

Supplementary Online Content

Goldman A, Woolhandler S, Himmelstein DU, Bor DH, McCormick D. Out-of-pocket spending and premium contributions after implementation of the Affordable Care Act. *JAMA Intern Med*. Published online January 22, 2018.
doi:10.1001/jamainternmed.2017.8060

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This supplementary material has been provided by the authors to give readers additional information about their work.

eMethods. Detailed Descriptions of Covariates Used in all Adjusted Multivariable Models

We treated age as a continuous variable; marital status was categorized as married, previously married, or never married; race as Hispanic, Black, White, Asian, or other race; and region as Northeast, South, Midwest or Western. We considered participants to be employed if they reported employment or short-term leave from a job.¹⁷ Family income was the sum of earned income, investments, and government assistance received by all members of the MEPS-defined family unit annually.¹⁷ Self-reported health status was treated as a binary variable: excellent, very good, or good health vs. either fair or poor health.

eTable 1. Secondary Analysis: Post-ACA Changes in Mean Out-of-Pocket and Premium Contribution Spending, Adjusted for Medical Utilization

	Income group	OOP Spending Pre-ACA, mean ^a	Estimated Change in Spending, mean	Pre to Post Change				
				Utilization-Adjusted Predicted Change (%) ^b	95% Confidence Interval		P Value	
OOP Spending	0-138%	\$392.35	-\$66.19	-16.9	-24.7	-8.2	.0003	**
	138-250%	\$512.71	-\$106.08	-20.7	-28.2	-12.4	<.0001	**
	250-400%	\$618.77	-\$74.81	-12.1	-19.0	-4.6	.002	**
	>400%	\$787.42	-\$95.20	-12.1	-18.4	-5.3	.001	**
	All Income Groups	\$619.23	-\$94.49	-15.3	-19.0	-11.4	<.0001	**
Premium Spending	0-138%	\$599.76	\$19.85	3.3	-10.8	19.7	.66	
	138-250%	\$1,390.46	-\$274.48	-19.7	-36.9	2.2	.07	
	250-400%	\$2,038.68	\$288.88	14.2	-8.4	42.3	.24	
	>400%	\$2,790.44	\$391.78	14.0	-4.4	36.0	.14	
	All Income groups	\$1,921.58	\$71.48	3.7	-6.7	15.4	.50	
OOP+ Premium Combined	0-138%	\$992.11	-\$134.03	-13.5	-24.1	-1.4	.03	**
	138-250%	\$1,903.17	-\$407.28	-21.4	-34.1	-6.2	.01	**
	250-400%	\$2,657.45	\$112.41	4.2	-8.9	19.2	.54	
	>400%	\$3,577.87	\$11.81	0.3	-9.1	10.8	.95	
	All Income groups	\$2,540.82	-\$165.66	-6.5	-12.5	-0.2	.045	**

Notes: The study sample included 83,431 non-elderly adults and 49,197 households. This analysis was done at the individual level for OOP spending and at the household level for premium contributions. This analysis was done at the individual level for OOP spending and at the household level for premium contributions. OOP+Premium spending combined is the sum of the amount that the individual paid for OOP expenses and the total premium contribution made by their family.

^a Spending figures are adjusted to 2015 dollars using the consumer price index. Pre-ACA refers to the sample mean in the pooled sample years 2012 and 2013, and post-ACA refers to the mean in 2014 and 2015. All regression outcomes used logged expenditure with one dollar added prior to log-transformation to retain zero-spenders in our analysis.

^b Regression analyses used logged expenditure with one dollar added prior to log-transformation to retain zero-spenders in our analysis and were adjusted for age, sex, race, region, marital status, family size, employment status, family income, self-reported health status, and utilization. Utilization variables were classified as follows: Outpatient: non-utilizers = no visits; low-utilizers = 1-2 visits; moderate-utilizers = 3-4 visits; high-utilizers = >5 visits. Inpatient: non-utilizers = no admissions; low-utilizers = 1-2 admissions; moderate-utilizers = 3-4 admissions; high-utilizers = >5 admissions. Emergency room visits:

non-utilizers = no visits; low-utilizers = 1-2 visits; moderate-utilizers = 3-4 visits; high-utilizers = >5 visits; Prescription drugs: non-utilizers = no drugs used; low-utilizers = 1-3 drugs; moderate-utilizers = 4-6 drugs; high-utilizers = >6 drugs.
** Indicates significant at $p < 0.05$.

eTable 2. Secondary Analysis: Post-ACA Odds of Exceeding Affordability Thresholds for Out-of-Pocket Expenses and Premiums, Adjusted for Medical Utilization

	Income group	Percent Exceeding Threshold Pre-ACA ^a	Percent Exceeding Threshold Post-ACA	Adjusted Percent Change	Pre to Post Change			
					Utilization-Adjusted Pre to Post Odds Ratio ^b	95% Confidence Interval		
OOP Spending >10% of Family Income	0-138%	13.0	11.0	-11.9	0.88	0.71	1.10	
	138-250%	6.1	4.7	-36.7	0.63	0.45	0.90	**
	250-400%	2.6	2.0	-5.3	0.95	0.65	1.39	
	>400%	1.0	0.8	-17.9	0.82	0.50	1.36	
	All Income Groups	4.5	3.5	-19.3	0.81	0.69	0.94	**
OOP Spending >5% of Family Income	0-138%	22.7	19.3	-18.3	0.82	0.69	0.97	**
	138-250%	14.5	11.3	-35	0.65	0.53	0.81	**
Premium Spending >9.5% of Family Income	0-138%	12.8	12.3	-7.8	0.92	0.77	1.10	
	138-250%	13.0	12.6	4.2	1.04	0.83	1.31	
	250-400%	7.1	8.9	17.9	1.18	0.92	1.51	
	>400%	2.7	2.5	-10.5	0.90	0.62	1.30	
	All Income Groups	7.6	7.4	-0.3	1.00	0.89	1.12	
Spending for OOP+Premium Combined >19.5% of Family Income	0-138%	15.6	13.6	-13.2	0.87	0.72	1.05	
	138-250%	7.8	6.4	-21.6	0.78	0.58	1.05	
	250-400%	3.1	3.3	14.7	1.15	0.77	1.72	
	>400%	0.8	0.9	-6.6	0.93	0.43	2.04	
	All Income Groups	5.4	4.6	-12.6	0.87	0.76	1.01	

Notes: This analysis included 83410 adults and 49183 households. Twenty-one individuals representing 14 households that were included in the full sample had negative values for family income and thus were not included in this analysis. This analysis was done at the household level.

^a Pre-ACA refers to the mean in the pooled sample years 2012 and 2013 and post-ACA refers to the mean in 2014 and 2015. Percent exceeding threshold represents the percent of non-elderly adults who are members of families for whom total family spending divided by total family income exceeded affordability thresholds. OOP and premium spending figures are the sum of expenditures for all household members. Spending is adjusted to 2014 dollars using consumer price index.

^b Regression analyses were adjusted for age, sex, race, region, marital status, family size, employment status, family income, self-reported health status, and utilization. Utilization variables were classified as follows: Outpatient: non-utilizers = no visits; low-utilizers = 1-2 visits; moderate-utilizers = 3-4 visits; high-utilizers = >5 visits. Inpatient: non-utilizers = no admissions; low-utilizers = 1-2 admissions; moderate-utilizers = 3-4 admissions; high-utilizers = >5 admissions. Emergency room visits: non-utilizers = no visits; low-utilizers = 1-2 visits; moderate-utilizers = 3-4 visits; high-utilizers = >5 visits; Prescription drugs: non-utilizers = no drugs used; low-utilizers = 1-3 drugs; moderate-utilizers = 4-6 drugs; high-utilizers = >6 drugs.

** Indicates significant at p<0.05.

eTable 3. Placebo Test for Change in Mean Spending in Pre-ACA Period, 2012 to 2013

	Income group	Predicted 2012 to 2013 Percent Change in Spending (%) ^a	95% CI		P Value	
OOP Spending	0-138%	-15.8	-24.5	-6.1	.002	**
	138-250%	-4.0	-16.8	10.8	.57	
	250-400%	-4.9	-17.0	8.9	.47	
	>400%	3.1	-7.4	14.8	.57	
	All Income Groups	-4.4	-10.3	2.0	.17	
Premium Spending	0-138%	-14.3	-28.8	3.0	.10	
	138-250%	-2.8	-21.7	20.7	.80	
	250-400%	2.9	-18.7	30.2	.81	
	>400%	-0.9	-15.5	16.1	.91	
	All Income groups	-4.2	-13.00	5.4	.38	
OOP+Premium Combined	0-138%	-18.2	-28.8	-5.9	.01	**
	138-250%	-2.4	-18.6	17.1	.79	
	250-400%	-3.4	-16.9	12.4	.65	
	>400%	1.3	-8.1	11.6	.80	
	All Income groups	-5.0	-11.2	1.5	.13	

Notes: The pre-ACA sample included 45,833 non-elderly adults and 25,433 households. This analysis was done at the individual level for OOP spending and at the household level for premium contributions. OOP+Premium spending combined is the sum of the amount that the individual paid for OOP expenses and the total premium contribution made by their family.

^a Spending figures are adjusted to 2015 dollars using the consumer price index. Placebo tests compared mean spending in 2012 with 2013. Regression analyses used logged expenditure data with one dollar added prior to log-transformation to retain zero-spenders in our analysis and were adjusted for age, sex, race, region, marital status, family size, employment status, family income, and self-reported health status.

** Indicates significant at p<0.05.

eTable 4. Placebo Test for Change in High-Burden Spending in Pre-ACA period, 2012 to 2013

	Income group	Adjusted 2012 to 2013 Odds Ratio ^a	95% Confidence Interval		P value
OOP Spending >10% of Family Income	0-138%	0.85	0.69	1.06	0.16
	138-250%	0.85	0.62	1.16	0.30
	250-400%	1.33	0.82	2.15	0.24
	>400%	1.12	0.60	2.08	0.73
	All Income Groups	0.94	0.80	1.09	0.41
OOP Spending >5% of Family Income	0-138%	0.88	0.75	1.04	0.14
	138-250%	0.95	0.78	1.16	0.58
Premium Spending >9.5% of Family Income	0-138%	0.87	0.69	1.09	0.22
	138-250%	0.91	0.73	1.12	0.36
	250-400%	0.93	0.68	1.26	0.62
	>400%	1.19	0.85	1.67	0.30
	All Income Groups	0.94	0.84	1.06	0.33
OOP+Premium Combined Spending >19.5% of Family Income	0-138%	0.86	0.69	1.07	0.17
	138-250%	1.03	0.77	1.36	0.85
	250-400%	1.17	0.72	1.89	0.52
	>400%	1.17	0.61	2.24	0.64
	All Income Groups	0.98	0.85	1.13	0.75

Notes: The pre-ACA sample included 45,823 adults and 25,426 households. Ten individuals representing 7 households that were included in the pre-ACA sample had negative values for family income and thus were not included in this analysis. This analysis was done at the household level.

^aPlacebo tests compared mean spending in 2012 with 2013. Percent exceeding threshold represents the percent of non-elderly adults who are members of families whose total family spending divided by total family income exceeded affordability thresholds. OOP and premium spending figures are the sum of expenditures for all household members. Spending is adjusted to 2015 dollars using consumer price index. Regression analyses were adjusted for age, sex, race, region, marital status, family size, employment status, family income, and self-reported health status.

** Indicates significant at $p < 0.05$.

eTable 5. Part 1 of 2-Part Model: Post-ACA Changes in Likelihood of Out-of-Pocket and Premium Contribution Spending

	Income group	Percent with any Expenditure Pre-ACA ^a	Percent with any Expenditure Post-ACA	Pre to Post Change			
				Adjusted Pre to Post Odds Ratio ^b	95% CI		
Likelihood of any OOP Spending	0-138%	63.0	62.2	0.94	0.85	1.03	
	138-250%	69.0	66.5	0.91	0.83	1.001	
	250-400%	76.5	74.5	0.92	0.82	1.03	
	>400%	83.7	83.0	0.96	0.87	1.07	
	All Income Groups	75.2	74.3	0.94	0.89	0.99	**
Likelihood of any Premium Spending	0-138%	17.8	18.9	1.10	0.96	1.27	
	138-250%	43.3	43.2	0.99	0.89	1.10	
	250-400%	63.9	64.5	1.06	0.94	1.19	
	>400%	74.6	76.8	1.12	1.00	1.24	**
	All Income Groups	54.9	57.2	1.07	1.01	1.14	**
Likelihood of any Spending, OOP+Premium Combined	0-138%	67.0	66.6	0.96	0.87	1.05	
	138-250%	77.9	77.0	0.96	0.86	1.06	
	250-400%	87.7	87.8	1.05	0.91	1.21	
	>400%	93.7	94.1	1.10	0.94	1.30	
	All Income Groups	84.1	84.5	1.01	0.95	1.07	

Notes: The study sample included 83,431 non-elderly adults and 49,197 households. This analysis was done at the individual level for OOP spending and at the household level for premium contributions. Likelihood of any spending, OOP+Premium combined was the probability that the individual made any OOP payment and/or the individual's family paid any premium contribution.

^aPre-ACA refers to the mean in the pooled sample years 2012 and 2013 and post-ACA refers to the mean in 2014 and 2015.

^b Logistic regression analyses were adjusted for age, sex, race, region, marital status, family size, employment status, family income, and self-reported health status.

** Indicates significant at p<0.05.

eTable 6. Part 2 of 2-Part Model: Post-ACA Changes in Mean Out-of-Pocket and Premium Contribution Spending Among Individuals With Any Amount of Spending (Nonzero Spending)

	Income group	Spending among those with any expenditure, Pre-ACA, mean ^a	Pre to Post Change				P Value	
			Estimated Change in Spending, (%)	95% CI				
OOP Spending	0-138%	\$622.57	-24.49	-31.07	-17.29	<.0001	**	
	138-250%	\$742.77	-14.17	-20.62	-7.21	.0002	**	
	250-400%	\$809.13	-7.98	-14.60	-0.83	.03	**	
	>400%	\$940.79	-3.67	-9.42	2.44	.23		
	All Income Groups	\$796.71	-9.77	-13.58	-5.80	<.0001	**	
Premium Spending	0-138%	\$3,365.65	-5.52	-15.01	5.04	.29		
	138-250%	\$3,209.01	-3.86	-10.47	3.24	.28		
	250-400%	\$3,190.32	0.92	-4.75	6.93	.75		
	>400%	\$3,740.40	2.66	-1.93	7.47	.26		
	All Income groups	\$3,497.18	0.90	-2.28	4.19	.58		
OOP+ Premium Combined	0-138%	\$1,480.66	-16.71	-25.86	-6.43	.002	**	
	138-250%	\$2,441.73	-9.67	-17.75	-0.79	.03	**	
	250-400%	\$3,029.25	-2.74	-10.66	5.89	.52		
	>400%	\$3,816.56	3.86	-1.81	9.85	.18		
	All Income groups	\$3,056.67	-2.81	-7.03	1.60	.21		

Notes: The study sub-sample of those with non-zero spending included 65,824 non-elderly adults and 39,555 households. This analysis was done at the individual level for OOP spending and at the household level for premium contributions. OOP+Premium spending combined is the sum of the amount that the individual paid for OOP expenses and the total premium contribution made by their family.

^a Spending figures are adjusted to 2015 dollars using the consumer price index. Pre-ACA refers to the sample mean in the pooled sample years 2012 and 2013, and post-ACA refers to the mean in 2014 and 2015.

^b Regression analyses were adjusted for age, sex, race, region, marital status, family size, employment status, family income, and self-reported health status.

Note: Because adjusted OOP, premium and OOP+premium spending were calculated from separate multivariate models, mean OOP and premium figures may not sum to combined expenditure amounts.

** Indicates significant at p<0.05.

eTable 7. Post-ACA Changes in Mean Out-of-Pocket and Premium Contribution Spending, Unadjusted

	Income group	Predicted mean per person spending, Pre-ACA ^a	Estimated Change in Spending, mean	Pre to Post Change				
				Unadjusted Predicted change (%)	95% Confidence Interval		P Value	
OOP Spending	0-138%	\$392.35	-\$69.49	-17.7	-28.2	-5.7	.01	**
	138-250%	\$512.71	-\$111.26	-21.7	-30.5	-11.8	<.0001	**
	250-400%	\$618.77	-\$102.10	-16.5	-25.9	-5.9	.003	**
	>400%	\$787.42	-\$62.76	-8.0	-17.8	3.0	.15	
	All Income Groups	\$619.23	-\$67.19	-10.9	-16.9	-4.4	.001	**
Premium Spending	0-138%	\$599.76	\$43.06	7.2	-8.7	25.8	.40	
	138-250%	\$1,390.46	-\$38.79	-2.8	-20.8	19.3	.79	
	250-400%	\$2,038.68	\$100.91	5.0	-14.3	28.6	.64	
	>400%	\$2,790.44	\$574.83	20.6	3.1	41.1	.02	**
	All Income groups	\$1,921.58	\$387.77	20.2	7.7	34.1	.001	**
OOP+Premium Combined	0-138%	\$992.11	-\$120.64	-12.2	-25.4	3.5	.12	
	138-250%	\$1,903.17	-\$268.16	-14.1	-26.6	0.5	.06	
	250-400%	\$2,657.45	-\$60.32	-2.3	-15.0	12.3	.74	
	>400%	\$3,577.87	\$172.81	4.8	-4.5	15.1	.32	
	All Income groups	\$2,540.82	\$73.43	2.9	-4.9	11.3	.48	

Notes: The study sample included 83,431 non-elderly adults and 49,197 households. This analysis was done at the individual level for OOP spending and at the household level for premium contributions. OOP+Premium spending combined is the sum of the amount that the individual paid for OOP expenses and the total premium contribution made by their family.

^a Spending figures are adjusted to 2015 dollars using the consumer price index. Pre-ACA refers to the sample mean in the pooled sample years 2012 and 2013. All regression outcomes used logged expenditure with one dollar added prior to log-transformation to retain zero-spenders in our analysis.

^b Linear regression models are unadjusted. Estimated change (expressed as a percentage) is the exponentiated beta coefficient of our predictor variable (pre/post-ACA) minus 1 x100, which provides an estimate of the adjusted relative change.

Note: Because adjusted OOP, premium and OOP+premium spending were calculated from separate multivariate models, mean OOP and premium figures may not sum

** Indicates significant at p<0.05.

eTable 8. Post-ACA Odds of Exceeding Affordability Thresholds for Household Spending on Out-of-Pocket Expenses and Premiums, Unadjusted

	Income group	Percent Exceeding Threshold Pre-ACA, mean ^a	Percent Exceeding Threshold Post-ACA, mean	Pre to Post Change					
				Unadjusted Percent Change	Unadjusted Odds Ratio	95% Confidence Interval		P Value	
OOP Spending >10% of Family Income	0-138%	13.0	11.0	-17	0.83	0.70	0.99	.04	**
	138-250%	6.1	4.7	-24.3	0.76	0.57	1.00	.049	**
	250-400%	2.6	2.0	-21.8	0.78	0.56	1.09	.15	
	>400%	1.0	0.8	-17.7	0.82	0.55	1.22	.33	
	All Income Groups	4.5	3.5	-22.4	0.78	0.69	0.88	<.0001	**
OOP Spending >5% of Family Income	0-138%	22.7	19.3	-18.6	0.81	0.71	0.93	.003	**
	138-250%	14.5	11.3	-24.8	0.75	0.64	0.88	.001	**
Premium Spending >9.5% of Family Income	0-138%	12.8	12.3	-4.9	0.95	0.82	1.11	.51	
	138-250%	13.0	12.6	-4.1	0.96	0.80	1.15	.65	
	250-400%	7.1	8.9	27.3	1.27	1.03	1.58	.03	**
	>400%	2.7	2.5	-7.5	0.93	0.69	1.24	.59	
	All Income Groups	7.6	7.4	-2.3	0.98	0.89	1.08	.64	
OOP+ Premium Combined Spending >19.5% of Family Income	0-138%	15.6	13.6	-14.6	0.85	0.73	1.00	.051	
	138-250%	7.8	6.4	-19	0.81	0.62	1.05	.11	
	250-400%	3.1	3.3	9.9	1.10	0.79	1.53	.57	
	>400%	0.8	0.9	12.4	1.12	0.65	1.95	.68	
	All Income Groups	5.4	4.6	-14.5	0.86	0.76	0.96	.01	

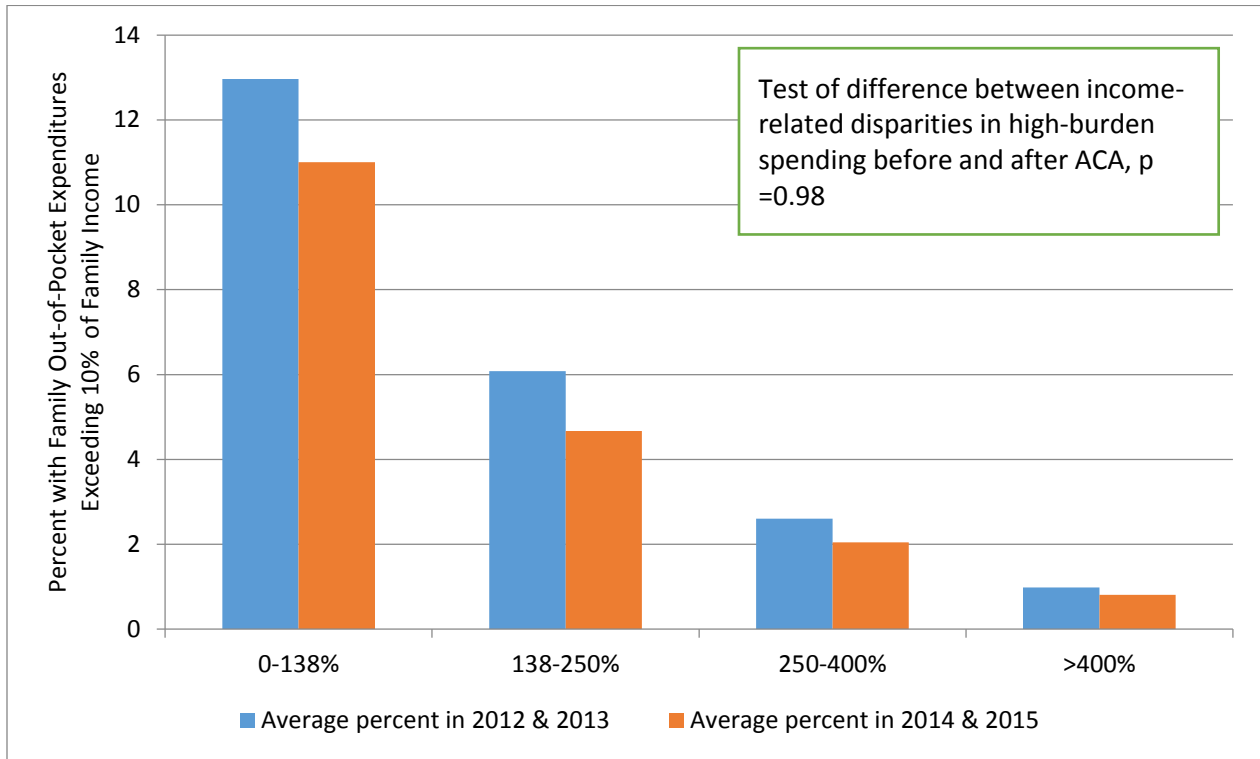
Notes: This analysis included 83410 adults and 49183 households. Twenty-one individuals representing 14 households that were included in the full sample had negative values for family income and thus were not included in this analysis. This analysis was done at the household level.

^aPre-ACA refers to the mean in the pooled sample years 2012 and 2013 and post-ACA refers to the mean in 2014 and 2015. Percent exceeding threshold represents the percent of non-elderly adults who are

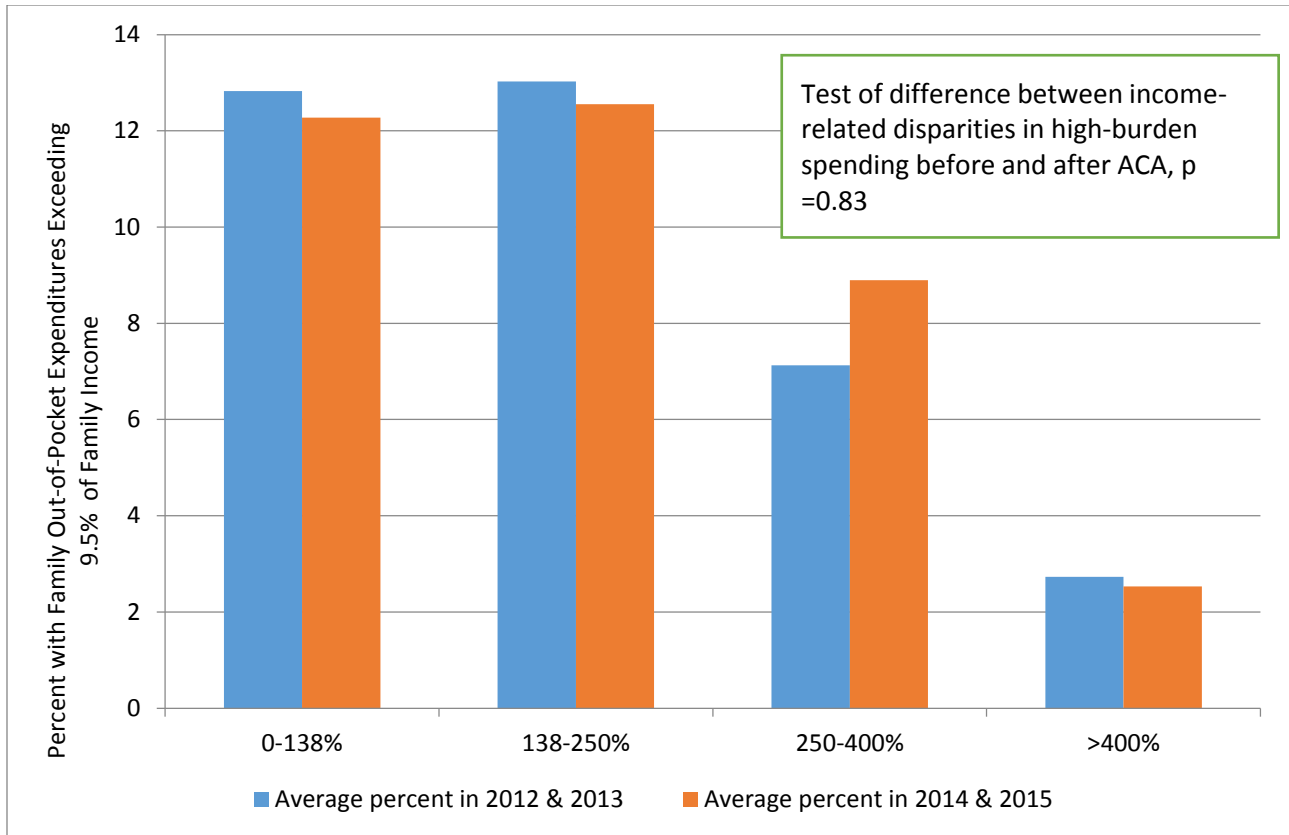
members of families whose total family spending divided by total family income exceeded affordability thresholds. OOP and premium spending figures are the sum of expenditures for all household members. Spending is adjusted to 2015 dollars using consumer price index.

** Indicates significant at $p < 0.05$

eFigure. Income-Related Disparities in the Prevalence of High-Burden Spending Before and After the ACA



A. High-burden OOP spending



B. High-Burden Premium Spending

Notes: Pre-ACA refers to the mean in the pooled sample years 2012 and 2013 and post-ACA refers to the mean in 2014 and 2015. OOP and premium spending figures are the sum of expenditures for all household members. Percent exceeding threshold represents the percentage of non-elderly adults who are members of families that exceeded thresholds (10% for OOP; 9.5% for premiums). P-value is for a test of a difference between the income disparities in prevalence of high-burden spending in the pre vs post-ACA cohorts.