

Mental Health Disparities after 'Obamacare':

Methods for analyzing nationally representative
datasets with complex survey designs

Questions

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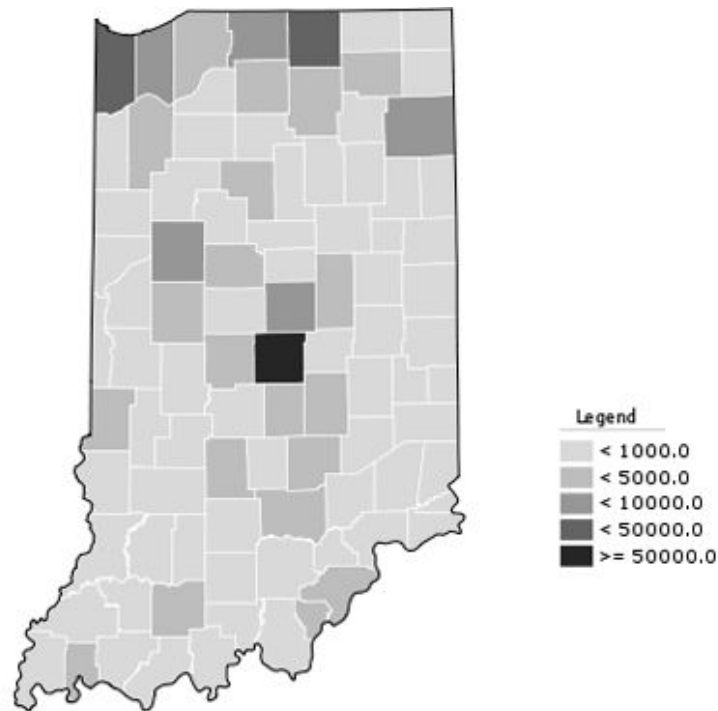
- What is a complex survey design and who cares?
- These survey designs are complex... how do I analyze them?
- Can the software be free, please? The data, too?
- What sorts of research questions can I answer?
 - Our real life example:
 - Disparities in mental healthcare
 - Spotlight on Serious Mental Illness (SMI) / Distress
 - Changes in this disparity over time

Survey Designs



Representing a nation

- **Complex survey designs**
 - Clustered
 - Stratified
 - Weighted
 - If model is constructed appropriately:
 - Relatively precise count estimates
 - Accurate standard errors



Complex survey datasets are...

- **Complex**
 - Variables for strata, clusters, & weights
- **Very large n**
 - Our survey *subset* has 64,000 cases
 - Increases to 319,000 for our analyses of income
- **Usually very large variable count**
 - Our restricted set has >1400

Programs for complex survey designs (all command line)

— — — ● SUDAAN/SAS

- Costs money

● Stata

- Costs money

● R

- Free
- Flexible
- Fast
- Open source
- Strong user community
- (Consider RStudio)

Free and public data! (check out www.asdfree.com)

- **National Health Interview Survey (NHIS)**
 - Detailed info on health, health insurance, healthcare utilization, income, worries about paying for health insurance, reasons for not getting health insurance, etc etc etc. Has SMI proxy
 - Adult, child, family-level info
- **Behavioral Risk Factor Surveillance System (BRFSS)**
 - Behavioral health data. "Frequent mental distress" proxy (HRQOL)
 - Largest phone survey in the world
- **National Study on Drug Use and Health (NSDUH)**
 - Alcohol, tobacco, drug use, health outcomes, substance use treatment, etc.
- **General Social Survey (GSS)**
 - VERY diverse. Seems to change things up a lot with every administration.
 - Religiousness, race relations, political beliefs, etc etc etc. Great stigma component in 1996.
- **European Social Survey (ESS)**
 - Well-being, health, values, political engagement, social marginalization, etc.
- **World Values Survey (WVS)**
 - Religiousness, gender equality, gross national happiness, etc.

So, let's do some research!

How are people with SMI doing in terms of...
healthcare coverage?
mental healthcare utilization?

**Has this changed at all since the passage of the
Affordable Care Act in mid-2010?**

National Health Interview Survey (NHIS)

- Highly detailed stats on insurance coverage
 - Do you have health insurance now? past 12 months? did you switch recently?
 - Why don't you have health insurance? If you have it, do you worry about paying for it?
 - Imputed income
- Detailed information on treatment
 - Have you seen a psychiatrist in past 12 mo? psychologist?
- “Serious Mental Illness” proxy called the K6
 - SMI := at least one “12-month DSM disorder” other than SUD and GAF < 60
 - Specificity = 0.96
 - Sensitivity = 0.36

Data preprocessing

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- Download datasets (took my computer all night)
- Install analysis packages (thank you Thomas Lumley!)
 - ‘survey’ to generate complex survey design objects
 - ‘mitools’ to analyze multiply imputed income data
- Recode variables. Validate your work!
- When analyzing, trim datasets and continuously erase unused information

```
psa.imp <-  
  svydesign(  
    id = ~psu_p , # cluster ids  
    strata = ~strat_p , # stratification levels  
    nest = TRUE , # stratification is nested  
    weights = ~wtfa_sa, # weights  
    data = imputationList( list( x1 , # income imputations  
                                x2 ,  
                                x3 ,  
                                x4 ,  
                                x5 ) )  
  )
```

Number of people with SMI

analysing totals

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2010

```
svytotal(~as.character(SMI),design = psa.Pre, na.rm=T)
```

		total	SE
as.character(SMI)No Serious Distress	182624382	2372782	
as.character(SMI)Serious Psych Distress (SMI)	6733041	314247	

2014

```
svytotal(~as.character(SMI),design = psa.Post, na.rm=T)
```

		total	SE
as.character(SMI)No Serious Distress	181596155	2271545	
as.character(SMI)Serious Psych Distress (SMI)	6411241	256907	

Percentage with SMI

analysing percents

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2010

```
svymean(~as.character(SMI),design = psa.Pre, na.rm=T)
```

	mean	SE
as.character(SMI)No Serious Distress	0.964443	0.0016
as.character(SMI)Serious Psych Distress (SMI)	0.035557	0.0016

2014

```
svymean(~as.character(SMI),design = psa.Post, na.rm=T)
```

	mean	SE
as.character(SMI)No Serious Distress	0.965899	0.0013
as.character(SMI)Serious Psych Distress (SMI)	0.034101	0.0013

Who has SMI (2014)?

multiple regression

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Multiple imputation results:

```
with(psa.impPost, svyglm(factor(SMI) ~ povrati3 + as.character(WHITE) +  
as.character(sex) + educ1 + age_p + Unemployment, family = quasibinomial()))  
MIcombine.default(with(psa.impPost, svyglm(factor(SMI) ~ povrati3 +  
as.character(WHITE) + as.character(sex) + educ1 + age_p +  
Unemployment, family = quasibinomial())))
```

	results	se	(lower	upper)	missInfo
(Intercept)	-3.43933243	0.253278262	-3.93574873	-2.942916143	0 %
povrati3	-0.32461290	0.030982776	-0.38535018	-0.263875630	3 %
as.character(WHITE)White	0.23849182	0.111789369	0.01938867	0.457594980	0 %
as.character(sex)Male	-0.10624646	0.089272883	-0.28121811	0.068725178	0 %
educ1	-0.02490391	0.011519090	-0.04748096	-0.002326864	0 %
age_p	0.02132029	0.003100444	0.01524353	0.027397050	0 %
Unemployment	0.38640015	0.036635404	0.31459580	0.458204493	0 %

More likely:

- Less reliably employed
- White
- Older

Less likely:

- Wealthier
- More educated

Who's getting mental health treatment (2014)?

multiple regression

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More likely:

- White
- Educated
- Less reliably employed
- Poorer
- With health insurance
- People with SMI

Less likely:

- Male
- Older

	results	se	(lower	upper)
(Intercept)	-4.035696574	0.242229500	-4.51045768	-3.560935464
povrati3	-0.060069905	0.013848308	-0.08721224	-0.032927572
as.character(WHITE)White	0.522076280	0.087651610	0.35028228	0.693870281
as.character(sex)Male	-0.300810890	0.091525203	-0.48019699	-0.121424788
educ1	0.101016733	0.010910129	0.07963327	0.122400196
age_p	-0.008053168	0.003161972	-0.01425052	-0.001855817
Unemployment	0.329663579	0.033546801	0.26391306	0.395414102
as.character(coverage)Not covered now	-0.874286781	0.137085779	-1.14296997	-0.605603590
as.character(SMI)Serious Psych Distress (SMI)	1.988654213	0.105094052	1.78267366	2.194634770

Who has health insurance (2014)?

multiple regression

	results	se	(lower	upper)
(Intercept)	-1.60439038	0.149800439	-1.897993877	-1.3107868920
povrati3	0.36672221	0.018348607	0.330745465	0.4026989556
educ1	0.13275694	0.007852581	0.117366152	0.1481477343
as.character(WHITE)White	-0.11851797	0.060684948	-0.237458570	0.0004226259
as.character(sex)Male	-0.32488588	0.046774359	-0.416561983	-0.2332097859
age_p	0.01138258	0.001911550	0.007636005	0.0151291473
Unemployment	0.12444864	0.024907340	0.075630743	0.1732665383
as.character(SMI)Serious Psych Distress (SMI)	-0.06070237	0.112453103	-0.281106616	0.1597018692

More likely:

- Wealthier
- Better educated
- Older
- Less reliably employed

Less likely:

- Males

Among insured, who has public insurance (2014)?

(viz., medicaid or medicare)

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	results	se	(lower	upper)
(Intercept)	1.33333143	0.212551142	0.916732222	1.74993064
povrati3	-0.77906679	0.035132018	-0.847970762	-0.71016281
educ1	-0.12239871	0.009726501	-0.141463165	-0.10333426
as.character(WHITE)White	-0.18708046	0.067917955	-0.320207680	-0.05395323
as.character(sex)Male	-0.24986716	0.063516701	-0.374358874	-0.12537544
age_p	0.01193719	0.002519580	0.006998451	0.01687592
Unemployment	0.68306101	0.029943457	0.624372837	0.74174918
as.character(SMI)Serious Psych Distress (SMI)	0.65745948	0.135995560	0.390908384	0.92401057

More likely:

- Older
- Less reliably employed
- People with SMI

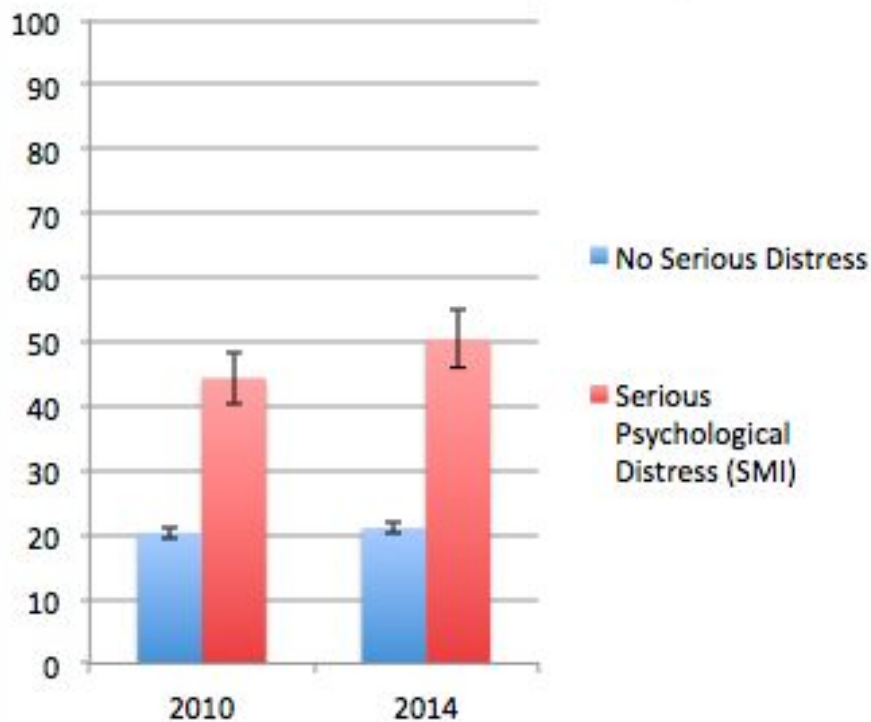
Less likely:

- Wealthier
- Educated
- White
- Males

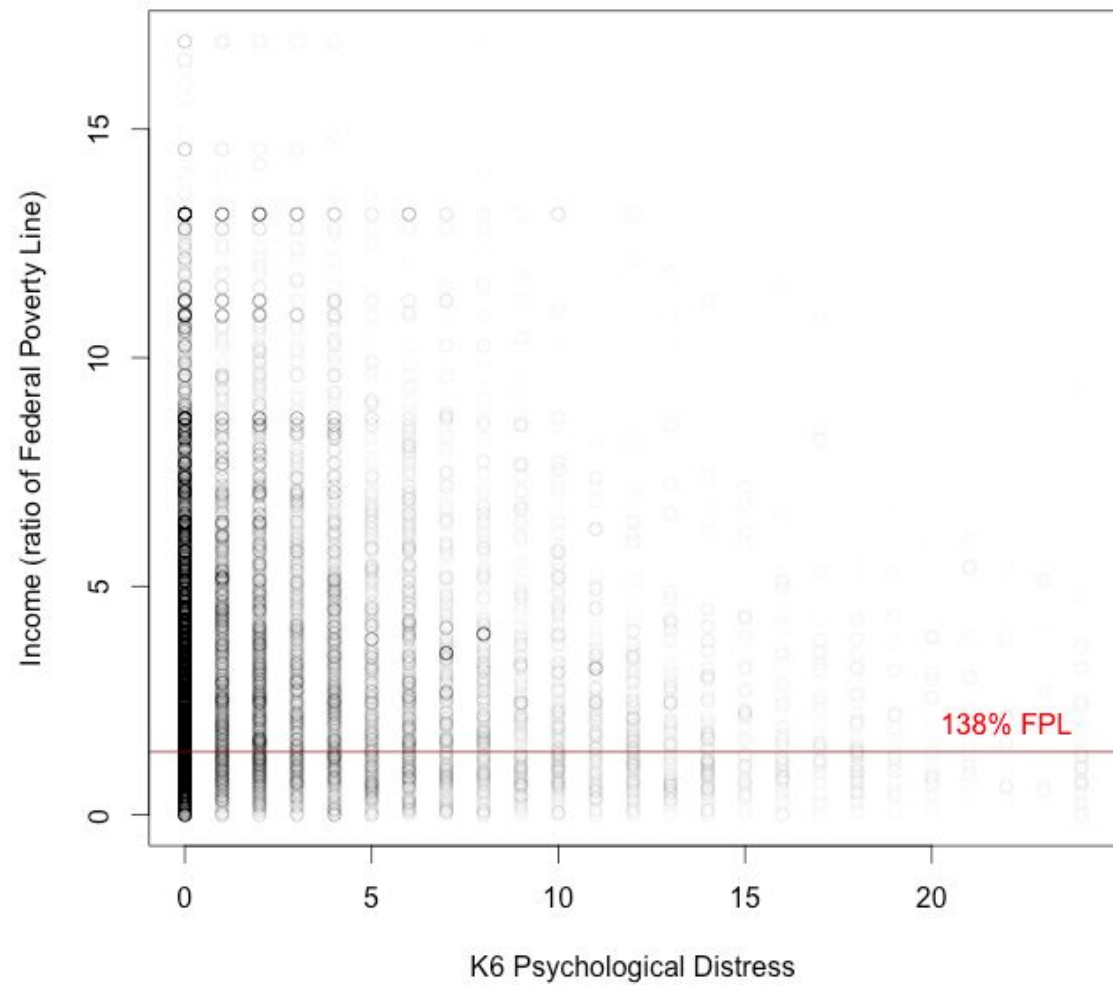
SMI and poverty

analyzing multiple factors

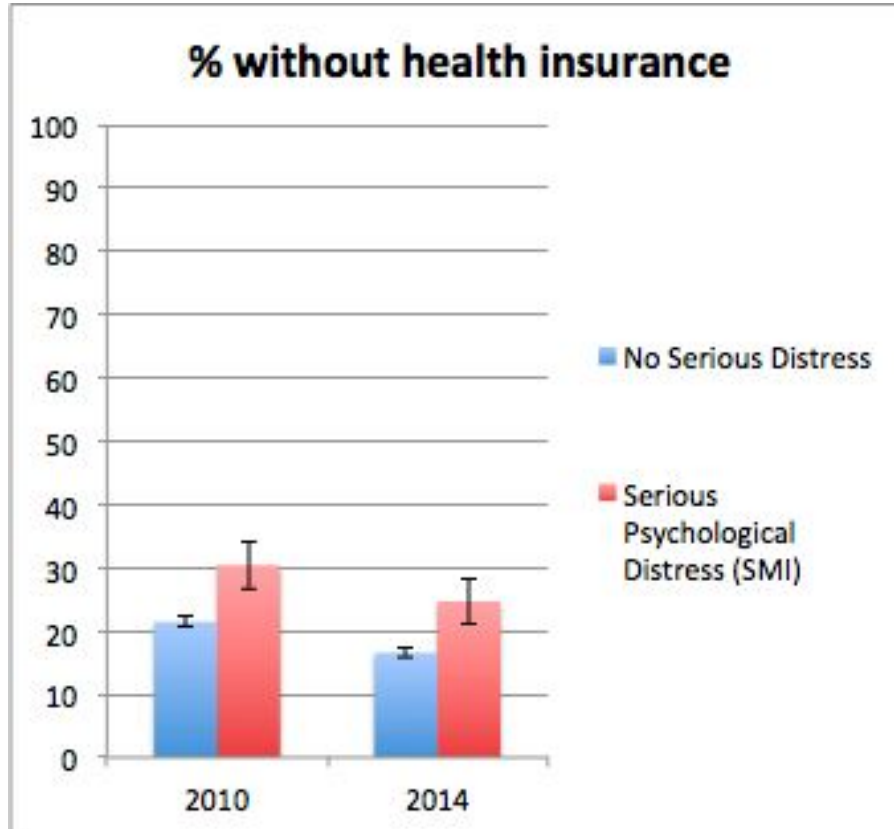
Percent below 138% poverty line



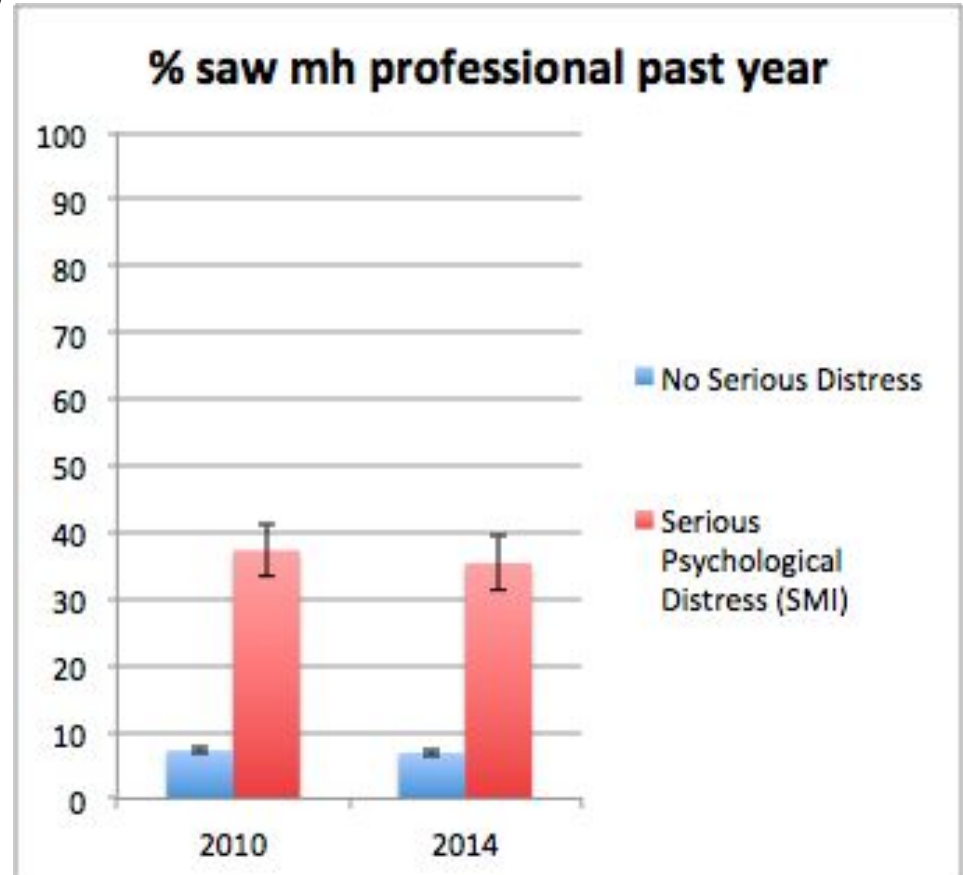
Income and Psychological Distress



SMI and health insurance

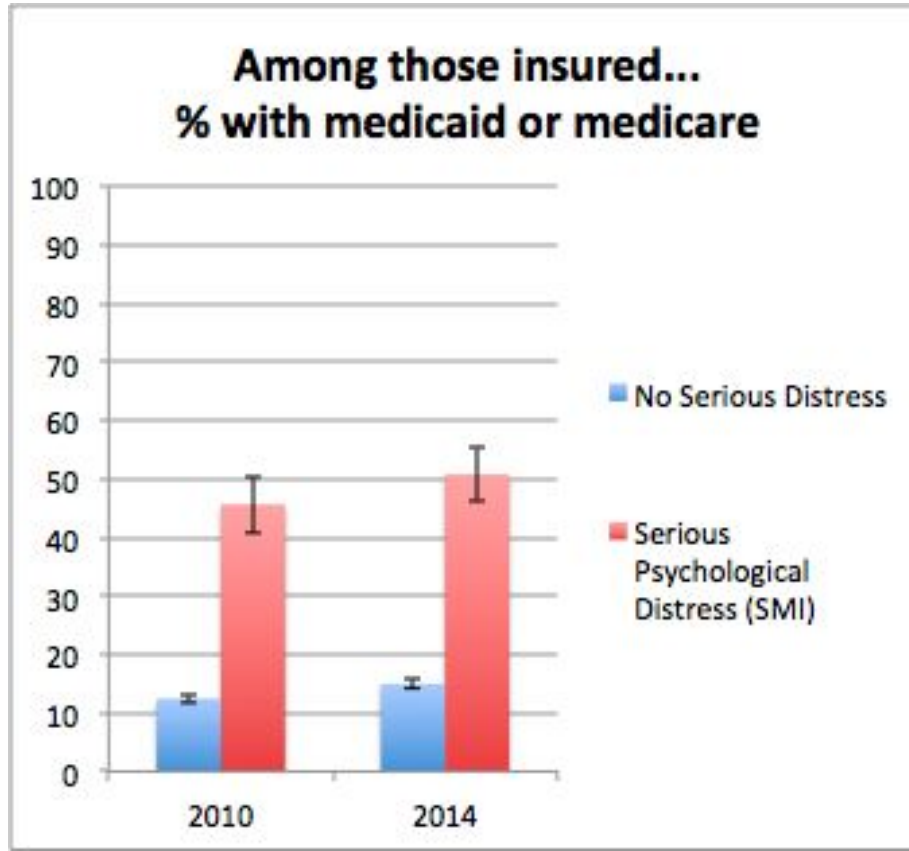


SMI and mental healthcare



SMI and public insurance

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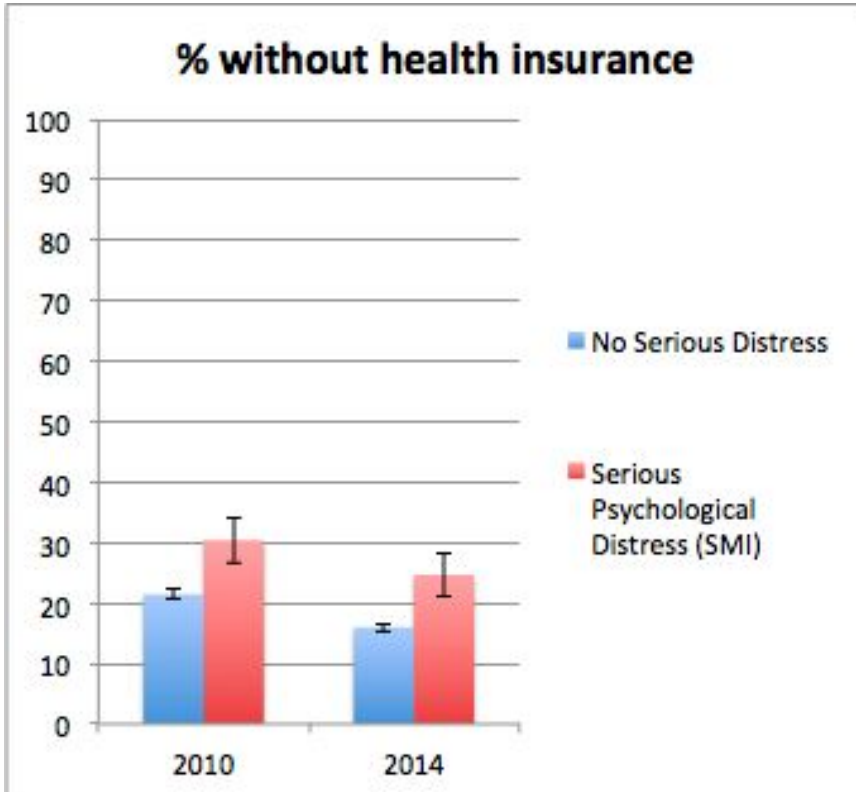


Differences-in-differences (DIDs)

SMI and health insurance

Differences-in-differences (arithmetic)

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$$\begin{aligned} & (\text{SMI uninsured: 2014} - \text{2010}) \\ & - (\text{nonSMI uninsured: 2014} - \text{2010}) \end{aligned}$$

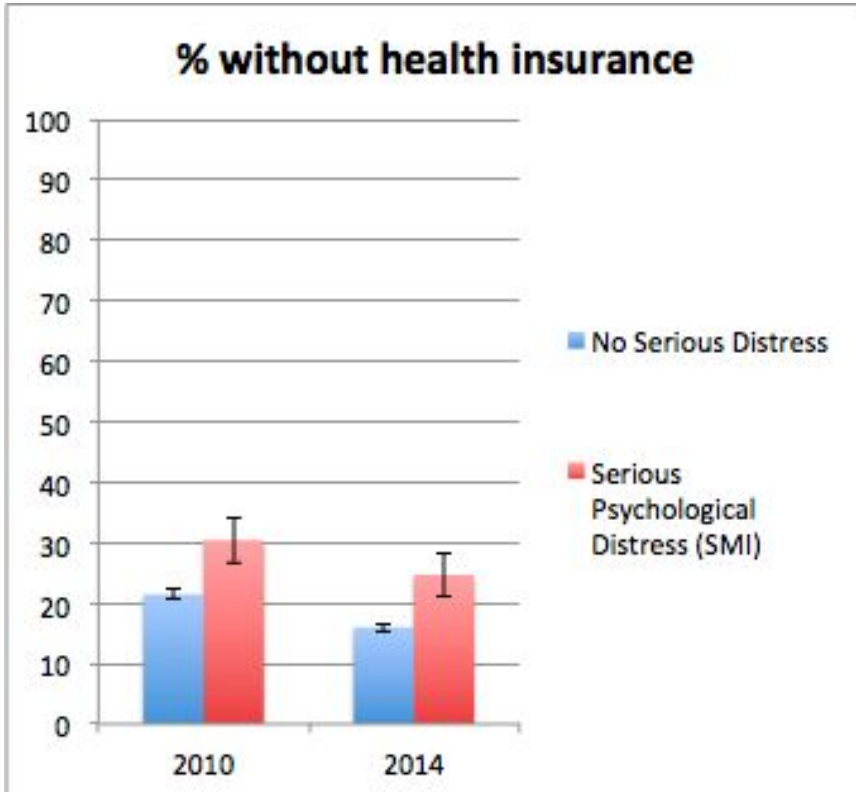
=

% rate at which the disparity is decreasing

SMI and health insurance

Differences-in-differences (arithmetic)

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$$\begin{aligned} & (\text{SMI uninsured: 2014} - \text{2010}) \\ & - (\text{nonSMI uninsured: 2014} - \text{2010}) \end{aligned}$$

=

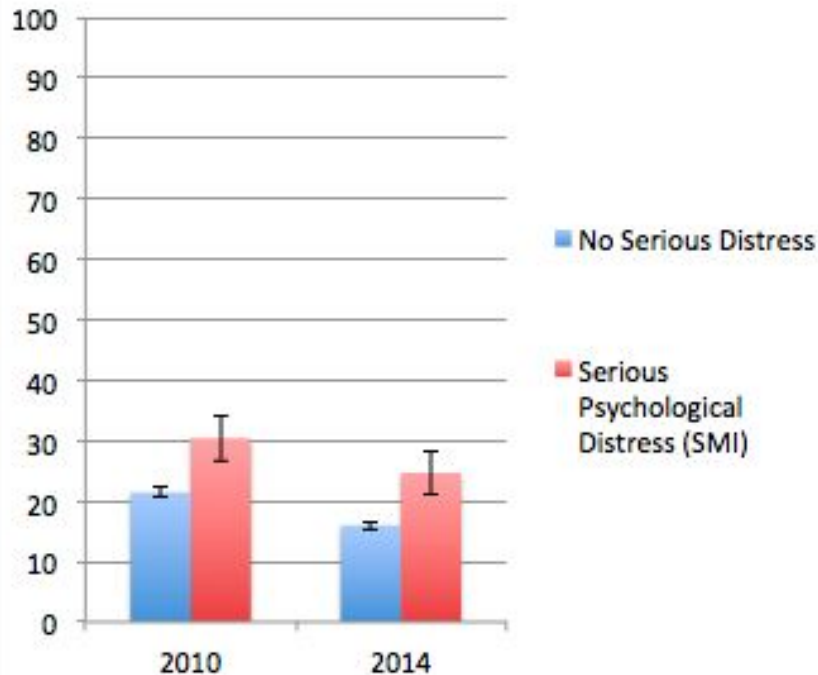
$$\begin{aligned} & (16.0031 - 21.1477) \\ & - (24.3843 - 30.1862) \end{aligned}$$

SMI and health insurance

Differences-in-differences (arithmetic)

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% without health insurance



$$\begin{aligned} & (\text{SMI uninsured: 2014} - \text{2010}) \\ & - (\text{nonSMI uninsured: 2014} - \text{2010}) \end{aligned}$$

=

$$\begin{aligned} & (16.0031 - 21.1477) \\ & - (24.3843 - 30.1862) \end{aligned}$$

=

0.6573 %

Multiple linear regression

Differences-in-differences

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Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	1.788523	0.003840	465.745	< 2e-16	***
as.character(SMI)Serious Psych Distress (SMI)	-0.090385	0.019408	-4.657	4.84e-06	***
as.character(YEAR)2014	0.051446	0.004840	10.630	< 2e-16	***
as.character(SMI)Serious Psych Distress (SMI):as.character(YEAR)2014	0.006573	0.025287	0.260	0.795	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

0.6573 %



SMI and health insurance

(with covariates!)

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	results	se	(lower	upper)
(Intercept)	1.2873351770	0.0163452371	1.255299061	1.319371293
educ1	0.0222566249	0.0008630735	0.020565010	0.023948240
povrati3	0.0264689950	0.0007960420	0.024906299	0.028031691
as.character(WHITE)White	-0.0008858272	0.0058527666	-0.012357047	0.010585393
as.character(sex)Male	-0.0445834979	0.0043703214	-0.053149173	-0.036017823
age_p	0.0020131440	0.0001795663	0.001661199	0.002365089
Unemployment	0.0024708059	0.0026381161	-0.002699850	0.007641462
as.character(SMI)Serious Psych Distress (SMI)	-0.0224972830	0.0186681594	-0.059086206	0.014091640
as.character(YEAR)2014	0.0480055375	0.0043833832	0.039414246	0.056596829
as.character(SMI)Serious Psych Distress (SMI):as.character(YEAR)2014	0.0126285556	0.0243270915	-0.035051677	0.060308788

↑
~1.3 %

Income disparity got worse for people with SMI

(between 2010 and 2014; differences-in-differences with continuous variables)

```

(Intercept) -3.92373868 0.099207930 -4.11820071 -3.72927666
as.character(WHITE)White 0.74411801 0.039555108 0.66656916 0.82166685
as.character(sex)Male 0.18257609 0.032872821 0.11813264 0.24701954
age_p 0.04596512 0.001430395 0.04316051 0.04876973
educ1 0.36740444 0.005621378 0.35638660 0.37842228
Unemployment -0.46287229 0.017115493 -0.49647788 -0.42926670
as.character(SMI)Serious Psych Distress (SMI) -0.92592057 0.091166756 -1.10493700 -0.74690414
as.character(YEAR)2014 -0.05403512 0.036924054 -0.12651507 0.01844484
as.character(SMI)Serious Psych Distress (SMI):as.character(YEAR)2014 -0.24888917 0.119464904 -0.48360643 -0.01417191

```

Between 2010 and 2014, the
income gap between people
with vs. without SMI increased
by about \$2900 / year

$(2014 \text{ FPL} * .25) = 2900$

Racial disparity in health coverage improved

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	results	se	(lower	upper)
(Intercept)	1.277318588	0.0173353840	1.243341818	1.311295358
povrati3	0.026455966	0.0007956377	0.024894082	0.028017850
educ1	0.022261336	0.0008628591	0.020570141	0.023952531
as.character(SMI)Serious Psych Distress (SMI)	-0.016428252	0.0139355632	-0.043741457	0.010884953
as.character(sex)Male	-0.044593604	0.0043694638	-0.053157598	-0.036029610
age_p	0.002012051	0.0001794891	0.001660258	0.002363844
Unemployment	0.002463831	0.0026387563	-0.002708079	0.007635741
as.character(WHITE)White	0.011346632	0.0087500040	-0.005803067	0.028496332
as.character(YEAR)2014	0.067599723	0.0099055922	0.048185117	0.087014328
as.character(WHITE)White:as.character(YEAR)2014	-0.024012891	0.0113219745	-0.046203559	-0.001822222



-2.4 %

Check out this code for yourself!

— — —

`github.com/peterphalen/Survey-data-analyses-using-R/`

`peter.phalen@gmail.com`