

ONLINE APPENDIX

**HOUSEHOLD IMMIGRATION STATUS HAD DIFFERENTIAL IMPACT ON MEDICAID
ENROLLMENT IN EXPANSION AND NON-EXPANSION STATES**

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NOTES ON THE STATISTICAL ANALYSIS

1. Determining Immigration Status

U.S. government survey data do not include indicators for undocumented immigration status. As a result, we used a newly developed algorithm to impute immigration status in the 2009–15 American Community Survey (ACS). This approach is similar to “residual” methodologies used by the Department of Homeland Security to estimate the size of the undocumented immigrant population (1).

With this approach, a foreign-born survey respondent is first categorized as a lawfully present immigrant if any of the following criteria apply:

- A. that person arrived before 1980;
- B. that person is a citizen;
- C. that person receives Social Security benefits, SSI, Medicaid, Medicare, or Military Insurance;
- D. that person is a veteran, is currently in the Armed Forces;
- E. that person works in the government sector;
- F. that person resides in public housing or receives rental subsidies, or that person is a spouse of someone who resides in public housing or receives rental subsidies;
- G. that person was born in Cuba (as practically all Cuban immigrants were granted refugee status);
- H. that person’s occupation requires some form of licensing (such as physicians, registered nurses, air traffic controllers, and lawyers);
- I. that person’s spouse is a legal immigrant or citizen.

Any remaining foreign-born individuals are then categorized as likely to have undocumented immigration status.

2. Medicaid Analysis

To examine whether living in a mixed-status household was associated with differential receipt of Medicaid coverage, we first conducted a triple differences analysis with multiple treatment periods, comparing the proportion of individuals with Medicaid, before and after expansion of Medicaid eligibility, in states that expanded Medicaid eligibility relative to those that did not, for individuals living in mixed-status households relative to individuals living in non-mixed-status households. The primary model specification was as follows:

Equation 1:

$$Medicaid_{ist} = \beta_0 + \beta_1(T_{st} \cdot MixedHH_i) + \beta_2T_{st} + \beta_3(Exp_s \cdot MixedHH_i) + \beta_4(\delta_t \cdot MixedHH_i) + \beta_5MixedHH_i + \beta_6X_i + \delta_t + \delta_s + \varepsilon_{ist}$$

In this model, i is the indexed person, s state, and t year. $Medicaid_{ist}$ is a binary variable indicating whether or not someone reported having Medicaid coverage. This outcome was regressed on an interaction of two key binary variables: (i) T_{ist} indicates the presence of expanded Medicaid eligibility in a given state and year; and (ii) $MixedHH_i$ indicates an individual lives in a mixed-status household (i.e., lives with at least one other individual who is likely undocumented). Exp_s is binary variable indicating whether a state was an expansion state during the study period. β_1 represents the estimated effect of Medicaid expansion for individuals living in a mixed-status household on Medicaid coverage. δ_t is a vector of year fixed effects, and δ_s is a vector of state fixed effects. We also controlled for a number of individual-level characteristics as represented by the vector X_i , including gender, age, education, race / ethnicity, health insurance unit income as a percent of the federal poverty level, marital status, employment status, number of adults, number of children, and whether the respondent primarily spoke Spanish or had self-care difficulties.

While most states expanded Medicaid on January 1, 2014 or 2015, several states adopted expansion mid-year. The ACS only includes year-level information for a respondents' date of interview, which prevents us from more discretely categorizing whether an individual in a given mid-year expansion state is responding to the survey before or after their state expands. For states that did not expand on January 1 during our study period, we categorized them as expanding on either January 1, 2015 or January 1, 2014, depending on which date was closer to the actual state expansion date.

EXHIBIT A1: COMMON TRENDS ANALYSIS

	Coefficient	95% CI
MixedHH*Exp*2010	-1.42	[-4.13,1.29]
MixedHH*Exp*2011	-0.27	[-2.60,2.07]
MixedHH*Exp*2012	-1.75	[-4.58,1.07]
MixedHH*Exp*2013	-3.47**	[-6.82,-0.11]
Joint F-test P-value		0.59

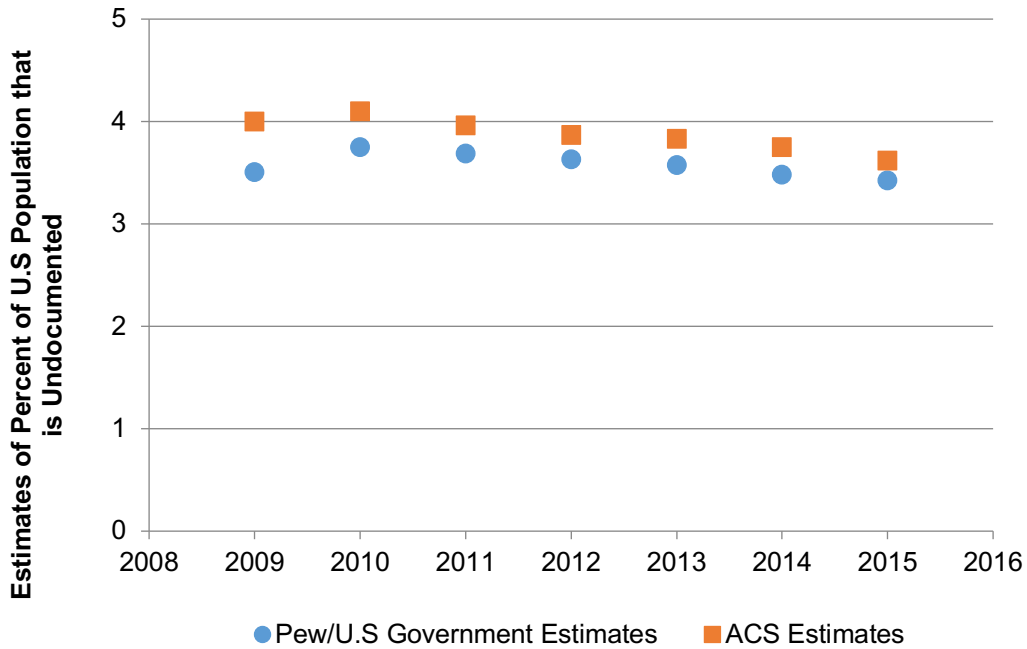
Sources/Notes: SOURCE Authors' analysis of data for 2009–13 from the American Community Survey and the Henry J. Kaiser Family Foundation. NOTES Table reports coefficients from a linear probability model using a modified version of Appendix Equation 1 that replaces the T_{ist} variable with an interaction between an indicator for being an expansion state (abbreviated as Exp) and year dummies between 2009 and 2013. MixedHH is an indicator for whether an individual lived in a household with mixed immigration status. The sample is defined in the notes to exhibit 1. Analyses were conducted with survey weights and controls; details are in the text. CI is confidence interval. We were unable to reject the joint null hypothesis that the coefficients on the interaction terms were equal to zero. *p<0.10 **p < 0.05 ***p < 0.01 ****p < 0.001

EXHIBIT A2: EXCLUSION OF EARLY EXPANSION STATES

	Full Sample		Lawfully Present Immigrants	
	Change	95% CI	Change	95% CI
Model 1: Medicaid Coverage				
2014–15	-0.06	[-2.26,2.14]	1.96	[-2.83,6.76]
2014	0.38	[-2.21,2.96]	1.68	[-5.88,9.24]
2015	-0.47	[-2.98,2.04]	2.45	[-3.75,5.03]

Sources/Notes: SOURCE Authors' analysis of data for 2009–15 from the American Community Survey and the Henry J. Kaiser Family Foundation. NOTES The sample and Medicaid coverage are defined in the notes to exhibit 1. Sample here also excludes early expansion states. Early expansion states included California, Minnesota, Connecticut and the District of Columbia. While New Jersey and Washington did expand their Medicaid program prior to 2014 as permitted by the Affordable Care Act, those expansions primarily consisted of transfers of individuals from existing programs (2). Because eligibility was not expanded substantially for a large group of previously uninsured individuals, these states were not defined as being early expansion states. Lawfully present immigrant sample further restricted to survey respondents who indicated they were non-citizens, but were unlikely to be undocumented. Coefficients are percentage-point differences in the proportion of respondents with Medicaid coverage before and after expansion of eligibility for Medicaid, in expansion states relative to non-expansion states, for people in mixed-status households relative to those in non-mixed-status households. Analyses were conducted using linear probability models with survey weights and controls; details are in the text. CI is confidence interval. *p<0.10 **p < 0.05 ***p < 0.01 ****p < 0.001

EXHIBIT A3: COMPARISON OF UNDOCUMENTED IMMIGRANT ESTIMATES



Sources/Notes: SOURCE Authors' estimates using data from the American Community Survey, Pew Research Center, U.S. Department of Homeland Security, and the U.S. Census Bureau. NOTES Because the Department of Homeland Security does not have published estimates of the size of the undocumented population after 2012, we use Pew Research Center estimates in missing years (2013–15) as a comparison to the estimates we generate from the American Community Survey using the methodology described in the appendix notes on the statistical analysis. Total population sizes used in the denominator for calculating the Pew / U.S. government estimates are from the U.S. Census Bureau (2009-2015).

EXHIBIT A4: RELATIONSHIP BETWEEN LIVING IN MIXED STATUS HOUSEHOLD AND MEDICAID COVERAGE IN NON-EXPANSION STATES, BY IMMIGRATION STATUS

	Full Sample	Lawfully Present Immigrants
2014*mixedHH	-1.645** (0.006)	-5.229 (0.032)
2015*mixedHH	-3.045**** (0.005)	-5.753* (0.029)
Time	0.678**** (0.001)	1.250**** (0.003)
MixedHH	-1.996 (0.017)	5.752*** (0.017)
Time*mixedHH	0.455** (0.002)	1.050* (0.005)
2014	0.656** (0.003)	0.560 (0.008)
2015	1.276** (0.006)	1.129 (0.009)
Sex	7.065**** (0.006)	5.571**** (0.006)
<Age25	-4.731**** (0.007)	-7.211**** (0.006)
Ages 25-29	1.325* (0.007)	-0.705 (0.012)
Ages 29-34	1.283** (0.006)	1.153 (0.017)
Ages 34-39	0.752* (0.004)	0.860 (0.022)
Ages 39-44	0.056 (0.003)	1.376 (0.015)
Ages 49-54	0.359 (0.004)	0.001 (0.012)
Ages 54-59	1.563**** (0.004)	1.645** (0.008)
Ages 59-64	-1.120** (0.005)	0.382 (0.006)
<HSGrad	19.306**** (0.009)	15.375**** (0.015)
HSGrad	11.657**** (0.006)	9.872**** (0.011)

Some college	4.981 ^{****} (0.004)	4.570 ^{****} (0.008)
Black	6.027 ^{****} (0.004)	6.405 ^{***} (0.020)
Other race	1.024 [*] (0.006)	2.287 (0.014)
Hispanic	-0.350 (0.005)	-0.454 (0.016)
HIU income %FPL	0.075 ^{****} (0.000)	-0.019 (0.000)
Spanish speaker	-0.339 (0.003)	1.725 (0.016)
Employment	-18.132 ^{****} (0.006)	-8.851 ^{****} (0.021)
Married	-5.674 ^{****} (0.004)	-7.099 ^{****} (0.014)
Self-care difficulty	31.215 ^{****} (0.013)	31.509 ^{****} (0.011)
Number of adults	-1.995 ^{****} (0.005)	-7.817 ^{****} (0.013)
Number of children	5.268 ^{****} (0.008)	2.627 ^{**} (0.010)
Constant	-31.379 ^{****} (0.014)	-21.011 ^{****} (0.042)
State fixed effects	Yes	Yes

Sources/Notes: SOURCE Authors' analysis of data from the 2009–15 American Community Survey and the Henry J. Kaiser Family Foundation. NOTES The sample and Medicaid coverage are defined in the notes to exhibit 1. Lawfully present immigrant sample further restricted to survey respondents who indicated they were non-citizens, but were unlikely to be undocumented. Coefficients are percentage-point differences in the proportion of respondents with Medicaid coverage before and after expansion of Medicaid eligibility, in non-expansion states, for individuals living in mixed-status households relative to individuals living in non-mixed-status households. Analyses were conducted using linear probability models with survey weights and controls; details are in the text. Standard errors in parentheses. MixedHH is an indicator for whether an individual lived in a household with mixed immigration status. HIU is the respondent's health insurance unit. FPL is the federal poverty level.

*p<0.10 **p < 0.05 ***p < 0.01 ****p < 0.001

NOTES

1. Borjas G. The Earnings of Undocumented Immigrants. Natl Bur Econ Res Work Pap Ser. 2017 Mar;1–43.
2. Sommers B, Arntson E, Kenney G, Epstein A. Lessons from Early Medicaid Expansions Under Health Reform: Interviews with Medicaid Officials. Medicare Medicaid Res Rev. 2013;3(4):E1–23.