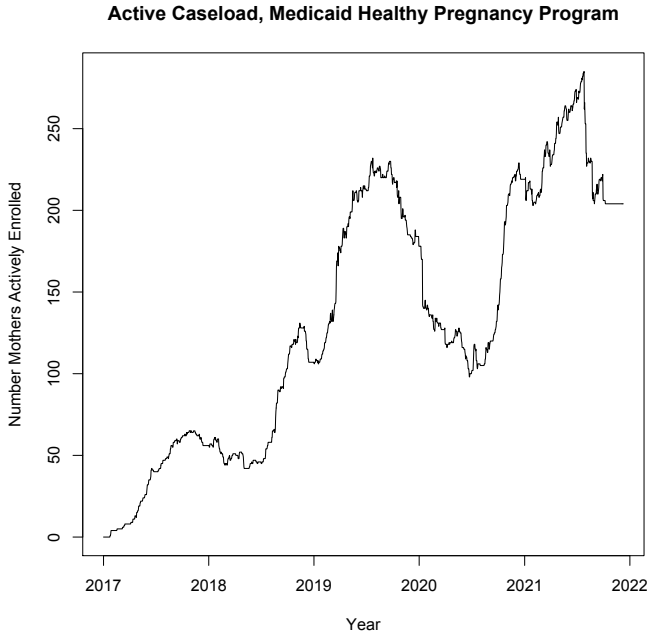
Per request of Delta Health Alliance, the Center for Community Research and Evaluation conducted an evaluation of certain components of the Mississippi Medicaid Population Health Demonstration Project to support its annual reporting to the state. The Project consists of two programs, the Healthy Pregnancy Program and Prediabetes Program, evaluated in turn. This evaluation consists of a descriptive analysis of enrollment and program activity patterns, calculates outcomes relating to key maternal and population outcomes, and for the Prediabetes Program, addresses the research question of estimating point estimates and statistical significance (relative to zero) for changes in BMI, hemoglobin A1c, diastolic blood pressure, and systolic blood pressure, between baseline and one year after intervention.

Healthy Pregnancy Program

As of December 9, 2021, a total of 1,148 mothers[1] have been enrolled in the Healthy Pregnancy Program. The total number of enrollments is 1,176. This includes mothers who enrolled more than once due to multiple pregnancies or, rarely, returning to the program after prolonged disengagement.[2] The number of new enrollments initiated by year is tabulated below:

2017	2018	2019	2020	2021
87	153	332	290	314



[1] The term "mother" is intended to include pregnancy.
[2] Enrollment data is sourced from the program roster file. For technical reasons, usually due to accidental dismissal later corrected, there were rare cases in which a woman had more than one enrollment with the same start date; in these cases, the duplicate erroneous enrollments were dropped.

The number of women actively enrolled in the intervention as of December 9, 2021 is 204. This is high historically: the active caseload (number of women enrolled on any particular day) is visualized above.

Program activities for enrolled participants of the Healthy Pregnancy Program are tabulated below.[3]

	Home visits	**Video conferences**	**Phone calls**	**Hospital/office visit**	**Education**	**Total**
2017	454	0	269	6	21	750
2018	676	0	276	2	26	980
2019	2,015	0	43	12	43	2,113
2020	995	366	280	0	43	1,684
2021	1,905	120	532	37	40	2,634
Total	6,045	486	1,400	57	173	8,161

To provide an indicator of the amount of substantive intervention a typical participant receives, the total number of home visits and video conferences per year is divided by the daily average of the active caseload for each year. The results are tabulated below. The caseload served by the program is at a record high in 2021. The amount of intervention received per participant, while still robust, is slightly lower than the historical average.

	Total # Home Visits/Video Conferences	Active Caseload, Daily Average	Home Visits/Video Conferences per Person
2017	454	35.2	12.9
2018	676	72.3	9.3
2019	2,015	186.8	10.8
2020	1,361	143.0	9.5
2021	2,025	230.0	8.8

Maternal outcomes are evaluated using self-report data provided by program participants. Outcomes are collected on assessment tools which vary over the course of the intervention. The tools (data as of October 15, 2021) are combined together with overlapping data removed. We calculate the incidence of preterm birth (<37 weeks gestation), low birthweight (<88 ounces) and very low birthweight (<54 ounces). Program rates are reported below. We also include the benchmark relating to the state rates of each measure for Black women. We also conduct a binomial test (z-test) to determine whether there is a statistically identifiable difference between the program rate and the benchmark rate and report the p-value. While not a rigorous test as program participants were not randomly selected from the population, this is likely to be a conservative test if program participants are more likely than the average Black woman to be at-risk for adverse health outcomes.[4] The statistical analysis reveals a statistically significant difference ($p<.05$) in Very Low Birthweight compared to benchmark (2.0% vs 3.4%), but no statistically significant differences for preterm birth or low birthweight.

[3] Source: Visit/Encounter file (2017-2020Q1); Visit/Encounter PVR file (2020Q2-present); Community Outreach file (2019-present). Counts services for enrolled participants only (excludes community outreach for non-enrolled participants and recruitment events). 2021 data for phone calls includes 107 visits coded as followup/welfare checks in 2021. 110 phone calls prior to 2019 which occur on the same day as another substantive activity are excluded.

[4] Program participants are likely to have lower access to prenatal healthcare due to rurality. Also, the incidence of multiple birth in this sample exceeds the national average for Black women (4.9% sample; 4.2% Black women nationally). However, there could be selection bias in that women who enroll are likely more motivated to take affirmative actions to prevent adverse health outcomes than a typical woman. Because of this, this study despite randomization is not a randomized control trial. National multiple birth rate from CDC National Vital Statistics Reports, Vol 70.2, March 23, 2021, Table 24, p.47.

	Preterm Birth	LBW	VLBW
All Participants	16.5%	17.0%	2.0%
Singleton Births Only (No Twins, Triplets)	13.4%	13.4%	1.6%
Rate Among MS Births to Black Women, 2017-2020[5]	17.1%	16.7%	3.4%
P-value, z-test[6]	0.341	0.451	0.032

Disaggregated by year, we find an increase in the percentage of very low birthweight births in 2021, but also record low rates for preterm birth rates. For singleton births, the low birthweight rate is at a record low in 2021.

Maternal outcomes by year, all births

	Preterm Birth Rate	Low Birthweight Rate	Very Low Birthweight Rate
2017-18	14.5%	18.2%	0.0%
2019	19.9%	19.9%	1.9%
2020	16.4%	13.5%	1.6%
2021[7]	13.6%	15.3%	3.4%

Maternal outcomes by year, singleton births only

	Preterm Birth Rate	Low Birthweight Rate	Very Low Birthweight Rate
2017-18	13.5%	16.7%	0.0%
2019	16.1%	14.5%	1.1%
2020	12.2%	11.8%	1.7%
2021[8]	11.2%	11.4%	3.0%

Rates are reported by quarter below.

Preterm Birth Rate

Quarter	Overall			Singletons (no twins, triplets)		
	Numerator	Denominator	Rate	Numerator	Denominator	Rate
Overall	**137**	**830**	**16.5%**	**106**	**789**	**13.4%**
2017 (first 3 quarters)	6	26	23.1%	6	26	23.1%
2017 (4th quarter)	2	21	9.5%	2	21	9.5%
2018 (1st quarter)	2	16	12.5%	0	14	0.0%
2018 (2nd quarter)	1	9	11.1%	1	9	11.1%
2018 (3rd quarter)	3	23	13.0%	3	23	13.0%
2018 (4th quarter)	7	50	14.0%	7	48	14.6%
2019 (1st quarter)	11	44	25.0%	4	37	10.8%
2019 (2nd quarter)	20	72	27.8%	20	72	27.8%
2019 (3rd quarter)	10	87	11.5%	8	83	9.6%
2019 (4th quarter)	13	68	19.1%	9	62	14.5%
2020 (1st quarter)	9	51	17.6%	5	47	10.6%
2020 (2nd Quarter)	7	31	22.6%	1	23	4.3%
2020 (3rd Quarter)	6	36	16.7%	6	36	16.7%
2020 (4th Quarter)	11	83	13.3%	11	83	13.3%
2021 (1st Quarter)	10	77	13.0%	8	73	11.0%
2021 (2nd Quarter)	10	64	15.6%	6	60	10.0%
2021 (3rd Quarter)	9	72	12.5%	9	72	12.5%

[5] Mississippi Statistically Automated Health Resource System, Mississippi State Department of Health.
[6] Program incidence compared to state rate (binomial test).
[7] Subject to change in future as more data is collected.
[8] Subject to change in future as more data is collected.

Low Birthweight Rate & Very Low Birthweight Rate

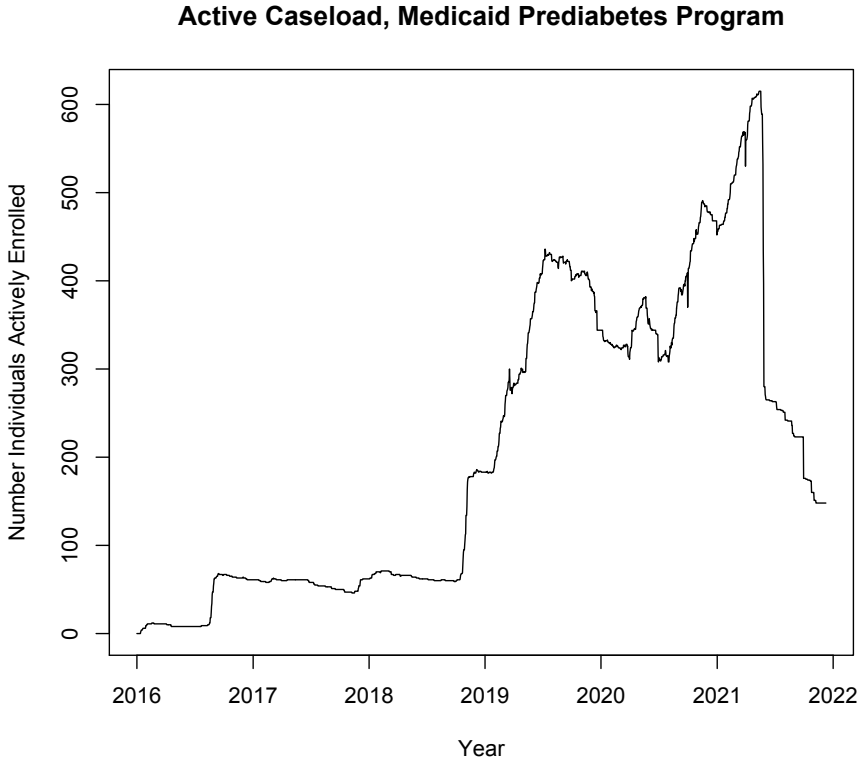
Quarter	LBW Rate - Overall			LBW Rate - Excluding Twins, Triplets			VLBW Rate (# per qtr.)	VLBW, excluding twins and triplets
	Numerator	Denominator	Rate	Numerator	Denominator	Rate		
Overall	**104**	**613**	**17.0%**	**78**	**580**	**13.4%**	**2.0%**	**1.6%**
2017 (first 3 qtrs.)	1	14	7.1%	1	14	7.1%	0	0
2017 (4th quarter)	1	16	6.3%	1	16	6.3%	0	0
2018 (1st quarter)	2	9	22.2%	0	7	0.0%	0	0
2018 (2nd quarter)	1	7	14.3%	1	7	14.3%	0	0
2018 (3rd quarter)	7	22	31.8%	7	22	31.8%	0	0
2018 (4th quarter)	8	42	19.0%	8	42	19.0%	0	0
2019 (1st quarter)	7	34	20.6%	0	27	0.0%	0	0
2019 (2nd quarter)	11	54	20.4%	11	54	20.4%	2	2
2019 (3rd quarter)	10	60	16.7%	10	58	17.2%	0	0
2019 (4th quarter)	12	53	22.6%	6	47	12.8%	2	0
2020 (1st quarter)	7	32	21.9%	6	29	20.7%	1	1
2020 (2nd quarter)	1	8	12.5%	1	8	12.5%	0	0
2020 (3rd quarter)	0	20	0.0%	0	20	0.0%	0	0
2020 (4th quarter)	9	66	13.6%	7	62	11.3%	1	1
2021 (1st quarter)	10	55	18.2%	4	48	8.3%	1	1
2021 (2nd quarter)	10	56	17.9%	8	54	14.8%	3	2
2021 (3rd quarter)	7	65	10.8%	7	65	10.8%	2	2

Prediabetes Program

- A total of 1,218 individuals have been enrolled in the Prediabetes Program.

- The total number of enrollments is 1,368. This includes individuals invited to re-enroll in the program, as well as individuals returning to the program after prolonged disengagement and dismissal.[9]

- As of December 9, 2021, 148 individuals are enrolled in the intervention. Due to decreased funding for the Project, enrollment ceased on May 14, 2021, with a significant number of participants dismissed in May 2021. Daily active caseload is visualized below.



- With a few exceptions,[10] enrollment in the Prediabetes Program followed the following process: Cerner Corporation would use a registry containing health records and Medicaid claims data to identify individuals at-risk of diabetes in the service area, and would provide this extract to Delta Health Alliance. The University of Memphis randomly identified a comparison group set aside and not subject to recruitment; the remaining list would then be subject to recruitment efforts by Delta Health Alliance to enroll in the intervention. Details on recruitment by wave are reported below. A significant decline in recruitment rate success was observed before and after the onset of COVID-19. Recruitment cohorts randomized before March 1, 2020 had a 26% enrollment rate; the rate declines to 9% after March 1.

[9] Sourced from program roster; accidental dismissal rows removed.

[10] Non-randomized and misc. enrollments includes: 2016 Leland, MS test cohort, cases in which identifier changes between recruitment and enrollment, or clerical errors. We also count 97 individuals enrolling from a large February 2021 recruitment list as non-randomized due to the recruitment process being interrupted by loss of funding.

Date of Randomization	Randomized to Control Group	Randomized to Recruitment Group		Recruitment Rate
		# Randomized for Prospective Recruitment	# Enrolled	
2016-08-08	251	252	78	31%
2017-09-12	148	149	48	32%
2018-10-05	102	1,068	229	21%
2019-02-12	49	431	132	31%
2019-04-15	34	280	97	35%
2019-06-19	20	154	42	27%
2019-08-20	25	200	43	22%
2019-10-16	13	118	33	28%
2019-11-08	6	51	8	16%
2020-02-21	16	159	38	24%
2020-03-25	189	1,710	128	7%
2020-05-12	66	578	51	9%
2020-06-24	37	310	28	9%
2020-08-10	46	382	54	14%
2020-10-19	62	508	47	9%
2020-12-02	30	291	20	7%
Total	1,094	6,641	1,076	16%
Non-Randomized & Misc. Enrollments			142	
Total Enrolled			1,218	

Program activity is summarized below. Program activity, through December 9, 2021, is aggregated from several sources over the course of the intervention, with duplicate data removed.[11]

	2016	2017	2018	2019	2020	2021	**Total**
Home visits, in-person	10	115	175	954	1,000	860	**3,114**
Televisits	0	0	0	0	572	133	**705**
Phone calls	735	656	600	2,478	3,383	3,264	**11,116**
Education, in-person, participants	32	38	37	370	286	341	**1,104**
Tele-education	0	0	0	0	57	21	**78**
Office visits	12	45	32	27	10	0	**126**
Total activity	**789**	**854**	**844**	**3,829**	**5,308**	**4,619**	**16,243**
Mailers	0	0	37	316	5,111	78	**5,542**
Community outreach, non-enrolled	764[12]			278	158	41	**1,241**

To provide an indicator of the amount of substantive intervention a typical participant receives, the total number of home visits and televisits per year is divided by the daily average of the active caseload for each year. The results are tabulated below. The amount of intervention received by participants in 2021 maps onto historical averages, though has declined since 2020.

[11] Excludes failed attempts, administrative calls, exit letters/phone calls, and miscellaneous categories. Assumes one participant can receive only one activity in each category per day. Phone calls dropped if another substantive activity occurs for the participant on the day. From April 1, 2020 to June 1, 2020, we assume that 30% of home visits are televisits; this is documented directly after. Education includes CDSMP, DEEP, Health Chats, nutrition classes, grocery store tours (enrolled participants only), and misc. community outreach (enrolled participants only).

[12] Includes Healthy Pregnancy program.

	Total # Home Visits/Televisits	Active Caseload, Daily Average	Home Visits/Televisits per Person
2016-17	125	42.4	2.9
2018	175	83.9	2.1
2019	954	345.4	2.8
2020	1,572	373.3	4.2
2021	993	353.9	2.8

Our ability to update previous estimates regarding the effectiveness of the intervention was significantly impaired in 2021 due to the loss of funding for the Project. Due to the termination of Delta Health Alliance's contract with Cerner, evaluators were unable to use data sourced from Cerner's HealtheRegistries. We are unable to evaluate changes in costs of Medicaid claims, as well as measures heavily sourced from claims such as diabetes onset, death, or Medicaid enrollment status. Our ability to assess changes in health outcomes was also affected, as Cerner was previously responsible for aggregating health outcomes from disparate EHR systems. However, we were able to execute a "second best" plan to update our health measure metrics by combining legacy Cerner evaluation extracts with EHR data made available by Delta Health Alliance for clinics with an ongoing health records relationship with the Alliance in 2021.[13]

For individuals with elevated measures on health outcomes at baseline, we evaluate whether there exists a change between baseline and followup at 12 months.[14] We consider only individuals with valid data at both baseline and follow-up, where baseline is the observation closest due to the date of enrollment (for intervention individuals) or randomization (for control individuals), but within 6 months, and follow-up being the same except for one year following the date of enrollment or randomization. We report p-values deriving from a paired t-test between baseline and follow-up for each group, and conduct a simple difference-in-differences regression (a linear regression controlling for the interaction of follow-up and assignment, as well as constituent parts) to assess whether there exists a statistically distinguishable difference in change between the two cohorts.[15] The statistical analysis reveals no statistically significant relationships, although notably for all measures, the point estimates of the impacts for the intervention group exceed that of the control group.

Measure		BMI	Diastolic BP	Systolic BP	A1c
Inclusion criterion (baseline)		≥40	>80	≥130	≥5.7
Intervention group	Baseline	46.0	89.8	147.9	6.38
	Most recent	45.3	84.3	140.6	6.04
	Change	-0.6	-5.5	-7.3	-0.34
	P-value	0.21	<0.01	<0.01	0.16
	N	62	116	107	25
Control group	Baseline	47.5	89.8	146.9	6.05
	Most recent	47.6	87.0	141.1	6.10
	Change	+0.1	-2.8	-5.5	+0.06
	Significance	0.72	<0.01	<0.01	0.61
	N	109	148	180	22
P-value, interaction term, diff-in-diff. regression		0.61	0.12	0.65	0.21

[13] Includes Leland Medical Clinic, Mallory Community Health Center, Aaron E. Henry Community Health Services, Cummings Health Care Center, and the Office of Dr. Andrea Smith.

[14] We limit the duration and number of health outcomes in this analysis relative to our October evaluation plan due to concern about low Ns due to data loss by using durations or outcomes relating to secondary and rarely collected outcomes.

[15] While cohorts are randomized, this procedure does not adjust for selection biases relating to the decision to enroll or not enroll. Another significant limitation is exclusion bias attributable to a reliance on health outcomes incidental to clinical services.

Population Measures

Below, we report key population health indicators related to the two interventions.

Maternal Outcomes for Black Residents in Ten-County Delta Service Area, 2011-2020.

Source: MSTAHRS. Infant mortality rate per 1,000 births; all other measures per 100 births.
Counties: Bolivar, Coahoma, Holmes, Leflore, Panola, Sunflower, Tunica, Warren, Washington, Yazoo.

	Very Low Birthweight	Low Birthweight	Preterm Birth	Inadequate Prenatal Care	Smoking During Pregnancy	Infant Mortality
2011	3.2	16.3	22.6	5.5	6.8	
2012	2.6	15.6	21.2	5.7	6.3	
2013	2.9	16.3	15.6	10.6	6.8	11.0
2014	3.2	15.1	13.8	9.6	6.2	
2015	2.8	15.3	15.2	9.1	5.5	
2016	3.4	15.7	16.4	9.8	6.4	
2017	3.2	15.0	15.5	9.2	5.3	
2018	3.1	16.4	16.9	10.6	5.7	11.9
2019	2.9	17.9	18.4	12.5	5.7	
2020	2.7	15.7	16.8	11.5	5.0	

Maternal Outcomes for Black Residents in Mississippi, 2011-2020.

Source: MSTAHRS. Infant mortality rate per 1,000 births; all other measures per 100 births.

	Very Low Birthweight	Low Birthweight	Preterm Birth	Inadequate Prenatal Care	Smoking During Pregnancy	Infant Mortality
2011	3.2	15.8	20.4	5.8	6.6	
2012	3.2	16.2	20.6	6.1	6.0	
2013	3.4	16.2	16.2	10.0	6.8	12.5
2014	3.2	15.6	15.3	9.1	6.5	
2015	3.5	16.5	16.1	9.1	6.4	
2016	3.5	15.9	16.6	8.9	6.6	
2017	3.4	16.0	16.3	8.5	5.5	
2018	3.5	17.0	17.3	9.9	5.5	11.7
2019	3.4	17.3	17.8	10.1	5.3	
2020	3.2	16.5	17.0	9.5	5.2	

Newly Diagnosed Diabetes Cases, Service Area and Mississippi, 2015-2018.

Source: CDC Diabetes Surveillance System, rate per 1,000. County rates age-adjusted; service area and state rates are equal average of county rates, weighted by crude population, age 20 and above. Population sourced from U.S. Census Bureau, 5-year estimate, 2014-18, American Community Survey, table S0101 (Age and Sex). *Counties*: Bolivar, Coahoma, Holmes, Leflore, Panola, Sunflower, Tunica, Warren, Washington, Yazoo.

	2015	2016	2017	2018
Ten-County Delta Service Area	14.9	16.0	14.6	14.4
State of Mississippi	12.7	13.1	11.9	11.9

To assess program goals, we determine whether a 5% reduction in preterm birth or diabetes occurred between the year before intervention (2016 for preterm birth; 2015 for diabetes) and the most recent year, among African-Americans in the ten-county service area. Such a reduction would correspond to a population preterm birth rate of 15.5 or less, and a population newly diagnosed diabetes rate of 14.1 or less. As of 2020, the preterm birth rate is 16.8 and the newly diagnosed diabetes rate is 14.4. Both rates remain above the 5% reduction benchmark.

Proposed Performance Measures

The interventions are likely to end in mid-2021. New enrollments have ended for the Prediabetes Program and are likely to end in the coming months for the Healthy Pregnancy Program. Therefore, we do not propose performance measures for the Prediabetes Program, and propose no enrollment performance measures for the Healthy Pregnancy Program.

We recommend the following outcome measures for 2022 births among program participants in the Healthy Pregnancy Program, which correspond to 80% of the 2016 level in the ten-county service area for African-Americans, rounded down. These performance measures are only recommendations and are not binding on Delta Health Alliance.

- Preterm birth rate less than or equal to 13.1%
- Low birthweight rate less than or equal to 12.6%
- Very low birthweight rate less than or equal to 2.6%