ATTACHMENT B

MATHEMATICA Policy Research

REPORT

FINAL REPORT

Medicaid Caseload Forecasting

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Deborah Chollet

Purvi Sevak

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Commonwealth of Massachusetts
Executive Office for Administration and Finance
State House Room 373
Boston, MA 02133

Project Officer: Julia Chabrier

Submitted by:

Mathematica Policy Research
1100 1st Street, NE
12th Floor
Washington, DC 20001-4221
Telephone: (202)-484-9220
Facsimile: (202) 863-1763

Project Director: Deborah Chollet

Reference Number: 40343

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I. INTRODUCTION AND SUMMARY

Historically, Massachusetts has operated 22 programs in Medicaid, each with different eligibility rules and some with different benefit designs. Most of these programs continue today. They include benefits for low-income children, adults, and seniors; for disabled and nondisabled children and adults; and for citizens and noncitizens. Eligibility for each program is limited by family income and by age; some programs also restrict eligibility by employment, firm size, or hours of employment; and some apply an asset test. With implementation of the Affordable Care Act (ACA), some of these programs (specifically, MassHealth Basic, Essential, Healthy Start, and Prenatal) were terminated as of January 2014, and some (CarePlus and Small Business Premium Assistance) were launched.

Massachusetts contracted with Mathematica Policy Research (Mathematica) to estimate the number of individuals in Massachusetts who were eligible for each program historically, from 2009 to 2011, and to identify the relative contribution to rising enrollment associated with two factors: (1) changes in the number of persons eligible for the programs; and (2) changes in the probability of enrollment when eligible. In addition, we were asked to project eligibility and enrollment in MassHealth programs from 2014 to 2020, and to develop confidence intervals around the 2014-2016 projections.

In this report, we present historical estimates and projections of future enrollment and eligibility based on analysis of the Massachusetts sample of the American Community Survey (ACS), which relies on a large population sample (approximately 1 percent). The analysis uses pooled annual samples benchmarked to a single year, thus relying on a still larger population sample for each annual estimate. However, even the pooled samples are insufficient to estimate each of the smaller programs individually; in addition, the ACS does not ask about circumstances (such as disability or immigration status) in the same way as MassHealth considers them. To address these problems, we consider programs in clusters, first defined by the populations served (children, adults, and seniors) and then parsed into programs clusters for each population group.

From analysis of enrollment changes from 2009 to 2011, we find that:

- The changes in enrollment from 2009 to 2011 reflect changes in the estimated number of persons eligible for these programs and in particular, changes in the percentage of persons in each population group with very low income – less than 133 percent of the federal poverty level (FPL).
- The proportion of eligible individuals enrolled in MassHealth grew steadily in each population group from 2009 to 2011, especially among children and seniors.
- Across all population groups and program clusters, greater take up among the eligible population accounted for 61 percent of net enrollment from 2009 to 2011, while an increase in the number of persons eligible accounted for 39 percent.

Based on the underlying analysis and projection of MassHealth enrollment from 2014 to 2020, we find that:

- Statistical (logit) models of enrollment among children, adults, and seniors (respectively) predict 94 percent of total enrollment, when tested against 2012 actual enrollment. The models perform equally well to predict 2012 enrollment in each population group and in most of the program clusters associated with children and seniors. For adults, the enrollment model performs less well overall and, in particular, when predicting enrollment in all but the largest program cluster (Standard and Common). Projections of 2014-2020 enrollment in CarePlus based on this modeling might be substantially low.
- Across all populations, the number of persons *eligible* for any MassHealth program is projected to decline 2.3 percent from 2014 to 2020. The changes in eligibility differ by population group, with projected eligibility among children and adults declining 2.7 percent and 3.8 percent, respectively, while projected eligibility among seniors increases 8.4 percent.
- Across all populations, the projected number of persons *enrolled* in MassHealth declines 5.8 percent from 2014 to 2020, with MassHealth serving 2.4 percent fewer children and 10.1 percent fewer adults in 2020 than in 2014. In contrast, the projected number of seniors enrolled in MassHealth grows more than 1 percent each year, cumulatively increasing 8.4 percent from 2014 to 2020.
- The changes in projected enrollment from 2014 to 2020 by population group are largely mirrored at the program level, when projected enrollment by population group is parsed into program clusters. Enrollment in every program cluster that serves children is projected to decline gradually each year. Among adults, the decline in projected enrollment is due largely to a relatively steep decline in Standard and Common and CarePlus enrollment, even as enrollment in Basic/Essential and Family Assistance is projected to rise. Enrollment among seniors is projected to grow in both program clusters that serve them, but more in the buy-in program than in Standard/Essential/Limited.

These projection results represent efficient estimates at the population level—that is, the 2014-2016 estimates for each population group are valid with 95 percent confidence within 1 percentage point above or below the mean projection, and often within 0.3 percent. However, the models themselves explained 23-56 percent of the variation in enrollment in 2011, and they predicted enrollment in 2012 that was 94 percent of actual enrollment. Thus, the unexplained heterogeneity in the models is embedded in the projections, even if it is not apparent in the calculation of confidence intervals.

Both phases of the analysis outlined above are presented in the following chapters. In Chapter II, we present the analysis decomposing the change in enrollment from 2009 to 2011 due to population change versus change in take up within each population group and by program cluster. In Chapter III, we present projections of eligibility and enrollment from 2014 to 2020, again by population group and program cluster. The data and methods used to support both analyses are described in Appendix A. The data elements and logic used to assign individuals to eligibility in each program cluster from 2009 to 2012 are reported in Appendix B. Modifications to that logic, for the purpose of projecting eligibility for each program cluster from 2014 to 2020, are reported in Appendix C.

II. DECOMPOSITION OF ENROLLMENT CHANGES

In this chapter, changes in MassHealth enrollment and estimated eligibility among children (age 0-18), adults (age 19-64), and seniors (age 65 and older) from 2009 to 2011 are presented, in total and by program cluster. Changes in enrollment are decomposed by year, population group, and program cluster into two component parts: (1) the change in enrollment due to a change in the take up rate among the eligible population; and (2) the change in enrollment due to a change in the number of people eligible for the program.

A. Changes in enrollment

From 2009 to 2011, enrollment in MassHealth programs grew 8.3 percent—an increase of approximately 103,000 enrollees over the 3-year period (Table II.1). Adults accounted for 57.8 percent of the total growth in MassHealth enrollment from 2009 to 2011; nearly 60,000 more adults were enrolled in 2011 than in 2009, about equally divided between the Standard and Common programs and Basic/Essential and Family Assistance programs.

Table II.1. Change in MassHealth enrollment by population group and program cluster, 2009-2011

Population and Program Cluster	2009	2010	2011	Change 2009-2011	Percent Change 2009-2011	Percent of Total Enrollment Change 2009-2011
Total, all populations and programs	1,242,341	1,295,797	1,345,539	103,197	8.3%	100.0%
Children	515,212	533,567	548,724	33,512	6.5%	32.5%
Standard and Common	439,336	459,815	473,179	33,843	7.7%	32.8%
Family Assistance	58,974	56,710	58,930	-45	-0.1%	0.0%
Limited, CMSP	16,901	17,043	16,615	-286	-1.7%	-0.3%
Adults	584,024	614,181	643,670	59,647	10.2%	57.8%
Standard and Common	434,620	447,828	460,790	26,170	6.0%	25.4%
Basic/Essential and Family Assistance	98,064	110,851	126,347	28,282	28.8%	27.4%
Limited, Prenatal	50,132	53,913	54,338	4,206	8.4%	4.1%
Buy-in	1,208	1,590	2,196	988	81.9%	1.0%
Seniors	143,106	148,049	153,144	10,038	7.0%	9.7%
Standard, Essential and Limited	124,823	128,881	132,510	7,687	6.2%	7.4%
Buy-in	18,283	19,168	20,634	2,351	12.9%	2.3%

Source: Mathematica Policy Research analysis of 2009-2011 MassHealth data.
Note: See Appendix A for definitions of population groups and program clusters.

Enrollment among children and seniors grew more slowly than among adults. Children's enrollment grew 6.5 percent, with larger growth in Standard and Common (7.7 percent) and declining enrollment in Family Assistance (-0.1 percent) and Limited/CMSP (-1.7 percent), Children accounted for 32.5 percent of enrollment growth across all MassHealth programs from 2009 to 2011.

MassHealth enrollment among seniors grew at about the same pace as among children, by 7 percent from 2009 to 2011, and about twice as fast (from a smaller base) in the Buy-in program as in the Standard, Essential, and Limited program cluster. Seniors accounted for 9.7 percent of the total increase in MassHealth enrollment from 2009 to 2011.

B. Changes in eligibility

The increase in total enrollment noted above corresponds to an increase in the total number of persons eligible for MassHealth programs. Estimated eligibility for one or more MassHealth programs increased 3.2 percent from 2009 to 2011, by more than 90,000 persons (Table II.2).

Table II.2. Change in the estimated eligible population by population group and program cluster, 2009-2011

Population and Program Cluster	2009	2010	2011	Percent Change 2009-2010	Percent Change 2010-2011	Summary: Percent Change 2009-2011	Change in Number of Estimated Eligibles 2009-2011	Percent of Total Change in Estimated Eligible Adults and Children 2009-2011
Total, all populations and programs	2,798,050	2,829,249	2,888,666	1.1%	2.1%	3.2%	90,616	n/a
Total, children and adults, all programs	2,479,991	2,515,072	2,577,480	1.4%	2.5%	3.9%	97,489	100.0%
Children	757,404	758,669	766,604	0.2%	1.0%	1.2%	9,200	9.4%
Standard and Common	594,961	598,193	607,520	0.5%	1.6%	2.1%	12,559	12.9%
Family Assistance	128,907	123,399	123,915	-4.3%	0.4%	-3.9%	-4,991	-5.1%
Limited, CMSP	37,855	41,076	38,629	8.5%	-6.0%	2.0%	775	0.8%
Adults	1,722,588	1,756,403	1,810,877	2.0%	3.1%	5.1%	88,289	90.6%
Standard and Common	612,823	642,103	655,309	4.8%	2.1%	6.9%	42,485	43.6%
Basic/Essential and Family Assistance	1,005,196	1,012,071	1,047,326	0.7%	3.5%	4.2%	42,130	43.2%
Limited, Prenatal	88,916	87,530	87,693	-1.6%	0.2%	-1.4%	-1,223	-1.3%
Buy-in	35,503	31,883	36,975	-10.2%	16.0%	4.1%	1,472	1.5%
Seniors	318,058	314,177	311,186	-1.2%	-1.0%	-2.2%	-6,873	n/a
Standard, Essential and Limited	253,551	246,070	251,850	-3.0%	2.3%	-0.7%	-1,701	n/a
Buy-in	64,508	68,106	59,336	5.6%	-12.9%	-8.0%	-5,172	n/a

Source: Mathematica Policy Research analysis of 2009-2011 American Community Survey data, Massachusetts population sample.

Notes: See Appendix A for definitions of population groups and program clusters. Persons eligible for programs in more than one cluster are counted in each cluster. As a result, the number of persons in the program clusters may not sum to the population group totals.

All of the increase in the eligible population was due to growth in the number of eligible adults and children. The number of adults eligible for MassHealth grew 5.1 percent from 2009 to

2011, with the increase about evenly divided between Standard and Common (where the number of eligible adults grew 6.9 percent, by approximately 42,000 adults) and Basic/Essential and Family Assistance (where the number of eligible adults grew 4.2 percent, also approximately 42,000 persons). Adults accounted for 90.6 percent of the increase in the number of persons eligible for MassHealth from 2009 to 2011, net of the small decline in the estimated number of eligible seniors.

The number of children eligible for MassHealth grew more slowly, by 1.2 percent from 2009 to 2011. Nearly all of the increase was due to growth in eligibility for Standard and Common (where the number of eligible children grew 2.1 percent). Children eligible for Limited/CMSP also grew (by 2.0 percent), but from a very small base.

In contrast, the number of seniors eligible for any MassHealth program declined 2.2 percent, mostly due to fewer seniors eligible for the buy-in programs. However, the number of seniors eligible for other MassHealth programs (Standard, Essential, and Limited) also declined slightly, by 0.7 percent.

The change in the number of persons eligible for specific MassHealth programs is reflected in the changing income distribution among the population eligible for any MassHealth program from 2009 to 2011 (Table II.3). The number of eligible children in families with income below 133 percent FPL grew 7.0 percent from 2009 to 2011, while the number of eligible adults with family income below 133 percent FPL grew 11.5 percent. The number of seniors eligible for any MassHealth program fell overall, but much faster among those with income above 133 percent FPL (- 4.6 percent) than among seniors with lower incomes (-0.2 percent).

Table II.3. Estimated number of persons eligible for MassHealth by federal poverty level, 2009-2011

Population and Program Cluster	2009	2010	2011	Percent Change 2009-2010	Percent Change 2010-2011	Percent Change 2009-2011
Total	2,798,050	2,829,249	2,888,666	1.1%	2.1%	3.2%
Children	757,404	758,669	766,604	0.2%	1.0%	1.2%
0-133% FPL	323,421	339,960	346,156	5.1%	1.8%	7.0%
Above 133% FPL	433,983	418,709	420,448	-3.5%	0.4%	-3.1%
Adults	1,722,588	1,756,403	1,810,877	2.0%	3.1%	5.1%
0-133% FPL	560,404	613,713	624,858	9.5%	1.8%	11.5%
Above 133% FPL	1,162,184	1,142,691	1,186,019	-1.7%	3.8%	2.1%
Seniors	318,058	314,177	311,186	-1.2%	-1.0%	-2.2%
0-133% FPL	183,436	179,953	183,158	-1.9%	1.8%	-0.2%
Above 133% FPL	134,622	134,224	128,028	-0.3%	-4.6%	-4.9%

Source: Mathematica Policy Research analysis of 2009-2011 American Community Survey data, Massachusetts population sample.

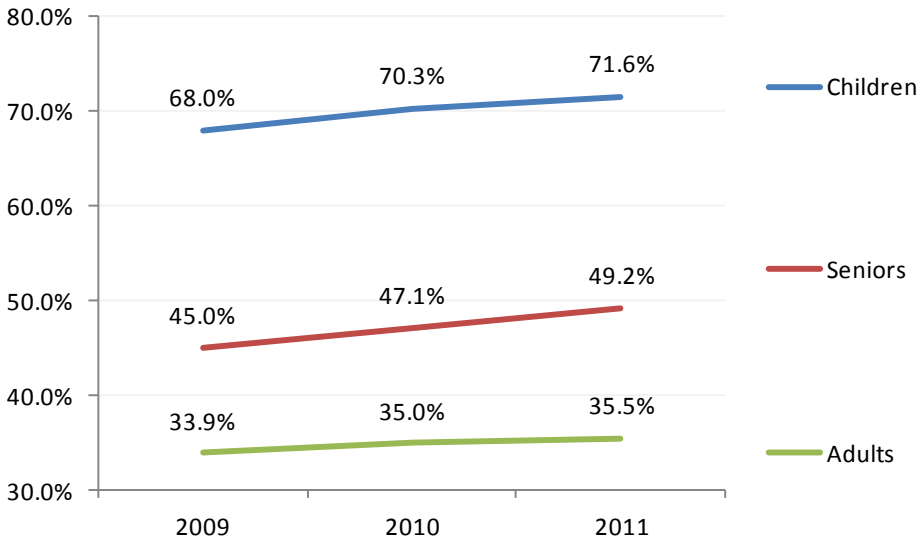
Notes: See Appendix A for definitions of population groups. For comparison with projections of eligibility and enrollment in 2014 through 2020, federal poverty levels are estimated as Modified Adjusted Gross Income (MAGI) divided by HHS-determined poverty income. The 5-percent FPL income disregard that the ACA requires as of 2014 is not applied.

C. Changes in take up

The proportion of eligible individuals enrolled in MassHealth (take up) grew steadily in each population group from 2009 to 2011. Take up among children grew from 68.0 percent in 2009 to 71.6 percent in 2011, while take up among seniors grew from 45.0 percent to 49.2 percent (Figure 1). Take up among adults grew more slowly, from 33.9 percent to 35.5 percent.

Among eligible children, take up in the largest program cluster for children, Standard and Common, grew more than in other program clusters, rising from 73.8 percent of eligible children in 2009 to 77.9 percent in 2011 (Table II.4). Among adults, take up of Standard and Common (also the largest program cluster for adults) was about the same in 2009 (70.9 percent) as in 2011 (70.3 percent), but take up in the smaller Basic/Essential program cluster increased from 9.8 percent in 2009 to 12.1 percent in 2011. Among eligible seniors, take up in both program clusters increased, but faster in the relatively small buy-in programs, from 28.3 percent in 2009 to 34.8 percent in 2011.

Figure II.1. MassHealth enrollment as a percent of eligible children, adults, and seniors, 2009-2011



Source: Mathematica Policy Research analysis of 2009-2011 American Community Survey data, Massachusetts population sample.

Note: See Appendix A for definitions of population groups and represented programs.

Table II.4. Estimated take up rates by population group and program cluster, 2009-2011

Population and Program Cluster	2009		2010		2011	
	Enrollment	Estimated Take up	Enrollment	Estimated Take up	Enrollment	Estimated Take up
Total	1,242,341	44.4%	1,295,797	45.8%	1,345,539	46.6%
Children	515,212	68.0%	533,567	70.3%	548,724	71.6%
Standard and Common	439,336	73.8%	459,815	76.9%	473,179	77.9%
Family Assistance	58,974	45.7%	56,710	46.0%	58,930	47.6%
Limited, CMSP	16,901	44.6%	17,043	41.5%	16,615	43.0%
Adults	584,024	33.9%	614,181	35.0%	643,670	35.5%
Standard and Common	434,620	70.9%	447,828	69.7%	460,790	70.3%
Basic/Essential and Family Assistance	98,064	9.8%	110,851	11.0%	126,347	12.1%
Limited, Prenatal	50,132	56.4%	53,913	61.6%	54,338	62.0%
Buy-in	1,208	3.4%	1,590	5.0%	2,196	5.9%
Seniors	143,106	45.0%	148,049	47.1%	153,144	49.2%
Standard, Essential and Limited	124,823	49.2%	128,881	52.4%	132,510	52.6%
Buy-in	18,283	28.3%	19,168	28.1%	20,634	34.8%

Source: Mathematica Policy Research analysis of 2009-2011 program and American Community Survey data, Massachusetts population sample.
Note: See Appendix A for definitions of population groups and program clusters.

D. Decomposition of enrollment changes

In this section, we present estimates of enrolment from 2009-2010 decomposed as (1) the change in enrollment due to a change in take up; and (2) the change in enrollment due to a change in the number of eligible persons. The change in enrollment from the base year due to a change in the rate of take up is calculated as the difference between enrollment in year *t* and the enrollment that would have occurred had the take up rate not changed from the base year *b*. That is, where E_t and L_t are the number of persons respectively enrolled and eligible in year *t*, the change in enrollment due to a change in the rate of take up *r* is:

$$\Delta_r = E_t - (L_t * r_b)$$

The change in enrollment due to a change in the number of people eligible is calculated as the residual, that is:

$$\Delta_L = E_t - E_b - \Delta_r = (L_t - L_b) * r_b$$

The eligibility and take up components of the annual and 2-year change in MassHealth enrollment from 2009 to 2011 are shown by population group in Figure 2. Two aspects of these changes are noteworthy: First, the factors that drove change in each population group are different. Among children, increased take up accounted for most of the change each year, and for 78 percent of the change in enrollment over two years. Among seniors, increased take up accounted for all of the increase in enrollment from 2009-2010 (as the estimated number of

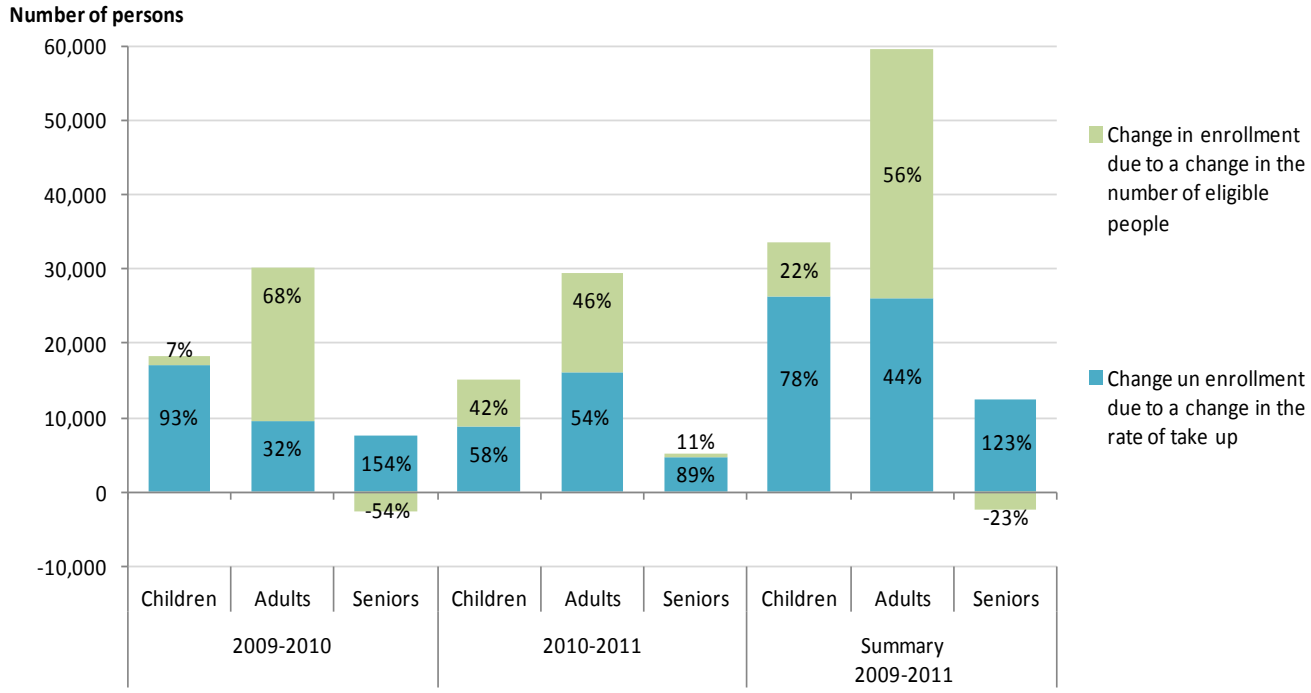
eligible seniors declined) and 89 percent of increase in enrollment from 2010 to 2011. As shown in Table II.5, across all population groups and program clusters, greater take up accounted for 61 percent of net enrollment from 2009 to 2011, and an increase in the eligible population accounted for 39 percent.

Second, the changes in enrollment associated, respectively, with changes in take up and changes in the number of eligible people vary widely by program cluster. For example, the relatively large increase in children's enrollment in Standard and Common from 2009 to 2010 was predominantly due to an increase in take up (88.3 percent); while the smaller increase in enrollment from 2010 to 2011, was due to both to higher take up (46.4 percent) and larger numbers of eligible children (53.6 percent).

Among adults, growth in the number of eligible adults accounted for all of the increase in enrollment in Standard and Common from 2009 to 2010, and 71.1 percent of the increase from 2010 to 2011. Conversely, in Basic/Essential and Family Assistance, most of the increase in enrollment both 2010 and 2011 was due to increased take up. Over both years, greater take up accounted for 85.5 percent of the increase in the number of adults enrolled in Basic/Essential and Family Assistance.

Similarly, greater take up accounted for all of the increase in MassHealth enrollment among seniors in both Standard/Essential/Limited and the buy-in program over the two-year period from 2009-2011, as eligibility declined. However, from 2010 to 2011, both higher take up and growth in the size of the eligible population accounted for the one-year increase seniors' enrollment in the larger Standard/Essential/Limited program cluster.

Figure II.2: Decomposition of the change in MassHealth enrollment by population group, 2009-2011



Source: Mathematica Policy Research analysis of 2009-2011 American Community Survey data, Massachusetts population sample.

Note: See Appendix A for definitions of population groups and represented programs.

Table II.5. Decomposition of MassHealth enrollment change by program cluster and population group, 2009-2011

Population and Program Cluster	2009-2010			2010-2011			Summary: 2009-2011		
		Percent of Enrollment Change Due to:			Percent of Enrollment Change Due to:			Percent of Enrollment Change Due to:	
	Change in Enrollment	Change in Take Up	Change in Number Eligible	Change in Enrollment	Change in Take Up	Change in Number Eligible	Change in Enrollment	Change in Take Up	Change in Number Eligible
Total	53,456	74.1%	25.9%	49,741	45.3%	54.7%	103,197	61.0%	39.0%
Children	18,355	92.9%	7.1%	15,157	57.8%	42.2%	33,512	78.1%	21.9%
Standard and Common	20,478	88.3%	11.7%	13,365	46.4%	53.6%	33,843	72.6%	27.4%
Family Assistance	-2,265	-11.3%	111.3%	2,220	89.3%	10.7%	-45	-5023.6%	5123.6%
Limited, CMSP	141	-917.2%	1017.2%	-428	-137.4%	237.4%	-286	220.9%	-120.9%
Adults	30,158	31.9%	68.1%	29,489	54.5%	45.5%	59,647	43.7%	56.3%
Standard and Common	13,208	-57.2%	157.2%	12,962	28.9%	71.1%	26,170	-15.1%	115.1%
Basic/ Essential and Family Assistance	12,787	94.8%	5.2%	15,495	75.1%	24.9%	28,282	85.5%	14.5%
Limited, Prenatal	3,781	120.7%	-20.7%	425	76.5%	23.5%	4,206	116.4%	-16.4%
Buy-in	382	132.2%	-32.2%	607	58.2%	41.8%	988	94.9%	5.1%
Seniors	4,943	153.9%	-53.9%	5,095	89.0%	11.0%	10,038	122.9%	-22.9%
Standard, Essential and Limited	4,058	190.7%	-90.7%	3,629	16.6%	83.4%	7,687	110.9%	-10.9%
Buy-in	885	-15.3%	115.3%	1,466	268.4%	-168.4%	2,351	162.3%	-62.3%

Source: Mathematica Policy Research analysis of 2009-2011 program and American Community Survey data, Massachusetts population sample.

Note: See Appendix A for definitions of population groups and program clusters.

III. MassHealth Enrollment Projections

In this chapter, we report MassHealth enrollment projections from 2014 to 2020. In Section A, we summarize our projection methods; in Section B, estimates of enrollment in 2012 using those methods are presented and compared to actual 2012 enrollment. In Section C, projected enrollment from 2014 to 2020 is presented, inclusive of ACA effects on enrollment in current programs as well as in the new CarePlus program for low-income adults. Confidence intervals around the mean 2014-2016 enrollment projections for each population group are reported in Section D.

A. Projection methods

Our projection methods allow two sources of change in eligibility for MassHealth: (1) population changes (specifically, changes in the size and age of the population, as well as the occupational and industry mix of employment); and (2) changes in program eligibility. As described in Appendix A, we benchmarked the baseline population to reflect the population and employment projections in each forecast year, 2014-2020.

To predict enrollment among the eligible population, we estimated three logit regression models on the 2011 ACS predicting enrollment among (respectively) children, adults, and seniors as a function of various personal and family characteristics. To support prediction of enrollment in CarePlus, we included adults eligible for Commonwealth Care in the model estimated for adults. The estimated coefficients for each model, when applied to individuals in the projected population data, generate a predicted probability of enrollment for each individual in each projected year, consistent with 2011 enrollment behavior.

Once the ACA changes in program eligibility that occur in 2014 are assigned, only changes in the distribution of characteristics within the population groups—including their age and employment characteristics as well as changes in characteristics that correlate with age and employment, such as income—drive changes in projected enrollment. The rules used to assign eligibility in all years from 2014 to 2020 are listed in Appendix C.

B. Comparing 2012 projected to actual enrollment

To gauge the models' ability to predict enrollment accurately, we projected 2012 enrollment and compared the results to administrative enrollment counts. Comparisons for each population group and program cluster are presented in Table III.1.

On average, the models predict 94 percent of total enrollment, and they perform about equally well for each population group. They also perform about equally well—within 6 percentage points—for most of the program clusters associated with children and seniors. For some program clusters (Family Assistance for children and the buy-in program for seniors), the models predicted within 3 percentage points.

Table III.1. Actual and projected enrollment by population group and program cluster, 2012

Population and program cluster	Actual Enrollment	Predicted Enrollment	Ratio of Predicted to Actual Enrollment
Total, all populations and programs	1,636,304	1,536,665	0.94
Children	562,064	535,022	0.95
Standard and common	486,148	456,781	0.94
Family assistance	59,649	60,013	1.01
Limited, CMSP	16,267	18,228	1.12
Adults	913,742	849,083	0.93
Standard and common	476,080	447,340	0.94
Basic/essential, family assistance	136,379	174,639	1.28
Limited, prenatal	55,840	49,978	0.90
Buy-in	2,639	7,236	2.74
Commonwealth care[a]	242,804	169,890	0.70
Seniors	160,498	152,559	0.95
Standard, essential, and limited	138,998	130,389	0.94
Buy-in	21,500	22,170	1.03

[a] Enrollment in Commonwealth Care, which was not a MassHealth program and is discontinued as of 2014, was projected as an indicator of potential enrollment in HealthPlus.

However, the take up model for adults performs less well overall (predicting 93 percent of actual enrollment, versus 95 percent for children and seniors), and it performs substantially less well when parsed into all but the largest program cluster (Standard and Common). The model predicts enrollment in the smallest program cluster (adult buy-in, with fewer than 3,000 actual enrollees in 2012) with the greatest error, predicting 2.74 times actual enrollment. Conversely, it underestimates enrollment in Commonwealth Care by 30 percent—suggesting that our projections of enrollment in CarePlus are substantially less than might actually occur.

C. Projected eligibility and enrollment

We projected eligibility within each population group from 2014 to 2020. Changes in the projected number of persons eligible are driven only by changes in the demographic and employment characteristics of the projected population. Consequently, they do not reflect a number of economic changes that are not measured by employment status—including, for example, potential changes in productivity due to technological change or projected changes in retirement income among seniors.

Table III.2 presents projections by year and population group. We project that across all populations, the number of persons eligible for any MassHealth program will decline 2.3 percent between 2014 and 2020. However, the changes in eligibility differ by population group, with eligibility among seniors increasing 8.4 percent, eligibility among children declining 2.7 percent, and adult eligibility declining 3.8 percent. Approximately half of the change in eligibility among children (-1.4 percentage points) is projected to occur from 2014 to 2015.

Table III.2. Projected number of persons eligible for MassHealth by population group, 2014-2020

Year	Total	Children	Adults	Seniors
Average monthly eligible				
2014	3,280,562	725,176	2,214,183	341,204
2015	3,277,668	714,826	2,216,470	346,372
2016	3,260,178	712,835	2,196,755	350,588
2017	3,244,290	710,902	2,178,351	355,037
2018	3,230,013	709,029	2,161,248	359,737
2019	3,217,362	707,219	2,145,435	364,708
2020	3,206,350	705,473	2,130,903	369,974
Annual change				
2014-2015	-0.1%	-1.4%	0.1%	1.5%
2015-2016	-0.5%	-0.3%	-0.9%	1.2%
2016-2017	-0.5%	-0.3%	-0.8%	1.3%
2017-2018	-0.4%	-0.3%	-0.8%	1.3%
2018-2019	-0.4%	-0.3%	-0.7%	1.4%
2019-2020	-0.3%	-0.2%	-0.7%	1.4%
Total change, 2014-2020	-2.3%	-2.7%	-3.8%	8.4%

As described above, projected enrollment by population group is based on the enrollment models estimated for children, adults, and seniors, applied to the projected population in each year. Consistent with declining eligibility for MassHealth overall, total enrollment in MassHealth is projected to decline (-5.8 percent, from 2014 to 2020), due to fewer children and adults projected to enroll (Table III.3). The number of children and adults enrolled in MassHealth is projected to decline each year, with MassHealth serving 2.4 percent fewer children and 10.1 percent fewer adults in 2020 than in 2014. In contrast, the number of seniors projected to enroll in MassHealth increases by more than 1 percent each year, and cumulatively by 8.4 percent from 2014 to 2020.

Table III.3. Projected MassHealth enrollment by population group, 2014-2020

Year	Total	Children	Adults	Seniors
Average monthly enrollment				
2014	1,614,304	520,615	932,603	161,086
2015	1,600,612	513,640	923,175	163,798
2016	1,582,086	512,410	903,942	165,735
2017	1,564,820	511,224	885,821	167,775
2018	1,548,816	510,083	868,804	169,928
2019	1,534,075	508,990	852,880	172,205
2020	1,520,599	507,945	838,038	174,616
Annual change				
2014-2015	-0.8%	-1.3%	-1.0%	1.7%
2015-2016	-1.2%	-0.2%	-2.1%	1.2%
2016-2017	-1.1%	-0.2%	-2.0%	1.2%
2017-2018	-1.0%	-0.2%	-1.9%	1.3%
2018-2019	-1.0%	-0.2%	-1.8%	1.3%
2019-2020	-0.9%	-0.2%	-1.7%	1.4%
Summary: 2014-2020	-5.8%	-2.4%	-10.1%	8.4%

The changes in projected enrollment by population group are largely mirrored at the program level, when projected enrollment is parsed into program clusters. Enrollment in nearly every program cluster that serves children or adults is projected to fall each year from 2014 to 2020. The largest decline in children's enrollment is projected to occur in 2014-2015 (-1.3 percent in Standard and Common, and -1.5 percent in Family Assistance and Limited/CMSP) (Table III.4). In all other years, from 2015 to 2020, children's enrollment is projected to decline 0.2 percent per year.

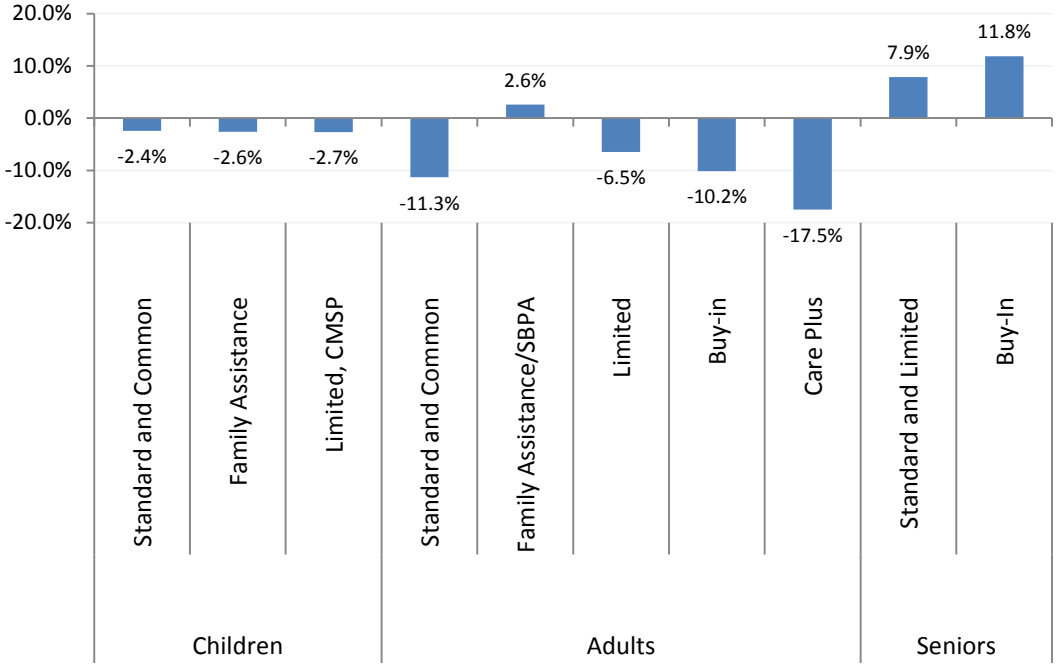
Among adults, total enrollment is projected to decline faster from 2015 to 2020 than from 2014 to 2015, driven by declining enrollment in two of the three largest program clusters that serve adults—Standard and Common, and CarePlus. From 2015 to 2020, adult enrollment in Standard and Common is projected to decline more than 2 percent per year, while enrollment in CarePlus is projected to decline more than 3 percent per year. Cumulatively, from 2014 to 2020, adult enrollment in Standard and Common is projected to decline 11.3 percent, while enrollment in CarePlus is projected to decline 17.5 percent (Figure III.1). That said, as noted in Section B, the enrollment model estimated for adults under-predicts enrollment in both programs, and especially in CarePlus; whether the model increasingly under-predicts over time (so as to predict steadily declining enrollment in these programs) might warrant further investigation. In contrast to all other MassHealth programs that serve adults, enrollment in Family Assistance or Small Business Premium Assistance (SBPA) program cluster is projected to maintain enrollment, increasing 1 percent from 2014 to 2015 and 0.3 percent each year from 2015 to 2020.

Table III.4. Projected MassHealth enrollment by population group and program cluster, 2014-2020

	2014	2015	2016	2017	2018	2019	2020
Projected average monthly enrollment							
Total, all populations and programs	1,614,304	1,600,612	1,582,086	1,564,820	1,548,816	1,534,075	1,520,599
Children	520,615	513,640	512,410	511,224	510,083	508,990	507,945
Standard and Common	448,155	442,274	441,216	440,196	439,217	438,281	437,387
Family Assistance	54,790	53,967	53,839	53,715	53,594	53,478	53,365
Limited, CMSP	17,670	17,398	17,355	17,313	17,272	17,232	17,193
Adults	932,603	923,175	903,942	885,821	868,804	852,880	838,038
Standard and Common	477,239	470,635	459,959	449,881	440,395	431,495	423,175
Family Assistance/SBPA	166,459	168,195	168,668	169,166	169,689	170,235	170,804
Limited	46,650	46,114	45,534	44,995	44,499	44,045	43,633
Buy-in	7,130	7,089	6,934	6,788	6,651	6,524	6,405
Care Plus	235,124	231,142	222,848	214,991	207,570	200,581	194,021
Seniors	161,086	163,798	165,735	167,775	169,928	172,205	174,616
Standard and Limited	139,406	141,702	143,258	144,894	146,619	148,441	150,370
Buy-In	21,680	22,096	22,477	22,881	23,310	23,764	24,247
Annual percentage change in projected average monthly enrollment							
Total, all populations and programs	--	-0.8%	-1.2%	-1.1%	-1.0%	-1.0%	-0.9%
Children	--	-1.3%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
Standard and Common	--	-1.3%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
Family Assistance	--	-1.5%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
Limited, CMSP	--	-1.5%	-0.2%	-0.2%	-0.2%	-0.2%	-0.2%
Adults	--	-1.0%	-2.1%	-2.0%	-1.9%	-1.8%	-1.7%
Standard and Common	--	-1.4%	-2.3%	-2.2%	-2.1%	-2.0%	-1.9%
Family Assistance/SBPA	--	1.0%	0.3%	0.3%	0.3%	0.3%	0.3%
Limited	--	-1.1%	-1.3%	-1.2%	-1.1%	-1.0%	-0.9%
Buy-in	--	-0.6%	-2.2%	-2.1%	-2.0%	-1.9%	-1.8%
Care Plus	--	-1.7%	-3.6%	-3.5%	-3.5%	-3.4%	-3.3%
Seniors	--	1.7%	1.2%	1.2%	1.3%	1.3%	1.4%
Standard and Limited	--	1.6%	1.1%	1.1%	1.2%	1.2%	1.3%
Buy-In	--	1.9%	1.7%	1.8%	1.9%	1.9%	2.0%

In contrast to declining MassHealth enrollment among children and adults in nearly all program clusters, the number of seniors enrolled in MassHealth is projected to rise in both program clusters that serve them, and to rise faster in the buy-in program than in the Standard/Essential/Limited programs. The number of seniors enrolled in the buy-in programs is projected to increase 11.8 percent, compared with a 7.9 percent increase in seniors projected to enroll in the Standard/Essential/Limited programs (Figure III.1).

Figure III.1. Cumulative change in projected enrollment by population group and program cluster, 2014-2020



D. Confidence intervals for 2014-2016 projected enrollment

We estimated confidence intervals around projected enrollment for each population subgroup in 2014, 2015, and 2016. In general, the confidence intervals for the estimates are narrow, reflecting specification of the enrollment models to include only highly predictive independent variables. The estimates for children are the most efficient: with 95 percent confidence, the estimates are within 0.2 percent of mean projected enrollment (Table III.5). The confidence intervals for adults are similarly narrow: within 0.3 percent of projected enrollment. The projections for seniors are the least efficient, but the enrollment projections for seniors are nevertheless within 0.9 percent of mean projected enrollment with 95 percent confidence.

Table III.5. Confidence intervals for projected enrollment by population group, 2014-2016

	2014		2015		2016	
	Projected Mean	95 Percent Confidence Interval	Projected Mean	95 Percent Confidence Interval	Projected Mean	95 Percent Confidence Interval
Children	520,570	+/- 0.2%	513,588	+/- 0.2%	512,355	+/- 0.2%
Adults	931,888	+/- 0.3%	922,463	+/- 0.3%	903,204	+/- 0.3%
Seniors	161,795	+/- 0.9%	164,511	+/- 0.9%	166,451	+/- 0.9%

The narrow confidence intervals around the projections reflect our effort to specify the underlying enrollment models (as documented in Appendix A) parsimoniously—rejecting potential explanatory variables that were marginally significant or insignificant, and that did not add appreciably to the overall goodness of fit. That said, the models explained just 23 to 56 percent of variation in enrollment among the eligible populations in 2011 and, as described in Section B, they projected just 94 percent of actual 2012 enrollment. Thus, substantial unexplained heterogeneity is embedded in the projections and with it, the potential for larger error in the projections than may be apparent from the narrowness of the confidence intervals around the projected means.

APPENDIX A

METHODS

APPENDIX A. METHODS

In the sections below, we describe the data sources, preparation of the database to support the Phase 1 estimates, and development of the Phase 2 projections.

A. Data sources

The reported eligibility estimates and enrollment projections are derived from analysis of the American Community Survey (ACS), an annual survey of U.S. households conducted by the U.S. Census Bureau. The ACS obtains information about the demographic and socio-economic characteristics of individuals and households. The ACS household sample includes approximately 3.1 million individuals (1 percent of the U.S. population), more than any other survey conducted by the Census Bureau; it is representative at the state level and also representative for many metropolitan areas and counties.

The analysis is based on respondents to the 2009, 2010, 2011, and 2012 ACS living in Massachusetts,[1] as well as administrative data measuring monthly enrollment in MassHealth. In each year, the ACS had about 65,000 Massachusetts respondents. To increase the precision of our estimates, we pooled each ACS year with the next adjacent year and reweighted the data (as described in Section C below) to provide annual estimates.

B. Preparation of the phase 1 database

1. Assigning MassHealth eligibility

During the 2009-2012period, MassHealth administered more than ten programs for low income residents. Eligibility for each program depended on personal characteristics (age, employment and hours of work, pregnancy and parental status, disability, Medicare or private health insurance coverage, and citizenship or immigration status) as well as family characteristics (income, family size, and spousal employment and hours of work). We abstracted the eligibility criteria for each program from the member booklets for each year, with consultation from MassHealth.

a. Measurement of personal characteristics

Some of the personal characteristics that define eligibility for the various MassHealth programs are not observable in the ACS or are reported differently than might be observed in an administrative process of eligibility determination. The eligibility algorithms developed for the analysis ultimately did not include criteria based on characteristics (e.g., breast cancer, HIV/AIDS status, or financial assets) that are not reported in the ACS. However, most of the MassHealth eligibility criteria for the various programs are reported in some manner in the ACS

[1] These data were extracted from the integrated public-use microdata files made available through the University of Minnesota. See: Steven Ruggles, J. Trent Alexander, Katie Genadek, Ronald Goeken, Matthew B. Schroeder, and Matthew Sobek. *Integrated Public Use Microdata Series: Version 5.0* [Machine-readable database], 2014.

and were included in the eligibility algorithms—although some are less specific than the criteria MassHealth uses for eligibility determination. For example:

- The ACS asks respondents about their citizenship status and differentiates among immigrants by the year they entered the U.S. In contrast, MassHealth defines "qualified immigrants" as documented immigrants or "special status aliens." To define eligibility for MassHealth, we included as qualified immigrants all immigrants living in Massachusetts who had been in the U.S. at least five years.
- The ACS does not identify current pregnancy status, but does identify whether a woman gave birth to a child in the past year. We used this variable as a proxy for pregnancy in the prior year, which is the same time frame over which income is reported in the ACS.
- The ACS does not measure disability in the same way as MassHealth does. The ACS includes a six-question sequence on functional limitations. While many studies have used this sequence of questions to identify the population with disabilities, it likely misidentifies many individuals with respect to determination of MassHealth eligibility. We coded individuals that report income from a Social Security disability program (SSI if younger than age 65, or SSDI if younger than age 62) as disabled. Because ACS does not separately report income for children under age 15, we used an affirmative response to one or more of the six functional limitation questions to identify disability among children younger than age 15.

b. Measurement of family characteristics

We constructed family units as they are defined for the purpose of determining MassHealth eligibility. For seniors (age 65 or older), a family unit is composed of the respondent and a spouse, if present. For adults under age 65 (age 19 to 64), the family unit is composed of the respondent and (if present in the household), a spouse and related children age 0-18. For children, the family unit is composed of the child and (if present in the household) a parent, foster parent, or caregiver (defined below); the spouse of the parent, foster parent, or caregiver; and other children age 0-18 related to the parent, foster parent, caregiver, or spouse.

For children that live with neither parent, we defined the caregiver as a related adult in the household. Because only one adult in a household can be deemed a caregiver for purposes of determining program eligibility, we imposed a hierarchy to identify the caregiver in households with more than one adult. If there was a related adult man and woman, we selected the woman. If there were multiple women related to the child, we selected the woman whose age was nearest to the child's age plus 20 years.

We calculated family income as income from selected sources, summed across all adult family members. To approximate "current" income relevant to eligibility determination, we recoded the annual earnings reported in the ACS to zero for all adults who reported not working at the time of the survey. Children residing with a foster parent or caregiver are deemed eligible for MassHealth and were coded as having no family income.

For seniors, MassHealth disregards some earned and unearned income when determining eligibility.[2] We followed the programs' "countable income" rules when calculating income for seniors. In addition, we presumed that seniors who reported difficulty in at least two of four areas (mobility, cognition, self-care, or independent living) would qualify for an additional income disregard for personal care attendant services to live at home.[3]

Family size was measured as the number of family members (as defined earlier), and used to compare family income (considering sources of income as appropriate to each MassHealth program) with poverty thresholds set by the U.S. Department of Health and Human Services to calculate family income as a percent of poverty.[4]

c. Eligibility assignment

In light of the individual and family level characteristics that are observable in the ACS and the size of the population sample, we made a preliminary determination that it might be feasible to identify eligibility for any of nine MassHealth programs:[5]

1. Standard
2. Common
3. Family Assistance
4. Basic and Essential (taken together)
5. Buy-in
6. Limited
7. CMSP
8. Health Start Program
9. Prenatal

We developed eligibility algorithms reflecting the eligibility rules for each program and flagged whether the individual was eligible for each – allowing eligibility for more than one program. The program eligibility rules as reflected in these algorithms are described in Appendix A.

[2] Countable income of seniors is the sum of 50 percent of monthly earned income after a $65 earnings disregard (or up to 85 dollars if unearned income is less than twenty dollars), and unearned income after a twenty dollar unearned income disregard.

[3] For an individual who is in need of PCA services (indicated by completion of a PCA supplement through the application process), instead of the $20 unearned income disregard, MassHealth subtracts the "increased unearned income disregard" as described at 130 CMR 520.013(B). This increased unearned income disregard is equivalent to the difference between the MassHealth Income Standard and 133% FPL for the applicable family size.

[4] U.S. Department of Health and Human Services, Assistant Secretary for Planning and Evaluation. Prior HHS Poverty Guidelines and Federal Register References. Accessed April 18, 2014.

[5] For the purpose of benchmarking the ACS to administrative data, we also estimated eligibility for Commonwealth Care, although it is not administered by MassHealth.

2. Coding program enrollment

An individual was coded as enrolled in a particular MassHealth program if the individual was eligible for the program and reported being enrolled in Medicaid. Unlike eligibility, enrollment was coded hierarchically—so that individuals were flagged as enrolled only in the most generous program for which they were eligible. After examining the unweighted counts of individuals flagged eligible and enrolled in each MassHealth program, we grouped the populations and programs into nine clusters as shown in table A.1, aggregating programs for which it was apparent that either the variables we could observe inadequately discriminated or the ACS sample size (even when combining survey years, as described below) was inadequate to measure low levels of enrollment.

Table A.1. Population groups and program clusters defined for analysis

Cluster	Definition	Program Composition
1	Full benefits, children	Standard and Common, children
2	Full benefits, adults	Standard and Common, adults
3	Moderate benefits, children	Family Assistance, Children
4	Moderate benefits, adults	Family Assistance and Basic/Essential, Adults
5	Limited benefits, children	Limited, CMSP, Children
6	Limited benefits, adults	Limited, Prenatal, Adults
7	Seniors – all non-buy-in programs	Standard, Essential, and Limited, Seniors
8	Buy in, non-seniors	Buy-in
9	Buy in, seniors	Buy-in

After organizing the monthly enrollment data provided by MassHealth into the nine population/program clusters, we discovered that our eligibility algorithms identified too few children and adults eligible for full benefits, and too many eligible for moderate benefits.[6] To account for the monthly income volatility that MassHealth observed, but that is unobserved in the ACS (even after adjusting annual income for periods of not working), we randomly selected 50 percent of children and 10 percent of adults that we had flagged as eligible for moderate benefits and re-flagged them as eligible for full benefits.

3. Creating benchmarked annual files

To conduct the Phase 1 analysis of take-up, we combine two adjacent years of ACS data in order to produce larger sample sizes (and, therefore, potentially more variation in population characteristics) for each year. We combined the 2009 and 2010 ACS to produce 2009 estimates, the 2010 and 2011 ACS to produce 2010 estimates, and the 2011 and 2012 to produce 2011

[6] This result is consistent with the substantial income volatility known to occur among the low-income nonelderly population. See, for example: Shore-Sheppard, Lara. Income Dynamics and Coverage Transitions of Health Reform Expansion Populations. 2012 and Sommers et al., Medicaid And Marketplace Eligibility Changes Will Occur Often In All States, 2014.

estimates. Using a conventional raking[7] process, we generated new population weights for each pooled sample benchmarked to key socio-demographic characteristics that determine Medicaid eligibility. These benchmarking characteristics and their sources are documented in Table A.2.

Table A.2. Benchmarks used to reweight the pooled 2009-2011 ACS population samples

Benchmark	Values	Source
Population age	Number of individuals in 5-year age intervals from 0-4 through 75-79. Individuals age 80 or older are top coded.	Census reports of MA population for each target year[a]
Family income as a percent of poverty	Number of individuals with estimated MAGI less than 100%, 100%-200%, 200%-300%, or more than 300% of the HHS poverty threshold	Benchmark distribution calculated from the ACS in the target year
Race and ethnicity	Number of individuals who report being of Hispanic descent (any race), White only (non-Hispanic), Black only (non-Hispanic), and other non-Hispanic (including mixed race).	Benchmark distribution calculated from the ACS in the target year
Medicaid eligibility	Number of individuals flagged as eligibility for each of the 9 program clusters or Commonwealth Care.	Benchmark distribution calculated from the ACS in the target year
Medicaid enrollment	Number of individuals enrolled in each of the nine clusters or Commonwealth Care.	MassHealth

[a] U.S. Census Bureau, Population Division. Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2012, June 2013.

C. Phase 2 projections

1. Preparation of the forecasting data

To generate the Phase 2 enrollment forecasts, we "aged" the 2011 database derived from the ACS and developed in Phase 1. This process involved reweighting the data to be representative of the Massachusetts population in sequential years 2014 to 2020. As in Phase 1, raking was used to generate new population weights for pooled 2-year samples benchmarked to demographic and employment forecasts.[7]

The raking used population forecasts for 2015 and 2020 that were generated by the University of Massachusetts Donohue Institute.[8] We linearly interpolated between 2012 and 2015 to obtain a forecast for 2014, and between 2015 and 2020 to obtain forecasts for 2016-2019. Employment forecasts were generated by the Massachusetts Executive Office of Labor and Workforce Development. These forecasts include estimates of the number of workers by

[7] See: Izrael, David, David C. Hoaglin, and Michael P. Battaglia. A SAS Macro for Balancing a Weighted Sample, 2000.

[8] UMass Donahue Institute. Population Projections, December 2013.

industry and occupation through 2020;[9] taken together with the projected population, they also provide forecasts of the number of non-workers. The detailed benchmarking groups used to rake the data to each projection year are shown in Table A.3. Adjusting the population weights to approximate the future distribution of employment has the effect of adjusting the distribution of family income and poverty measures that correlate with employment measures. For children, we benchmarked the industry and occupation of the parent with higher earnings in order to, in effect, adjust their family income in step with projected employment changes.

Table A.3. Benchmarks used to reweight the ACS population samples to 2020

Benchmark	Values	Source
Population age by sex	Number of individuals in 5-year age intervals from 0-4 through 75-79. Individuals age 80 or older are top coded.	University of Massachusetts Donohue Institute
Number of workers by occupation	Occupational groups: Management Business and Financial Operations Computer and Mathematical Operations Architecture and Engineer Life, Physical, and Social Science Community and Social Services Legal Education, Training, and Library Art, Design, Entertainment, Sports, and Media Healthcare Practitioners and Technical Healthcare Support Protective Services Food Preparations and Serving Related Building and Grounds Cleaning and Maintenance Personal Care and Service Sales and Related Office and Administrative Farming, Fishing, and Forestry Support Construction and Extraction Installation, Maintenance, and Repair Production Transportation and Materials Moving Military Non Workers	Massachusetts Executive Office of Labor and Workforce Development
Number of workers by industry	Industry groups: Agriculture, Forestry, Fishing, Hunting and Mining Construction, Utilities, and Manufacturing Wholesale Retail Transportation, Information, Real Estate, Accommodations and Food Finance, Professional, Administration and Remediation Management of Companies and Education Health Care, Arts, Other Services Government Non Workers	Massachusetts Executive Office of Labor and Workforce Development

[9] Massachusetts Industry-Occupation Employment Matrix, 2010-2020. Massachusetts Executive Office of Labor and Workforce Development (http://lmi2.detma.org/lmi/projections.asp)

The resulting population projections strictly reflect the external population and employment forecasts used to age the 2011 ACS; in effect, these forecasts drive the projected changes in eligibility and enrollment from 2014 to 2020. The projections do not reflect any factors that might vary the rate of workers per population, nor do they reflect factors that might vary the level or distribution of real income other than workers' industry/occupational mix. For example, if the rate of employment does not improve according to forecasts, the ratio of workers to nonworkers will be less than projected; in turn, more adults and children would likely be eligible for MassHealth, and enrollment might be greater than projected. Alternatively, if productivity rises due to technological change, earnings might increase; in turn, fewer adults and children in working families might be eligible for MassHealth, and enrollment might be less than projected. Among seniors, the projections assume the same levels of real income (by age cohort and gender) that were observed among seniors in 2011, although many fewer seniors might have defined pension income or substantial retirement savings in 2020. These alternative scenarios, while feasible, are not reflected in current economic forecasts.

2. Coding 2014 eligibility

We coded additional eligibility variables to reflect the changes in eligibility in January 2014. These changes are listed in detail in Appendix C. Most importantly with respect to re-coding eligibility, we created a new income variable to approximate modified adjusted gross income (MAGI) that all states must use as of January 2014 to determine Medicaid eligibility for nondisabled children and adults. MAGI excludes income from SSI or TANF. In addition, we created CarePlus eligibility rules for childless adults. Adults eligible for CarePlus were included in a new Cluster 10, in addition to the 9 clusters described in Table A.1.

3. Take up analysis

Using the 2011 file prepared for the Phase 1 analysis, we estimated three models predicting take-up among (respectively) children, adults, and seniors using Logit regression. The model specifications were selected to maximize the predictive power of the models as measured by the pseudo R-square[10] and the Hosmer-Lemeshow Test.[11] The final specifications and logistic regression results are reported in Tables A.4 through A.6.

[10] Institute for Digital Research and Education, University of California at Los Angeles. FAQ: What are pseudo R-squareds? Accessed April 18, 2014.

[11] SAS Institute. The Hosmer-Lemeshow Goodness of Fit Test. SAS/STAT(R) 12.1 User's Guide. Accessed April 18, 2014.

Table A.4. Logit regression estimates for children: dependent variable = enrolled in Medicaid, 2011

Independent Variable (Dependent: Enrolled =1)	Coefficient Estimate	Level of Significance
Eligible only for limited benefit	-3.4792	<.0001
Medicare coverage	-3.615	<.0001
Private or military insurance	-4.4238	<.0001
Private or military insurance interacted with FPL[a]	0.00236	<.0001
Residence in institution or group quarters	1.3279	0.0189
Has disability	1.1119	0.0006
Has disability interacted with continuous age[a]	0.1211	<.0001
SNAP receipt	0.6939	<.0001
SSI receipt	-1.4561	<.0001
TANF receipt	2.9753	0.022
Unmarried parents	0.5381	<.0001
No parents in household	0.7978	<.0001
FPL less than 100	1.6214	<.0001
FPL 100 to 132	2.339	<.0001
FPL 133-149	2.0409	<.0001
FPL 150-199	1.6702	<.0001
FPL 200-299	1.4491	<.0001
Mother's (or father's when mother not present) race/ethnicity is Hispanic	0.702	<.0001
Mother's (or father's when mother not present) race/ethnicity is Other Race (not White or Black)	0.3719	0.0006
Highest educational attainment of parent is less than high school graduate	0.2426	0.1007
Parent has Medicaid	6.6788	<.0001
N = 14,573		
Model Fit Statistics:		
Pseudo r-square =0.5922		
Hosmer-Lemeshow: Chi-Square =741.38 (DF 8, Pr>ChiSq < 0.0001)		

[a]Variable is continuous; all other variables are categorical (0-1).

Table A.5. Logit regression estimates for adults: dependent variable = enrolled in Medicaid, 2011

Independent Variable (Dependent: Enrolled =1)	Coefficient Estimate	Level of Significance
Eligible only for limited benefit	3.0122	<.0001
Eligibility only for programs with premiums	-0.1932	0.0048
Eligible for Standard/Common	2.095	<.0001
Eligible for Standard/Common without premiums	-0.4922	<.0001
Private or military insurance	-3.0859	<.0001
Age 19 to 26	-0.4007	<.0001
Female	0.1773	<.0001
Gave birth in past year	1.5044	<.0001
Married	-0.1558	0.0015
Children in household	0.1278	0.0107
FPL less than 100	0.9884	<.0001
FPL 100 to 132	1.3729	<.0001
FPL 133-149	1.248	<.0001
FPL 150-199	1.0452	<.0001
FPL 200-299	0.6018	<.0001
Education is college graduate	-0.2726	<.0001
Number of disabilities [a]	0.0893	0.0046
Number of disabilities interacted with age>50 [a]	-0.2009	<.0001
Self employed	0.3761	<.0001
Unemployed	0.3279	<.0001
Employed full time	-1.4884	<.0001
Employed part time[b]	-1.1176	<.0001
SNAP receipt	0.8893	<.0001
SSI receipt	-0.1966	0.0029
TANF receipt	1.6289	<.0001
N = 39,795		
Model Fit Statistics:		
Pseudo r-square = 0.5387		
Hosmer-Lemeshow: Chi-Square = 1904.14 (DF 8, Pr>ChiSq < 0.0001)		

[a]Variable is ordinal, ranging from 0 to 6; all other variables are categorical (0-1).
[b]Missing = not in labor force

Table A.6. Logit regression estimates for seniors: dependent variable = enrolled in Medicaid, 2011

Independent Variable[a] (Dependent: Enrolled =1)	Coefficient Estimate	Level of Significance
Private or military insurance	-0.8026	<.0001
Age 65-69	0.4477	<.0001
Age 70-74	0.176	0.0308
Age 75-79	0.2915	0.0002
Female	-0.0135	0.8491
Hispanic	0.6418	<.0001
Black	0.4237	0.0002
Other race (not White)	0.3604	0.0007
Residence in institution or group quarters	1.1413	<.0001
Married	-0.2088	0.0392
Married and female	0.1008	0.4562
FPL less than 100	0.1285	0.1103
FPL 100 to 200	0.2179	0.0027
Education is less than high school graduate	0.214	0.0003
Employed	-0.5797	<.0001
Self-employed	-0.3353	0.0952
Age 70+ interacted with cognitive limitation	0.133	0.0894
Age 70+ interacted with physical limitation	0.00391	0.9612
Age 70+ interacted with mobility limitation	0.0993	0.2539
Age 70+ interacted with vision limitation	0.0595	0.5087
Age 70+ interacted with hearing limitation	-0.0121	0.8692
Age 70+ interacted with self care limitation	0.2246	0.0126
SNAP receipt	1.2633	<.0001
SSI receipt	-0.5672	<.0001
TANF receipt	0.0456	0.7708
Homeowner	-0.4846	<.0001
Nonparent caregiver	0.5599	0.1772
N = 7,620		
Model Fit Statistics:		
Pseudo r-square = 0.2318		
Hosmer-Lemeshow: Chi-Square = 122.55 (DF 8, Pr>ChiSq < 0.0001)		

[a]All variables are categorical (0-1).

4. Projecting enrollment from 2014 to 2020

These estimates reported in Tables A.4 through A.6 were used to stochastically assign Medicaid enrollment among MassHealth-eligible children, adults, and seniors in each forecasting year. Specifically, we developed a stochastic model that calculated the predicted probability of enrollment for each individual as $e^{(a + \sum bx)}/(1+e^{(a + \sum bx)})$ where e is the exponential function and, for each population group, a is the estimated intercept term, b is the vector of estimated coefficients, and x is the vector of values of the independent variables. The predicted probability input was then compared with a random number between 0 and 1 generated for each individual. Individuals were assumed to enroll if their predicted probability of enrollment exceeded their random number—allowing for forecasts that included individuals likely to enroll as well as some individuals who were not likely to enroll. Using the adjusted population weights for each forecast years 2014-2020, we tabulated enrollment among each population group in each year, and then parsed forecasted enrollment into the 10 program clusters.

To generate confidence intervals around the enrollment forecast for each population group in years 2014 to 2016, we re-ran the stochastic model described above, using values for b drawn from the 95 percent confidence intervals around each estimated coefficient to predict the probability of enrollment for each individual. We replicated this process 1,000 times to generate a distribution of predicted enrollment within a 95 percent confidence interval around the mean estimate.

APPENDIX B

RULES FOR CODING PROGRAM 2009-2012 PROGRAM ELIGIBILITY

APPENDIX B. RULES FOR CODING PROGRAM ELIGIBILITY

A. Eligibility rules: under age 65

1. Standard

- Eligible if a citizen or qualified immigrant (U.S. born or immigrated at least 5 years prior to year of survey) and is
  - Pregnant in prior 12 months AND family income less than or equal to 200% FPL; or
  - Under one year of age with family income less than or equal to 200% FPL; or
  - Aged 1-18 with family income less than or equal to 150% of FPL; or
  - A parent or adult caregiver of a child age 18 or younger with family income less than or equal to 133% FPL; or
  - Identified to have a disability with family income less than or equal to 133% FPL.

2. Buy-in

- Eligible if not eligible for Standard, identified to have a disability, reports Medicare coverage, and is
  - Not married and has monthly "countable income" less than or equal to $1,277 in 2013, $1,277 in 2012, $1,246 in 2011, $1,239 in 2010, or $1,240 in 2009; or
  - Married and has monthly "countable income" less than or equal to $1,675 in 2013, $1,675 in 2012, $1,675 in 2011, $1,660 in 2010, or $1,661in 2009.

3. CommonHealth

- Eligible if not eligible for Standard or Buy-in, identified to have a disability, is a citizen or qualified immigrant (U.S. born or immigrated at least 5 years prior to year of survey), and is
  - aged 18 or younger; or
  - aged 19 or older with reported weekly hours worked of 10 or more; or
  - aged 19 to 64 and not working

4. Family assistance

- Eligible if not eligible for Standard or Common Health, is a citizen or qualified immigrant (U.S. born or immigrated at least 5 years prior to year of survey), and is
  - aged 18 and younger with family income less than or equal to 300% FPL; or
  - aged 19-64, working (or has a spouse who is working) and has family income less than or equal to 300% FPL

5. Basic & essential

- Eligible if not eligible for Standard, Common Health, or Family Assistance, is a citizen or qualified immigrant (U.S. born or immigrated at least 5 years prior to year of survey), and is not working, has not worked in the past year, does not have a spouse that works more than 25 hours per week, and has family income less than or equal to 100% FPL.

6. MassHealth limited

- Eligible if not eligible for Standard, Common Health, Family Assistance, Basic/Essential and is
  - Pregnant in prior 12 months, and has family income less than or equal to 200% FPL; or
  - Under one year of age with family income less than or equal to 200% FPL; or
  - Aged 1-18 and has family income less than or equal to 150% FPL; or
  - A parent or adult caregiver of a child age 0-18 and has family income less than or equal to 133% FPL; or
  - Identified as having a disability and has family income less than or equal to 133% FPL.

7. Children's medical security plan

- Eligible if not eligible for Standard, Common Health, Family Assistance, or Basic/Essential; is aged 0-18; and has no source of coverage other than Medicaid

8. MassHealth prenatal

- Eligible if pregnant in the prior 12 months.

9. Commonwealth care

- Eligible if not eligible for Standard, Common Health, Family Assistance, Basic/Essential, Limited, or Prenatal, is a citizen or qualified immigrant (U.S. born or immigrated at least 5 years prior to year of survey), is aged 19-64, and has family income less than or equal to 300% FPL

B. Eligibility Rules: Age 65 and Older.

1. Standard/Essential

- Eligible if a citizen or qualified immigrant (U.S. born or immigrated at least 5 years prior to year of survey) and is
- Not married and has monthly countable income was less than or equal to $951in 2013, $951 in 2012, $928 in 2011, $923 in 2010, or $923 in 2009; or
- Married and has monthly countable income was less than or equal to $1,281 in 2013, $1,281 in 2012, $1,246 in 2011, $1,235 in 2010, or $1,235 in 2009; or

- Not married and has a positive response to two or more of the ACS six disability questions, and countable income adjusted for personal care is less than or equal to $951 in 2013, $951 in 2012, $928 in 2011, $923 in 2010, or $923 in 2009; or
- Married and has a positive response to two or more of the ACS six disability questions, and countable income adjusted for personal care is less than or equal to $1,281 in 2013, $1,281 in 2012, $1,246 in 2011, $1,235 in 2010, or $1,235 in 2009.

2. Limited

- Eligible if not eligible for Standard/Essential and
  - Not married and monthly countable income is less than or equal to $951 in 2013, $951 in 2012, $928 in 2011, $923 in 2010, or $923 in 2009; or
  - Married and monthly countable income is less than or equal to $1,281 in 2013, $1,281 in 2012, $1,246 in 2011, $1,235 in 2010, or $1,235 in 2009.

3. Buy In

- Eligible if not eligible for Standard/Essential, has Medicare, is a citizen or qualified immigrant (U.S. born or immigrated at least 5 years prior to year of survey) and is
  - Not married and monthly countable income is less than or equal to $1,277 in 2013, $1,277 in 2012, $1,246 in 2011, $1,239 in 2010, or $1,240 in 2009; or
  - Married and monthly countable income is less than or equal to $1,675 in 2013, $1,675 in 2012, $1,675 in 2011, $1,660 in 2010, or $1,661 in 2009.

APPENDIX C

RULES FOR CHANGING PROGRAM ELIGIBILITY IN 2014

APPENDIX C. RULES FOR CHANGING PROGRAM ELIGIBILITY IN 2014

A. Changes in eligibility rules: under age 65

- Replace FPL with MAGI FPL (adjusted for the 5 percent FPL income disregard), other than for eligibility based on disability

1. Standard

- Age range for child eligibility changed from ages 1 to 18 to ages 1 to 20

2. Buy-in

- Income threshold changed to $1313 for non-married eligibility, and $1765 for married eligibility

3. CommonHealth

- Age range for child eligibility changed from ages 1 to 18 to 1 to 20.

4. Family Assistance

- An additional eligibility group added for ages 19 and 20, with MAGI FPL less than 150 percent of poverty.

5. Basic, Essential, Healthy Start Program, Prenatal, and Commonwealth Care

- Removed, as the programs were eliminated

6. CarePlus added as a new program

- Eligible if not eligible for Standard
- Are a citizen or immigrated prior to five years
- MAGI FPL less than 133

7. Small Business Premium Assistance added as a new program

- Eligible if not eligible for Standard, CommonHealth, Family Assistance, or CarePlus
- Age is between 19 and 64
- FPL is greater than 133 but no more than 300
- Employed
- Are a citizen or immigrated prior to five years

8. Limited

- Replace FPL with MAGI FPL in all eligibility rules, other than for eligibility based on disability.
- Age range for child eligibility changed from ages 1 to 18 to ages 1 to 20

B. Changes in Eligibility Rules: Age 65 and Over

1. Standard and Limited

- Income threshold changed to $978 for non-married eligibility and $1313 for married eligibility

2. Buy-in

- Income threshold changed to $1313 for non-married eligibility, and $1765 for married eligibility

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