The Rise of Depression in Youth

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COMS180

"Kids are so depressed these days!"

Pressure of self-optimization

Rising standards

Future of politics, social injustice, environmental destruction

Modern technology

- Sleep deprivation
- Cyberbullying
- Fear of missing out
- Information anxiety

Intended hypotheses

H_0: The rate of depression in youth in recent years is the **same** rate as in the past.

H_A: The rate of depression in youth in recent years is **greater** than the rate in the past.

Sample & population

NSDUH

National Survey on Drug Use and Health

16 years of data from 7 annual reports.

Sample: 389,330,544 youth aged 12 to 17 in the US from 2004 to 2019.

Population: Almost entire youth population in the US.

Raw data

Year	Incidence of MDE	
	Count	%
2004	2225000	9
2005	2191000	8.8
.	.	
.	.	
.	.	
2018	3482000	14.4
2019	3783000	15.7

Major Depressive Episode (MDE)

A period of depression lasting two weeks or longer while exhibiting some of a specific criteria of symptoms.

Variables

Independent

Year

i.e. 2004-2019

Dependent

One or more incidences of MDE in the past year

i.e. Yes/No

Descriptive statistics (sample)

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
	.		
	.		
	.		
2018	3482000	20698556	24180556
2019	3783000	20312541	24095541
Total	40437000	348893544	389330544

Mean
2,527,312.5

Standard deviation
616,557.942

Statistical test

Chi-Square Test for Independence

Testing relationship between two categorical variables.

Calculated with Python.

```python
126  testStats = [] # Initialize list of elements to sum
127  for i in range(16): # 16 rows
128      for j in range(2): # 2 columns
129          toSum = [((observed[i][j]-expected[i][j])**2)/expected[i][j]] # Formula
130          testStats += toSum # Add value to list of elements to sum
131  testStatistic = sum(testStats) # Sum values
```

Hypotheses

H$_0$: Incidence of MDE in youth is **independent** of the year.

H$_A$: Incidence of MDE in youth is **related** to the year.

Critical value

$α$ = 0.05

$df = (R-1)(C-1) = (16-1)(2-1) = 15$

$X^2* = 24.996$

df		α	
	0.05	0.01	0.001
1	3.841	6.635	10.828
2	5.991	9.210	13.816
3	7.815	11.345	16.266
	.	.	.
14	23.685	29.141	36.123
15	24.996	30.578	37.697

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
	. . .		
2018	3482000	20698556	24180556
2019	3783000	20312541	24095541
Total	40437000	348893544	389330544

Expected values

$$Expected_{i,j} = \frac{Row_i Column_j}{N}$$

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
.	.	.	.
2018	3482000	20698556	24180556
2019	3783000	20312541	24095541
Total	40437000	348893544	389330544

Expected values

Year	Incidence of MDE		
	Yes	No	Total
2004			
2005			
.	.	.	.
2018			
2019			
Total			

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
		.	
		.	
		.	
2018	3482000	20698556	24180556
2019	3783000	20312541	24095541
Total	40437000	348893544	389330544

Expected values

Year	Incidence of MDE		
	Yes	No	Total
2004	2567721.712		
2005			
		.	
		.	
		.	
2018			
2019			
Total			

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
		.	
		.	
		.	
2018	3482000	20698556	24180556
2019	3783000	20312541	24095541
Total	40437000	348893544	389330544

Expected values

Year	Incidence of MDE		
	Yes	No	Total
2004	2567721.712	22154500.29	
2005			
		.	
		.	
		.	
2018			
2019			
Total			

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
		.	
		.	
		.	
2018	3482000	20698556	24180556
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Expected values

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	Yes	No	Total
2004	2567721.712	22154500.29	24722222
2005			
		.	
		.	
		.	
2018			
2019			
Total			

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
	.	.	
		.	
		.	
2018	3482000	20698556	24180556
2019	3783000	20312541	24095541
Total	40437000	348893544	389330544

Expected values

Year	Incidence of MDE		
	Yes	No	Total
2004	2567721.712	22154500.29	24722222
2005	2585950.171		
	.	.	
		.	
		.	
2018			
2019			
Total			

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
		.	
		.	
		.	
2018	3482000	20698556	24180556
2019	3783000	20312541	24095541
Total	40437000	348893544	389330544

Expected values

Year	Incidence of MDE		
	Yes	No	Total
2004	2567721.712	22154500.29	24722222
2005	2585950.171	22311776.83	
		.	
		.	
		.	
2018			
2019			
Total			

Test statistic

Observed values

| Year | Incidence of MDE | | |
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
⋮			
2018	3482000	20698556	24180556
2019	3783000	20312541	24095541
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Expected values

| Year | Incidence of MDE | | |
	Yes	No	Total
2004	2567721.712	22154500.29	24722222
2005	2585950.171	22311776.83	24897727
⋮			
2018			
2019			
Total			

Test statistic

Observed values

| Year | Incidence of MDE | | |
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
	.	.	
		.	
	.	.	
2018	3482000	20698556	24180556
2019	3783000	20312541	24095541
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Expected values

| Year | Incidence of MDE | | |
	Yes	No	Total
2004	2567721.712	22154500.29	24722222
2005	2585950.171	22311776.83	24897727
	.	.	
		.	
	.	.	
2018	2511462.71		
2019			
Total			

Test statistic

Observed values

| Year | Incidence of MDE | | |
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
		⋮	
2018	3482000	20698556	24180556
2019	3783000	20312541	24095541
Total	40437000	348893544	389330544

Expected values

| Year | Incidence of MDE | | |
	Yes	No	Total
2004	2567721.712	22154500.29	24722222
2005	2585950.171	22311776.83	24897727
		⋮	
2018	2511462.71	21669093.29	
2019			
Total			

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
	. . .	. . .	
2018	3482000	20698556	24180556
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	Yes	No	Total
2004	2567721.712	22154500.29	24722222
2005	2585950.171	22311776.83	24897727
	. . .	. . .	
2018	2511462.71	21669093.29	24180556
2019			
Total			

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
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		. . .	
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	Yes	No	Total
2004	2567721.712	22154500.29	24722222
2005	2585950.171	22311776.83	24897727
		. . .	
2018	2511462.71	21669093.29	24180556
2019	2502632.805		
Total			

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
		.	
		.	
		.	
2018	3482000	20698556	24180556
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	Yes	No	Total
2004	2567721.712	22154500.29	24722222
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		.	
		.	
		.	
2018	2511462.71	21669093.29	24180556
2019	2502632.805		
Total	40437000		

Test statistic

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	Yes	No	Total
2004	2225000	22497222	24722222
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		⋮	
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	Yes	No	Total
2004	2567721.712	22154500.29	24722222
2005	2585950.171	22311776.83	24897727
		⋮	
2018	2511462.71	21669093.29	24180556
2019	2502632.805	21592908.2	
Total	40437000		

Test statistic

Observed values

Year	Incidence of MDE		
	Yes	No	Total
2004	2225000	22497222	24722222
2005	2191000	22706727	24897727
		. . .	
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Test statistic

$$X^2 = \sum \frac{\left(Observed_{i,j} - Expected_{i,j}\right)^2}{Expected_{i,j}}$$

Test statistic

Observed values

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2005	2585950.171	22311776.83	24897727
		⋮	
2018	2511462.71	21669093.29	24180556
2019	2502632.805	21592908.2	24095541
Total	40437000	348893544	389330544

Test statistic

$$X^2 = \sum \frac{\left(Observed_{i,j} - Expected_{i,j}\right)^2}{Expected_{i,j}}$$

$$= 2,640,706.77722$$

Decision

Critical value
24.996

Test statistic
2,640,706.77722

Reject H$_0$

Based on our data from 389,330,544 people, we can say that:

there is a statistically significant relation between what year it is and a youth's incidence of MDE,

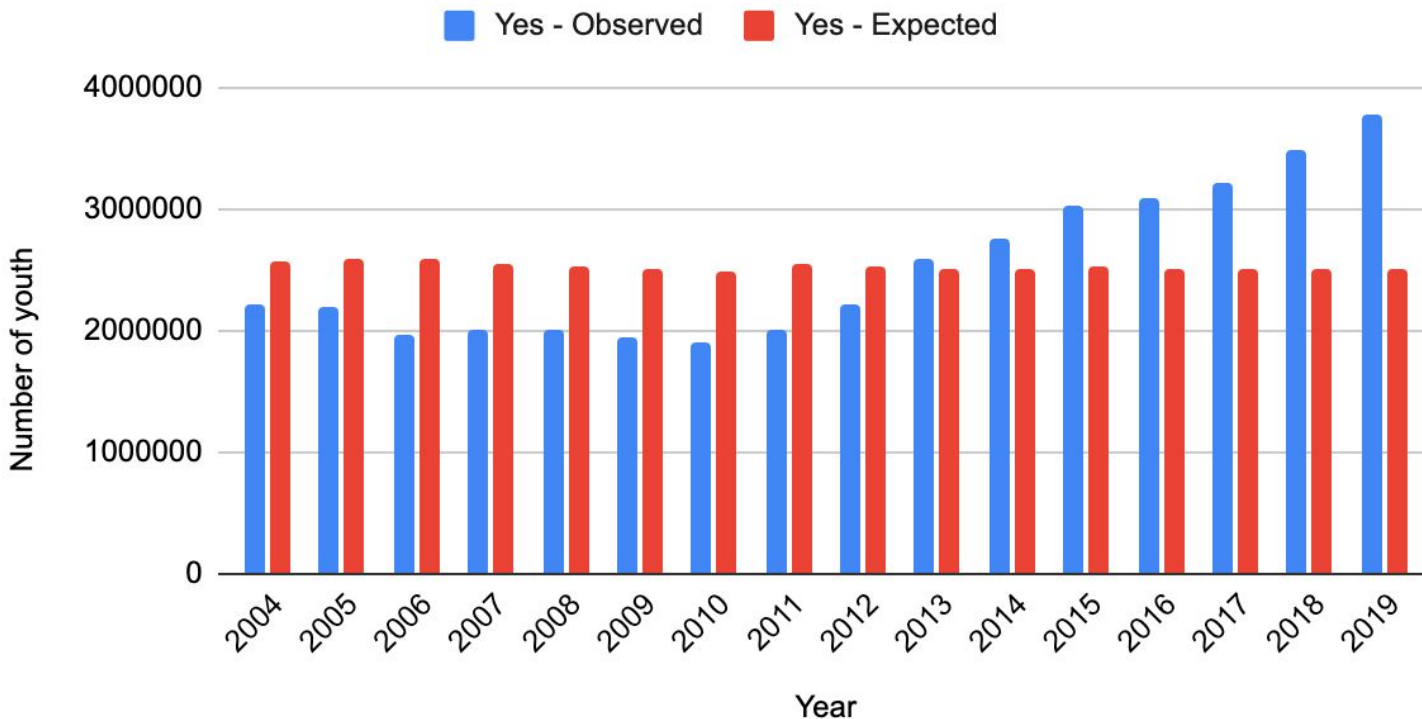$X^2(15) = 2,640,706.77722$, $p < 0.05$.

Effect size

Cramer's V

$$= \sqrt{\frac{X^2}{N \cdot (k-1)}}$$

$$= \sqrt{\frac{2640706.77722}{389330544 \cdot (2-1)}}$$

$$= 0.0823570632309$$

Thus, the statistically significant relation between the variables is small.

Incidence of Major Depressive Episode (MDE) in past year among youth aged 12 to 17, 2004-2019
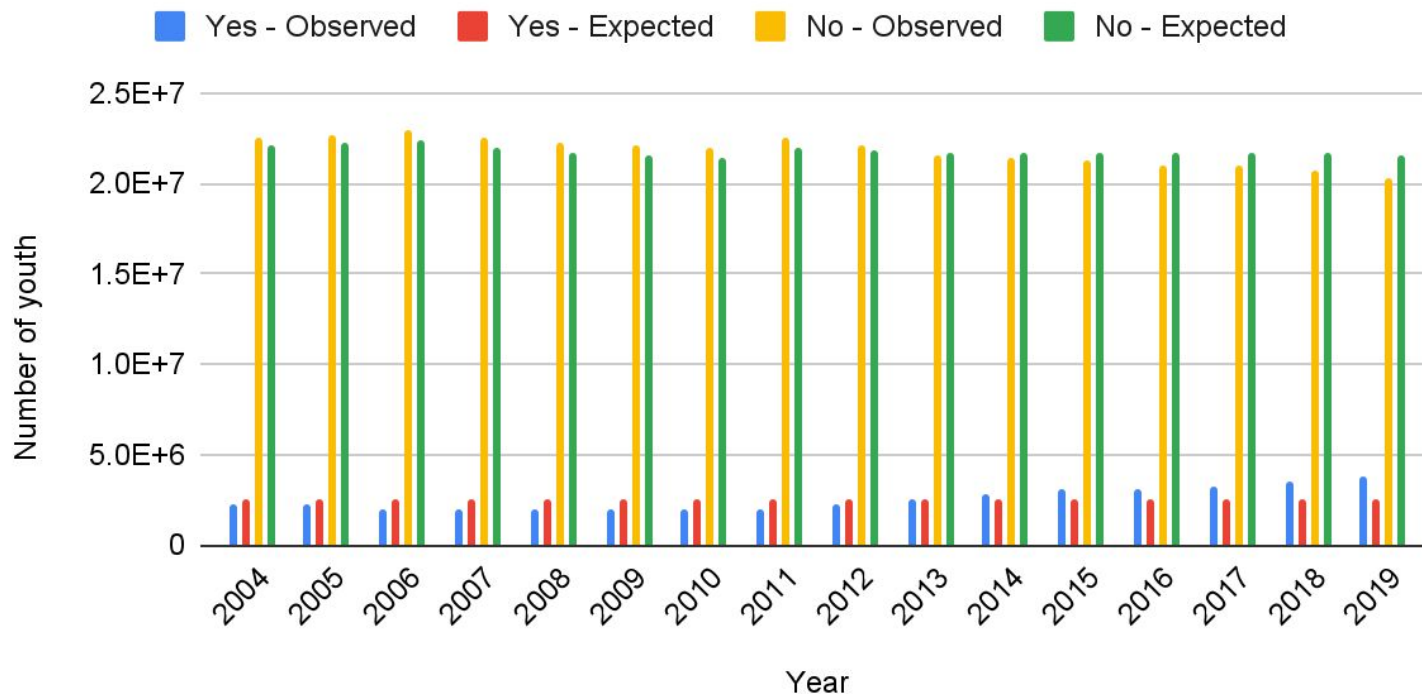
Incidence of Major Depressive Episode (MDE) in past year among youth aged 12 to 17, 2004-2019

Incidence of Major Depressive Episode (MDE) in past year among youth aged 12 to 17, 2004-2019
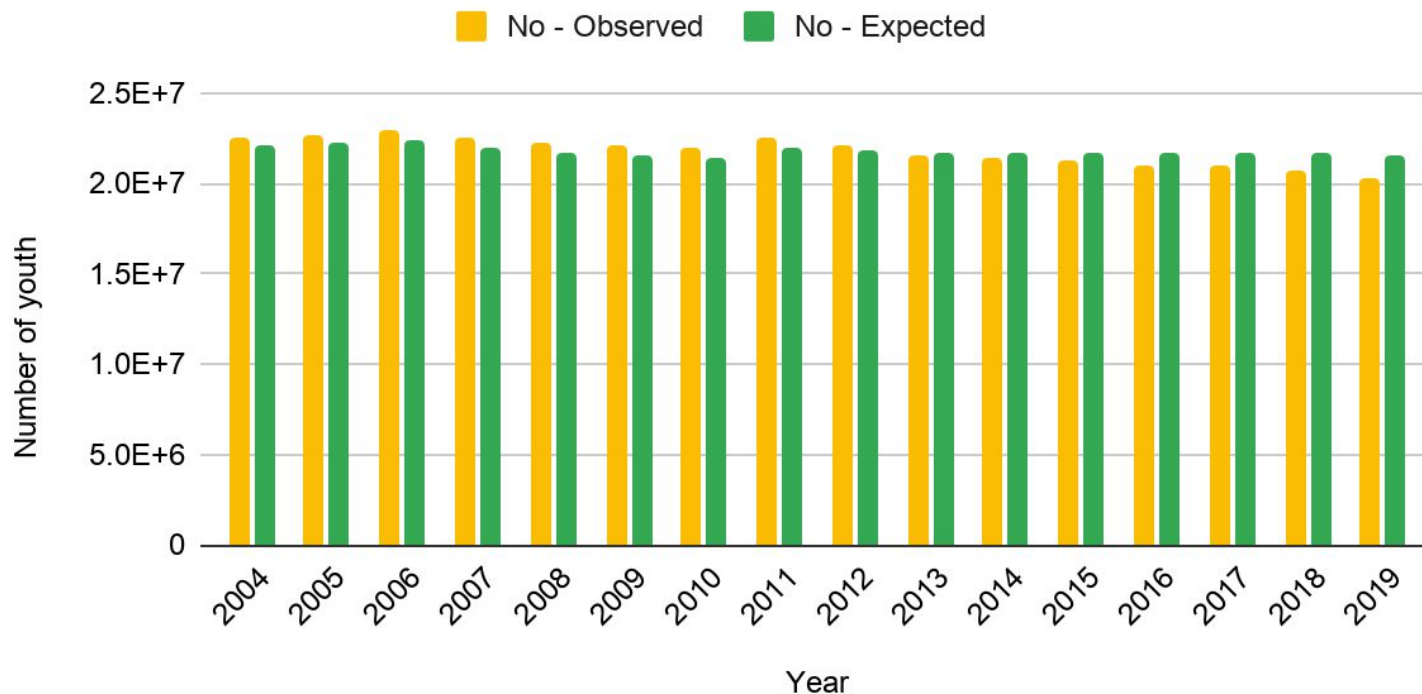
Noteworthy findings

Based on our analysis of 389,330,544 youth aged 12 to 17 in the US from 2004 through 2019, there is some relationship between incidence of MDE and the year, though the relation is small.

Future work