Affordable Care Act: the impact of the policy on physical and mental health

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For long period of time, United States has been dealing with serious issues related to its health care insurance system. Existing health care programs premiums were more costly compared to other similar countries and around 30 mln Americans were uninsured at the time. In order to solve this problem, on 23rd March 2010 The Patient Protection and Affordable Care Act (ACA) was signed into law by President Obama. The main objective of the policy was to create more uniformly accessible health care coverage. This research paper aims to capture the average impact of ACA policy implementation on how many days did poor physical or mental health keep insured individuals from doing their usual activities (self-care, work), during the past 30 days. The key motivation behind this study is , the findings of this research can serve as basis for further   decision makings and effective policy implementations in US linked to the social wellbeing of the population.

As of a 2014, ACA's major provisions came into force reducing share of uninsured population by half by the end of 2016. In their research, *Sommers et al., 2017* examined ACA's coverage expansion effect on low-income adults using difference in differences model. Their result showed that the uninsurance rate in expansionary states dropped by 20% compared to non-expansionary states. *Courtemanche et al.,2018.* Also found a positive effect on gains in health insurance coverage and increase in the probability of reporting excellent health condition. However, when *Heim et al., 2016* attempted to estimate the impact of the ACA policy on self-employment decision, results were not statistically significant. Following these papers, current paper examines whether ACA's coverage expansion holds a positive effect on insured individuals who are limited from their daily activities due to poor physical or mental health.

The data for this study is obtained from the BRFSS. Our data contains period of years from 2011 until 2017 . In 2014 the policy came into force so, it will be the start of the treatment. Data includes 22 expansionary states as treatment group and 22 states as a control group (*figure 1*). The outcome variable is Number of Days Mental Health Not Good and Poor Physical or Mental Health (*POORHLTH or MENTHLTH*). The treatment variable is ACA policy , unit of observation is states. Our analysis will be done using diff in diff method based on the following equation where:

$$Y_{it} = \alpha_i + \lambda_t + \beta^{DD} (after_{it} * treated_{it}) + \delta X_{it} + u_{it}$$

Y_{it} is the outcome variables (*POORHLTH and MENTHLTH*) , i is the unit of observations which is states in our case and t is the time period, α stands for state level fixed effects and λ stands for time fixed effects, β is treatment effect which should capture the impact of ACA's policy on outcome variables, variable *after* is = 1 if year is = 2014,2015,2016 and 2017 and takes value of 0 if year = 2011, 2012 and 2013. The variable *treated* is = 1 for all the state accepted the policy expansion and 0 for the states that did not expand the policy. δ stands for coefficient of the control variable and X is set of control variables.

Our identification strategy assumes that more accessible health coverage will decrease number of days where individuals had limitations due to physical or mental health problem since they would have more access to the treatment. However, to be able to use difference in differences method on the underlying analysis, we must show that parallel trend assumption is plausible. We cannot document post treatment parallel trend therefore we will document pre-treatment parallel trend. In *Figure2* and *Figure4* we plot average outcome for control and treatment groups before the treatment. However, we do not obtain meaningful plot showing these groups trending together therefore, we run a regression that is shown in *Table 2* and *Table 3* where we can see substantial changes overtime and very large *p_values* shows statistical insignificance therefore, we can claim for parallel trend assumption. We equally plot *figure 4 and figure 5* where 95CI overlaps with zero and this also allows us to claim the plausibility of the parallel trend assumption.

In summary statistics *Table 1* we can see that our sample contains 44 states observed during 7years. Looking at the first outcome variable *menthlth* we can see that on average people in our sample reported that 3 days in a month they had a mental problem limiting from daily activities. The standard deviation of 7.5 shows that we have wider dispersion around the mean. Another outcome variable *poorhealth* shows that on average people in our sample reported that 5.5 days in a month they had a physical or mental problem limiting from daily activities. We equally observe wide dispersion around the mean for this variable as well.

Table 4 contains regression results of the policy on mental health. The result shows that after the treatment, individuals living in the states that accepted ACA policy on average experienced 0.3 day in other words, almost half a day less mental problems during the last 30 days that limited them from daily activities compared to those individuals who are in states that did not implement the policy. However , these results are not statistically significant because we obtained a very large p_values (0.8) and we cannot claim that policy had a positive effect on those in treatment group.

We also run another regression to identify the dynamic effect of the policy over time after the treatment. Table 5 shows that right after the intervention, individuals living in the states that accepted ACA policy on average experienced 1 day less mental problems during the last 30 days that limited them from daily activities compared to those in states that did not expand the policy. After two years, the impact stayed the same without a change and only three years after, individuals who had the coverage experienced 0.5 days increase in mental problems limiting them from daily activities compared to those in the control group. However, these results are not statistically significant and therefore we cannot claim any significant impact of the ACA policy on the underlying outcome variable. We have run the same type of analysis on physical and mental health variable *Table 6* and *Table 7*. And in this case, as well we get statistically insignificant result.

The DD estimates of our models showed an insignificant effect of the ACA policy on both mental and physical health limitations during the last 30 days on individuals who have health care coverage. This could have a potential explanation that in general the policy effect on those who suffer from chronic mental or physical problem such as depression or arthritis would take longer period to cure. So we could maybe see a positive effect of the policy on underlying variables effect of the ACA policy only in coming decades.

However , these insignificant results could be related to the limitations of this analysis. It can be linked to the important variables which were eliminated due to substantial amount of missing values so we could not include them in our model. Moreover, most variables in the data contains categorical value which made this empirical study more challenging. In the future this study could be analysed further by using larger span of time periods or could be analysed with different approach for example, this topic could be analysed by changing the identification methods.

Appendix

Figure 1   list of US states included in this study

N	FIPS Code	States in treatment group	FIPS Code	States in control group
1	50	Vermont	16	Idaho
2	25	Massachusetts	46	South Dakota
3	44	Rhode Island	55	Wisconsin
4	9	Connecticut	31	Nebraska
5	36	New York	20	Kansas
6	34	New Jersey	40	Oklahoma
7	10	Delaware	48	Texas
8	24	Maryland	22	Louisiana
9	54	West	1	Alabama
10	51	Virginia	28	Mississippi
11	39	Ohio	12	Florida
12	21	Kentucky	13	Georgia
13	17	Illinois	45	South Carolina
14	27	Minnesota	37	North Carolina
15	38	North Dakota	23	Maine
16	8	Colorado	30	Montana
17	35	New Mexico	56	Wyoming
18	4	Arizona	49	Utah
19	32	Nevada	47	Tennessee
20	6	California	51	Virginia
21	53	Washington	29	Missouri
22	41	Oregon	2	Alaska
23	15	Hawaii		
24				
25				

Table 1   Summary Statistics

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Variable              Mean    Std. Dev.        Min        Max   Observations

menthlth overall   3.029703     7.57233          0         30   N =      303
         between               3.188005          0   10.28571   n =       44
         within                6.887653  -7.256011   28.74399   T-bar = 6.88636

poorhlth overall   5.493056    9.251722          0         30   N =      144
         between               5.515528          0         25   n =       43
         within                7.714841  -9.506944   27.99306   T-bar = 3.34884

hlthpln1 overall   1.087662    .2832634          1          2   N =      308
         between               .0883101          1   1.285714   n =       44
         within                .2694288   .8019481   1.944805   T =        7

medcost  overall   1.876623    .5393677          1          9   N =      308
         between               .1913926   1.428571   2.714286   n =       44
         within                .5049776   .1623377   8.162338   T =        7

hispanc2 overall   1.988636    .5968176          1          7   N =       88
         between               .4243824        1.5        4.5   n =       44
         within                .4220911  -.5113636   4.488636   T =        2

marital  overall   2.237013    1.681184          1          9   N =      308
         between               .5424051   1.428571   3.571429   n =       44
         within                1.593087  -.3344156   7.808442   T =        7

children overall  68.70358    35.89992          1         88   N =      307
         between              11.38507          39         88   n =       44
         within               34.08223  -5.867846   117.7036   T = 6.97727

educa    overall   4.827922    1.070602          1          9   N =      308
         between               .5011421   3.571429   6.285714   n =       44
         within                .9486588   1.685065   7.542208   T =        7

income2  overall   5.590164    2.256236          1          8   N =      244
         between               .9175358        3.5        7.2   n =       44
         within                2.069816  -.1241218   9.590164   T-bar = 5.54545

sex      overall   1.561688    .4969874          1          2   N =      308
         between                .214336   1.142857          2   n =       44
         within                .4493934   .7045455   2.418831   T =        7
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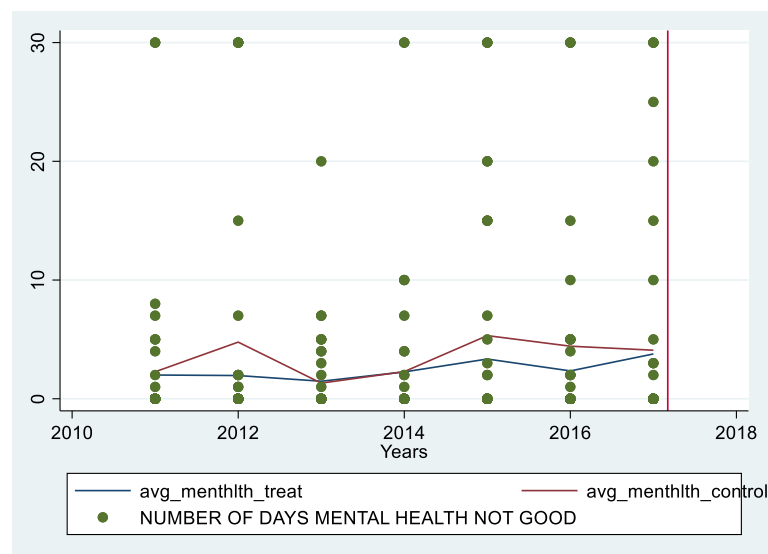
Figure 2 visual inspection: poor mental health

Table 2 regression for parallel trend assumption on menthal health

menthlth	Coef.	Std. Err.	t	P>t	[95%Conf.	Interval]
treat_post	-0.17559	1.798664	-0.1	0.923	-3.80294	3.45176
yr2011_treat	2.958914	2.44537	1.21	0.233	-1.97264	7.890472
yr2012_treat	-1.88997	3.258059	-0.58	0.565	-8.46047	4.680532
yr2	3.320311	3.181029	1.04	0.302	-3.09484	9.735467
yr3	-0.07948	1.777918	-0.04	0.965	-3.66499	3.506034
yr4	1.032125	2.123518	0.49	0.629	-3.25036	5.314607
yr5	2.312939	2.310608	1	0.322	-2.34685	6.972725
yr6	0.472623	1.826184	0.26	0.797	-3.21023	4.155474
yr7	2.817021	2.139088	1.32	0.195	-1.49686	7.130904
sex	-0.52252	0.995823	-0.52	0.602	-2.53078	1.485751
educa	-0.97514	0.425532	-2.29	0.027	-1.8333	-0.11697
marital	0.288414	0.315955	0.91	0.366	-0.34877	0.925597
children	-0.00204	0.011287	-0.18	0.857	-0.02481	0.020718
income2	-0.47189	0.285203	-1.65	0.105	-1.04705	0.103282
medcost	-1.58219	0.676773	-2.34	0.024	-2.94703	-0.21734
_cons	11.83944	2.980944	3.97	0	5.827798	17.85109
N groups	44					

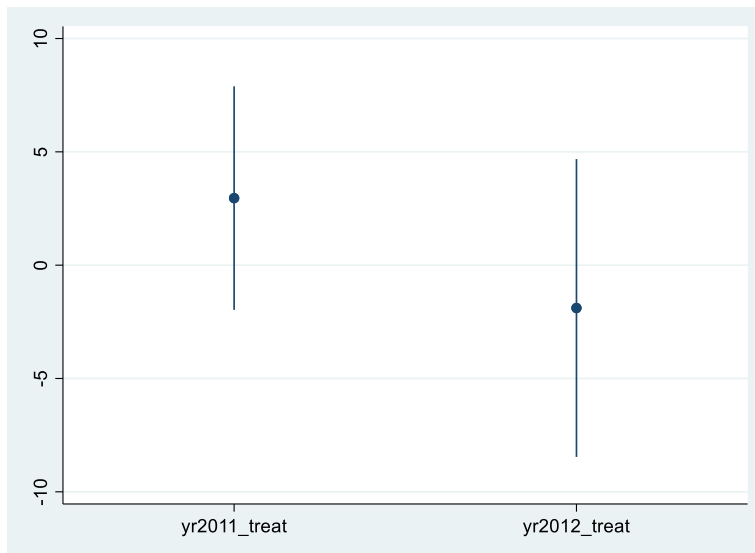*Figure 3* Placebo test for poor mental health

Figure 4 : visual inspection for poor physical or mental health
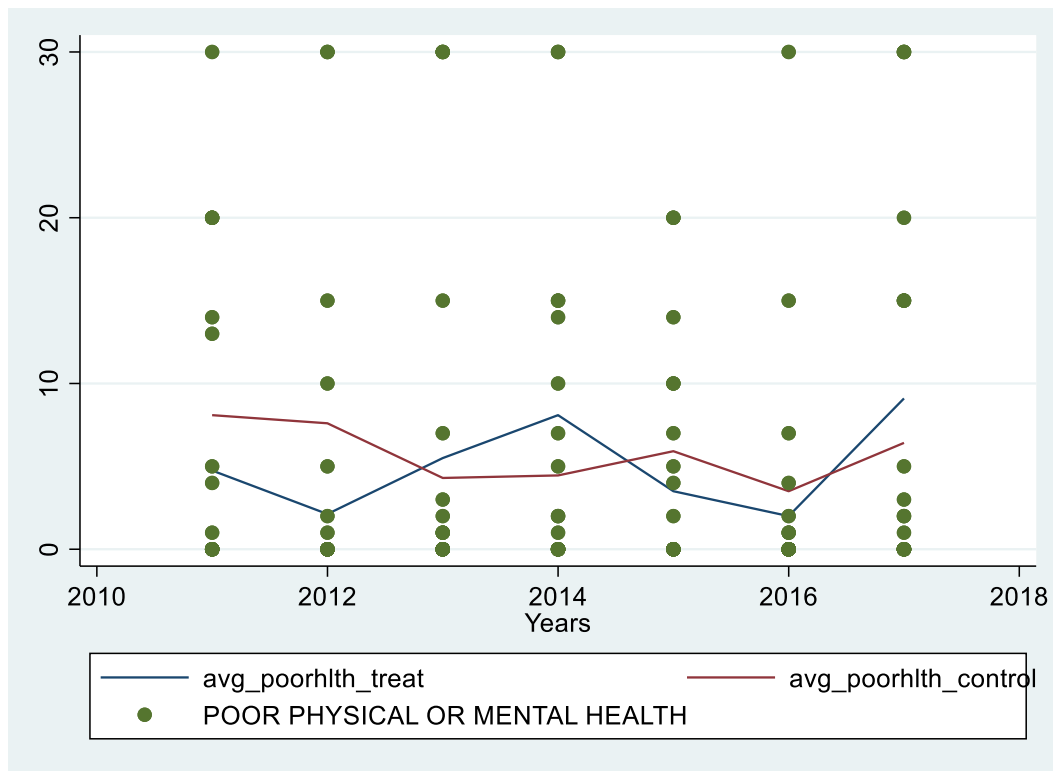

Table 3: regression for parallel trend assumption on poor phisical health and menthal health

poorhlth	Coef.	Std. Err.	t	P>t	[95%Conf.	Interval]
treat_post	-4.73724	6.03044	-0.79	0.437	-16.9072	7.432682
yr2011_treat	2.948982	6.116034	0.48	0.632	-9.39367	15.29164
yr2012_treat	-11.9226	7.740462	-1.54	0.131	-27.5435	3.698247
yr2	6.789257	4.409385	1.54	0.131	-2.10924	15.68776
yr3	5.839991	4.179088	1.40	0.170	-2.59375	14.27373
yr4	11.18519	4.240303	2.64	0.012	2.627913	19.74247
yr5	5.987214	3.506876	1.71	0.095	-1.08995	13.06438
yr6	5.665062	2.686843	2.11	0.041	0.242792	11.08733
yr7	6.640741	3.426207	1.94	0.059	-0.27362	13.55511
sex	0.101462	2.326131	0.04	0.965	-4.59286	4.795784
educa	1.455804	1.261981	1.15	0.255	-1.09098	4.002584
marital	-1.37758	0.643963	-2.14	0.038	-2.67715	-0.07801
children	0.046615	0.022341	2.09	0.043	0.00153	0.0917
income2	-1.89463	0.509202	-3.72	0.001	-2.92224	-0.86702
medcost	-5.35538	2.436325	-2.20	0.034	-10.2721	-0.43868
_cons	13.35322	10.56481	1.26	0.213	-7.96742	34.67387
N groups	44					

Figure 5 Placebo test for poor physical or mental health
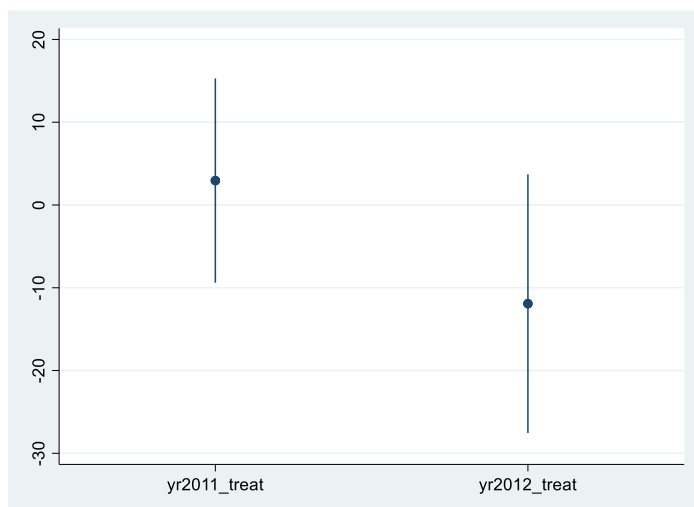
Table 4 DD regression output: treatment effect on mental health

menthlth	Coef.	Std. Err.	t	P>t	[95%Conf.	Interval]
treated	0	(omitted)				
after	2.193105	1.892822	1.16	0.253	-1.62414	6.010345
treat_post	-0.34449	1.732955	-0.2	0.843	-3.83933	3.150342
yr2	1.466482	2.185648	0.67	0.506	-2.9413	5.874262
yr3	-0.95601	1.387913	-0.69	0.495	-3.755	1.842986
yr4	-2.13213	1.925755	-1.11	0.274	-6.01578	1.751526
yr5	-0.84584	2.013583	-0.42	0.677	-4.90662	3.214934
yr6	-2.7652	1.568088	-1.76	0.085	-5.92755	0.397156
sex	-0.38744	0.94667	-0.41	0.684	-2.29659	1.521698
marital	0.239882	0.310069	0.77	0.443	-0.38543	0.865194
educa	-0.97194	0.426922	-2.28	0.028	-1.83291	-0.11097
employ1	0.05312	0.166911	0.32	0.752	-0.28349	0.389727
income2	-0.47204	0.260109	-1.81	0.077	-0.9966	0.052519
_cons	9.363932	3.568933	2.62	0.012	2.166493	16.56137
N group	44					
N obs	240					
R-sq	0.11					

Table 5 Output on how β DD changes over time (Y = mental health)

menthlth	Coef.	Std. Err.	t	P>t	[95% C.	Interval]
yr2015_treat	-1.03381	2.592739	-0.4	0.692	-6.26257	4.194948
yr2016_treat	-1.11333	2.683362	-0.41	0.68	-6.52485	4.298183
yr2017_treat	0.537066	2.776215	0.19	0.848	-5.06171	6.135837
yr2	1.351452	1.812924	0.75	0.46	-2.30466	5.007561
yr3	-0.62582	1.115602	-0.56	0.578	-2.87565	1.624004
yr4	0.409656	1.557951	0.26	0.794	-2.73225	3.551563
yr5	2.868356	2.260228	1.27	0.211	-1.68983	7.42654
yr6	1.85697	2.367643	0.78	0.437	-2.91784	6.631777
yr7	1.641083	2.37566	0.69	0.493	-3.14989	6.432057
_cons	2.07192	1.031496	2.01	0.051	-0.00829	4.152129
N group	44					
N obs	303					
R-sq overall	0.0208					

Table 6 DD regression output: treatment effect on physical and mental health

poorhlth	Coef.	Std. Err	t	P>t	[95%Conf.	Interval]
treated	0	(omitted)				
after	6.02853	3.269435	1.84	0.072	-0.56946	12.62652
treat_post	-3.4907	4.211377	-0.83	0.412	-11.9896	5.008201
yr2	1.853128	3.534387	0.52	0.603	-5.27955	8.98581
yr3	5.04087	3.434212	1.47	0.15	-1.88965	11.97139
yr4	2.464056	3.314585	0.74	0.461	-4.22505	9.15316
yr5	-2.20164	3.560364	-0.62	0.54	-9.38674	4.983466
yr6	-0.77232	3.402004	-0.23	0.822	-7.63784	6.093205
sex	-0.61116	2.48006	-0.25	0.807	-5.61613	4.3938
marital	-1.10134	0.705805	-1.56	0.126	-2.52571	0.323031
educa	0.995797	1.289312	0.77	0.444	-1.60614	3.597734
employ1	0.981074	0.427565	2.29	0.027	0.118213	1.843935
income2	-1.42721	0.529996	-2.69	0.01	-2.49678	-0.35763
_cons	3.614058	7.441581	0.49	0.63	-11.4037	18.63178
N gr	43					

Obs	110
R-sq	0.25

Table 7 Output on how β DD changes over time (Y = physical and mental health)

poorhlth	Coef.	Std. Err.	t	P>t	[95%Conf.	Interval]
yr2015_treat	-2.32597	4.686763	-0.50	0.622	-11.7842	7.132299
yr2016_treat	-0.54033	4.024172	-0.13	0.894	-8.66144	7.580779
yr2017_treat	4.555728	5.368213	0.85	0.401	-6.27777	15.38922
yr2	-1.2089	3.601699	-0.34	0.739	-8.47743	6.05962
yr3	-0.88149	3.439991	-0.26	0.799	-7.82367	6.060696
yr4	1.390643	3.294426	0.42	0.675	-5.25778	8.039064
yr5	0.911466	4.247029	0.21	0.831	-7.65939	9.482317
yr6	-2.78133	4.299571	-0.65	0.521	-11.4582	5.895556
yr7	-0.7914	2.487036	-0.32	0.752	-5.81045	4.227638
_cons	5.83825	2.154402	2.71	0.010	1.490491	10.18601
N groups	43					
N obs	144					
R-sq	0.03					

References

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BRFSS data source *https://www.cdc.gov/brfss/annual_data/annual_data.htm*