

## **Changes in health insurance coverage associated with the Affordable Care Act among adults with and without a cancer history: Population-based national estimates**

### **Technical Appendix**

**Additional Sample Selection Information:** We limited the sample to U.S. citizens. The National Health Interview Survey (NHIS) is representative of the civilian non-institutionalized U.S. population, which includes citizens, legal residents and undocumented immigrants. Legal residents are eligible to participate in some elements of the Affordable Care Act (ACA)-related provisions, but undocumented immigrants are not eligible for Medicaid expansions or to purchase coverage in the Marketplace. The NHIS collects information on citizenship, but not on whether a non-citizen is a legal resident, so we chose to limit our analyses to citizens only. As a result, our estimates may overstate the proportion of all adults age < 65 years who gained coverage during the first two years of the coverage expansions, as well as the proportion of all uninsured eligible for coverage under the ACA.

### **Additional detail concerning methods:**

**Identifying health insurance units (HIUs):** The NHIS reports information on family income, but the family definition includes all persons related through blood, marriage or adoption. The HIU is a subset of the family, and includes the sample adult, a spouse, and their dependent biologic, step, or adopted children. This HIU definition most closely approximates eligibility for employment related coverage. In addition, the HIU is the principal unit used to assess income for purposes of determining Medicaid eligibility and eligibility for Marketplace premium subsidies. We used information on relationships within the family to identify the HIU members for each sample adult.

**HIU income:** In cases where the family and HIU were identical, we used reported continuous family income as reported on the NHIS imputed income files. When the HIU was a subset of the family, we used a multivariable regression-based imputation process (mean predictive matching) to estimate HIU income. The income regression model included information on HIU

composition, sample adult and spouse demographic characteristics, sources of income for the sample adult or spouse, and county-level mean family income. Models were estimated separately for single and married adults. Once the imputation was completed, income was converted to percent of federal poverty guidelines (FPG) by applying calendar year and HIU-size specific thresholds.

**Measurement of insurance coverage:** The NHIS ask for information for each family member concerning current insurance coverage. The survey asks whether anyone in the family currently has health insurance, and then asks for type of coverage for each individual. Multiple types of coverage may be reported for each family member, including single service plans such as dental care, but excluding plans that pay cash when an individual is hospitalized or diagnosed with a specific condition. The data collection process involves a confirmatory question for each individual. We used the responses to the insurance questions to capture enrollment in public coverage (Medicaid or CHIP, state sponsored or other government health plan), private (employment related or privately purchased), Medicare, and not covered.

**Sample weights:** The NHIS provides sample weights to generate nationally representative estimates. We used the weights, dividing by four when using the pooled data to generate annual estimates. Although the NHIS includes observations from all states, the weights are not designed to generate state-specific estimates related to coverage eligibility. The absence of state-specific weights may create some error in the national estimates, for example, the number of uninsured cancer survivors. However, the adjusted estimates of the pre-post changes associated with the ACA implementation are not expected to be biased.

**Specification testing:** Our model uses a difference-in-difference (DID) approach, comparing pre-post ACA changes in the uninsured rate for selected eligibility categories, compared to the highest income group expected to be affected the least by the expansions. One of the requirements for a DID analysis is parallel trends, meaning that trends in the subgroups were

not different prior to the “treatment” of interest. Although our sample included only two years prior to the ACA, we tested for parallel trends by estimating the logistic regression models, using 2013 as the false “post-ACA” period. We did not expect to have adequate statistical power to stratify by cancer survivorship status, but in pooled models, found small increases in the uninsured rate in 2013 in the pre-ACA eligible category and the reference category. We do not have an explanation for this result, but it may represent anticipatory behavior – if adults in that category dropped private coverage knowing that they would soon enroll in Medicaid. It is possible that this pre-ACA change may have overstated the gains in coverage in this category in the post-ACA period.

**Appendix Table 1. Falsification test: Adjusted Estimates of Change in Probability of Being Uninsured by Coverage Eligibility, comparing 2012 (pre-ACA) and 2013 (faux post-ACA)**

	95% Confidence			
	Coefficient	Interval	P> t	
Eligibility category (ref=income>400% FPG)				
Medicaid eligible pre-ACA	0.080	0.052 0.107	0.000	
Newly Medicaid eligible post-ACA	0.159	0.134 0.185	0.000	
Poor, Medicaid eligibility gap	0.215	0.180 0.249	0.000	
Premium subsidies only	0.486	0.444 0.528	0.000	
Alternative affordable coverage	-0.028	-0.038 -0.017	0.000	
Postperiod	0.010	0.001 0.019	0.025	
Eligibility * postperiod				
Medicaid eligible pre-ACA	0.040	0.005 0.075	0.025	
Newly Medicaid eligible post-ACA	0.025	-0.008 0.057	0.136	
Poor, Medicaid eligibility gap	0.021	-0.025 0.067	0.365	
Premium subsidies	-0.012	-0.067 0.042	0.657	
Alternative affordable coverage	0.005	-0.009 0.018	0.502	

Source: National Health Interview Survey, 2012-2013. Models control for age, race, sex, education, marital status, chronic conditions, region, MSA size, and unemployment rate. Abbreviations: ACA, Affordable Care Act; FPG, Federal Poverty Guidelines

Appendix Table 2. Changes in Uninsured Rate Among Adult Cancer Survivors and Adults without a Cancer History Age < 65 years, Pre-Post Implementation of the ACA

Eligibility category	Pre-ACA		Post ACA		Change	% Change	
	%	SE	%	SE			
Cancer Survivors							
Medicaid eligible pre-ACA	11.5%	0.032	2.9%	0.012	-8.6%	-75.0%	.003
Expanded Medicaid eligible post-ACA	25.8%	0.036	7.4%	0.022	-18.3%	-71.1%	<.001
Poor, Medicaid eligibility gap	31.8%	0.049	21.1%	0.052	-10.7%	-33.7%	.15
Subsidy eligible	43.8%	0.043	32.5%	0.044	-11.4%	-25.9%	.071
Alternative affordable coverage	5.8%	0.021	3.0%	0.010	-2.8%	-47.8%	.19
Income >400% FPG	3.7%	0.008	3.3%	0.007	-0.5%	-12.9%	.66
Without Cancer History							
Medicaid eligible pre-ACA	20.2%	0.009	14.2%	0.007	-6.0%	-29.7%	<.001
Expanded Medicaid eligible post-ACA	26.8%	0.009	15.5%	0.007	-11.4%	-42.3%	<.001
Poor, Medicaid eligibilty gap	35.5%	0.014	29.0%	0.012	-6.5%	-18.2%	.001
Subsidy eligible	60.9%	0.009	41.3%	0.009	-19.7%	-32.3%	<.001
Alternative affordable coverage	7.2%	0.003	5.6%	0.003	-1.6%	-22.4%	<.001
Income >400% FPG	6.2%	0.003	4.3%	0.002	-1.9%	-30.7%	<.001

Source: National Health Interview Survey, 2012-2015. Abbreviations: ACA, Affordable Care Act; SE, standard error; FPG, federal poverty guidelines.

**Appendix Table 3. Adjusted Estimates of Change in Probability of Being Uninsured in Post-ACA Period by Coverage Eligibility, Cancer Survivors and Adults without a Cancer History, Full Models**

	Cancer Survivors				Without Cancer History			
	Coefficient	95% Confidence Interval	P> t		Coefficient	95% Confidence Interval	P> t	
<b>Eligibility category (ref=income&gt;400% FPG)</b>								
Medicaid eligible pre-ACA	0.040	-0.027 0.107	0.240		0.088	0.070 0.106	<0.001	
Expanded Medicaid eligible post-ACA	0.186	0.112 0.260	<0.001		0.164	0.146 0.183	<0.001	
Poor, Medicaid eligibility gap	0.229	0.127 0.332	<0.001		0.215	0.187 0.242	<0.001	
Premium subsidies	0.379	0.294 0.464	<0.001		0.494	0.475 0.513	<0.001	
Alternative affordable coverage	0.008	-0.039 0.054	0.741		-0.024	-0.032 -0.015	<0.001	
<b>Postperiod</b>	-0.006	-0.031 0.019	0.632		-0.015	-0.021 -0.008	<0.001	
<b>Eligibility * postperiod</b>								
Medicaid eligible pre-ACA	-0.084	-0.156 -0.013	0.021		-0.040	-0.062 -0.018	<0.001	
Expanded Medicaid eligible post-ACA	-0.167	-0.245 -0.090	<0.001		-0.097	-0.120 -0.074	<0.001	
Poor, Medicaid eligibility gap	-0.106	-0.243 0.032	0.132		-0.046	-0.084 -0.008	0.017	
Premium subsidies	-0.113	-0.235 0.008	0.068		-0.177	-0.202 -0.153	<0.001	
Alternative affordable coverage	-0.025	-0.078 0.028	0.360		0.002	-0.008 0.012	0.721	
<b>Age</b>								
26-35 years	0.116	0.003 0.229	0.044		0.067	0.055 0.078	<0.001	
36-45 years	0.030	-0.060 0.119	0.517		0.046	0.034 0.058	<0.001	
46-55 years	-0.006	-0.095 0.083	0.892		0.038	0.025 0.050	<0.001	
56-64 years	-0.016	-0.104 0.072	0.721		0.016	0.004 0.029	0.009	
<b>Sex, Male</b>	-0.024	-0.048 0.000	0.049		0.029	0.023 0.035	<0.001	
<b>Race/ethnicity</b>								
Non-Hispanic black	-0.055	-0.086 -0.025	<0.001		0.015	0.006 0.025	0.002	
Hispanic	0.017	-0.036 0.069	0.528		0.050	0.039 0.060	<0.001	
Non-Hispanic - Asian, other	0.000	-0.077 0.076	0.994		0.011	-0.001 0.022	0.077	

	Cancer Survivors				Without Cancer History			
	Coefficient	95% Confidence Interval		P> t	Coefficient	95% Confidence Interval		P> t
<b>Highest educational attainment</b>								
HS graduate, some college	-0.024	-0.067	0.019	0.274	-0.049	-0.062	-0.036	<0.001
College degree	-0.054	-0.098	-0.011	0.015	-0.093	-0.107	-0.079	<0.001
Graduate or professional degree	-0.062	-0.111	-0.012	0.014	-0.118	-0.132	-0.104	<0.001
<b>Marital status</b>								
Widowed, separated or divorced	0.012	-0.016	0.040	0.400	0.036	0.028	0.044	<0.001
Never married or unknown	0.009	-0.027	0.046	0.612	0.042	0.035	0.050	<0.001
<b>Region</b>								
Midwest	0.053	0.016	0.089	0.005	0.020	0.010	0.029	<0.001
South	0.061	0.033	0.089	<0.001	0.054	0.045	0.063	<0.001
West	0.029	0.000	0.058	0.053	0.019	0.010	0.029	<0.001
<b>MSA Size</b>								
Metro 0.25-1 million	-0.006	-0.035	0.022	0.659	0.009	0.001	0.018	0.028
Small metro, adjacent, rural	-0.003	-0.035	0.029	0.853	0.031	0.023	0.040	<0.001
<b>Chronic health conditions</b>								
Diabetes	-0.033	-0.062	-0.004	0.028	-0.035	-0.046	-0.025	<0.001
Respiratory condition	-0.009	-0.043	0.024	0.584	-0.009	-0.016	-0.001	0.027
Cardiovascular disease	0.008	-0.022	0.038	0.597	-0.017	-0.027	-0.007	0.001
Other (liver, kidney, stroke)	-0.016	-0.041	0.010	0.221	-0.030	-0.037	-0.023	<0.001
<b>Unemployment</b>								
	0.003	-0.004	0.009	0.412	0.002	0.000	0.003	0.044

Source: National Health Interview Survey, 2012-2015. Abbreviations: ACA, Affordable Care Act; CI, confidence intervals; FPG, federal poverty guidelines; MSA, metropolitan statistical area.

**Appendix Table 4. Adjusted Estimates of Change in Probability of Being Uninsured in Post-ACA Period by Coverage Eligibility, Pooled Cancer Survivors and Adults without a Cancer History**

	<b>Coefficient</b>	<b>95% Confidence Interval</b>		<b>P&gt; t </b>
Eligibility category (ref=income>400% FPG)				
Medicaid eligible pre-ACA	0.086	0.069	0.104	0.000
Newly Medicaid eligible post-ACA	0.165	0.147	0.183	0.000
Poor, Medicaid eligibility gap	0.215	0.188	0.242	0.000
Premium subsidies	0.490	0.471	0.508	0.000
Alternative affordable coverage	-0.023	-0.031	-0.014	0.000
Postperiod	-0.014	-0.020	-0.007	0.000
Eligibility * postperiod				
Medicaid eligible pre-ACA	-0.041	-0.063	-0.020	0.000
Newly Medicaid eligible post-ACA	-0.100	-0.122	-0.078	0.000
Poor, Medicaid eligibility gap	-0.049	-0.086	-0.012	0.010
Premium subsidies	-0.175	-0.199	-0.151	0.000
Alternative affordable coverage	0.000	-0.009	0.010	0.928

Source: National Health Interview Survey, 2012-2015. Models control for age, race, sex, education, marital status, chronic conditions including cancer, region, MSA size, and unemployment rate. Abbreviations: ACA, Affordable Care Act; FPG, Federal Poverty Guidelines

**Appendix Table 5. Adjusted Estimates of Post-ACA Coverage Effects. Results of sensitivity analysis that drops early expansion states.**

	Cancer				No Cancer			
	Coefficient	95% Confidence Interval	P> t		Coefficient	95% Confidence Interval	P> t	
Eligibility category (ref=income>400% FPG)								
Medicaid eligible pre-ACA	0.046	-0.044	0.136	0.313	0.091	0.068	0.115	<0.001
Newly Medicaid eligible post-ACA	0.194	0.092	0.296	<0.001	0.173	0.149	0.198	<0.001
Poor, Medicaid eligibility gap	0.225	0.115	0.335	<0.001	0.211	0.184	0.239	<0.001
Premium subsidies	0.390	0.284	0.496	<0.001	0.496	0.473	0.518	<0.001
Alternative affordable coverage	-0.007	-0.044	0.030	0.697	-0.024	-0.034	-0.014	<0.001
Postperiod	-0.004	-0.035	0.027	0.808	-0.012	-0.020	-0.004	0.005
Eligibility * postperiod								
Medicaid eligible pre-ACA	-0.106	-0.197	-0.015	0.022	-0.025	-0.056	0.005	0.097
Newly Medicaid eligible post-ACA	-0.180	-0.289	-0.071	0.001	-0.125	-0.156	-0.094	<0.001
Poor, Medicaid eligibility gap	-0.111	-0.250	0.028	0.117	-0.046	-0.085	-0.007	0.021
Premium subsidies	-0.114	-0.259	0.031	0.122	-0.150	-0.181	-0.120	<0.001
Alternative affordable coverage	-0.021	-0.063	0.022	0.339	0.002	-0.010	0.014	0.773

States dropped from the sample include those that expanded Medicaid prior to 2012, and those that expanded after January 2014. Early expansion states included District of Columbia, Delaware, Massachusetts, New York, and Vermont. Late expansion states (expanded after January 2014 but within 2015) included Michigan, New Hampshire, Indiana, Pennsylvania, Alaska. Models control for age, race, sex, education, marital status, chronic conditions, region, MSA size, and unemployment rate.

Source: National Health Interview Survey, 2012-2015. Abbreviations: ACA, Affordable Care Act; FPG, Federal Poverty Guidelines