Determinants of Mental Health – A New York City Case Study

Gia Hy Pham
Professor Schmitz
Empirical Research
City College of New York
26th May 2020

I. Introduction

Mental health has long been one of the focal points of psychological and neurological researches. There are arguably many factors that would influence one's mental well-being. However, there are countless debates over how mental healthcare remains a luxury for a specific group of the general population. This group, in particular, consists of households that do no struggle from economic hardship. In other words, only the rich can afford to care about their state of mind, while the poor already have their minds filled up with financial worries.

Research has shown that, in fact, there are correlations between one's socioeconomic status and how one's responses to questions concerning their mental health status[1] [5]. The factors that shape one's financial standing are income, education level, number of persons in their household, age, employment status, marital status, and gender. Gender is a complex variable that needs further analysis since not everyone identifies with his or her given sex[2] [3]. Also, whether one resides in a rural or an urban community will spur changes regarding one's attitude and therefore psychological well-being[3][4] [3][4].

But the causes of one's mental illnesses do no lie solely around one's income and its influences. Substance abuse also correlates with mental health problems[5][2]. Studies have also shown that whether one consumes drugs, narcotics, or alcohol often or not has to influence one's overall mental health. Furthermore, gender is a factor on its own that has studies done to determine whether or not one decides that he or she does not identify with one's original sex from birth has to do with their mental health. Having a newly adopted attitude towards one's own gender identity can significantly influence one's overall psychological behaviors. Because then, one's sexual behaviors and sexual inclinations are wholly changed; and that often comes with a shock.

Therefore, it is redundant to stress the importance of mental health in human life, so understanding the prospective causal factors that affect it is crucial to improving our overall quality of life. This paper attempts to test the correlations between stated-above factors as independent variables and mental health status as the dependent variable. The data set used in this paper is the 2016 Community Health Survey in New York City (NYC) – a place that is urban, ethnically, and gender diverse, with residents from different walks of life. Because of the limitation of the data, prospective factors such as residency in rural and residency in urban areas will not be utilized. This paper focuses solely on the urban environment, and relevant researches on geography's effects on mental health will be discussed in the literature review section.

II. Review of Literature

1. Socioeconomic Status

All of the literature mentioned in this paper have section(s) that includes quantitative socioeconomic measures as independent variables to the study of mental health. Amongst these articles, the study done by Meyer et al. (2014) focuses solely on socioeconomic status as a driver of psychological well-being. "Decades of research have shown that lower socioeconomic status (SES) is associated with poorer health behaviors

[1] [5]Meyer et al
[2] [3]Katz-Wise et al
[3] [4]Kelly et al
[4] [1]Doornbos et al
[5] [2]Hunter et al

[5]. From the paper, the factors that influence one's SES are income, education, race/ethnicity, physical activity, and neighborhood safety. The hypothesis of Meyer et al.' paper is that "individuals lower in SES have greater fears about their safety" [5]. The data used in the article is the 2009 California Health Interview Survey. They also used education and income as the measure of SES. As expected, "greater SES was associated with better self-reported health (SRH) and mental health, greater physical activity, and lower neighborhood safety fears. Physical activity was positively associated with SRH and mental health" [5].

2. Geography

The paper by Kelly et al. (2011) focuses on the determinants of mental health in rural and remote communities. The hypothesis of the paper is "that factors known to exhibit significant variability across rural communities, such as the extent of remoteness and environmental adversity, would have a significant independent effect on the measures of mental health and well-being , after accounting for the role of the individual dispositional characteristics and other factors that may moderate the level of health and well-being (e.g., social support, social connectedness, perception of community characteristics)" [4]. The data set used in the paper is The Australian Rural Mental Health Study. The result of the study suggests that individual perception of social context plays an important role in one's mental health, rather than a community-level factor. This provides a foundation for further researches about mental health at a rural level, as different factors, compared to the urban level, will play out differently.

3. Substance Use

Substance abuse is another leading variable that directly affects one's mental health. Hunter et al. (2012) conducted a trial on treating depression and substance use. Although the target of the paper is to treat depression and substance use, not to understand the causal effect of substance use on depression, it still provides shreds of evidence on the relationship between these two things. If there is no effect of substance use on depression, then there would be no trial to treat the two illnesses. "Individuals with substance use disorders frequently have depression, and co-occurring disorders are associated with increased morbidity and mortality along with poorer treatment outcomes.... Moreover, depressed mood is a frequently cited precipitant of relapse among individuals with substance use disorders" [2]. From this, the variable of substance usages will be tested in this paper to examine its relationship with one's mental health in New York City.

4. Gender

Among the demographic factors that contribute to the overall level of one's socioeconomic status, gender has long been showing that females are earning less than males, on average. However, Katz-Wise et al. (2017) have shown that changes in attractions and sexual identifications have affected transgender adults' mental health. "The link between having a transgender identity and negative mental health outcomes is well established" [3]. Being conscious of a newly discovered sexual attraction and gender identification affects greatly to an individual's psychology. The data set used in their study is from Project VOICE, a collaboration between The Fenway Institute at Fenway Health and the Massachusetts Transgender Political Coalition. The outcome of

the study shows that "nearly 60% of participants, aged 18-75 years, in the current study reported lifetime changes in attractions…. Lifetime changes in attractions were significantly associated with all mental health outcomes, in that individuals reporting changes in attractions were more likely than individuals not reporting changes in attractions to indicate adverse mental health" [3]. This article provides evidence to test the variable of gender further in this paper, as respondents to the CHS also stated other answers than male or female.

III. Data Analysis

The data set used in this paper is the 2016 Community Health Survey in NYC. It is a telephone survey conducted annually by the DOHMH, Division of Epidemiology, Bureau Of Epidemiology Services. The CHS is a cross-sectional telephone survey with an annual sample of approximately 10,000 randomly selected adults aged 18 or older from all five boroughs of NYC. All data collected are self-reported [6]. The data set contains 10,000 observations of 147 variables. After filtering out all "don't know," "refused," and "missing" responses from selected variables for the purpose of this paper, there are 7476 observations of (n=6476).

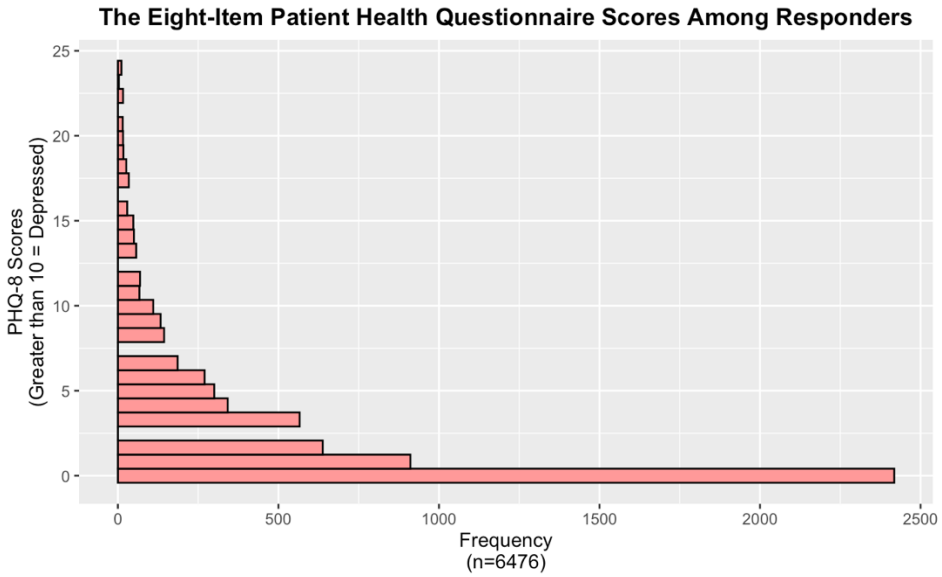
The two dependent variables that are crucial to the focus of this paper are the 8-item patient health questionnaire score (PHQ-8) and self-reported responses to having depression within the last two week from the conduct time of the survey. The PHQ-8 score is a measure of mental health, with scores greater than or equal to 10 means that the person is diagnosed with depression [7].

Summary Statistics of Mental Health Variables

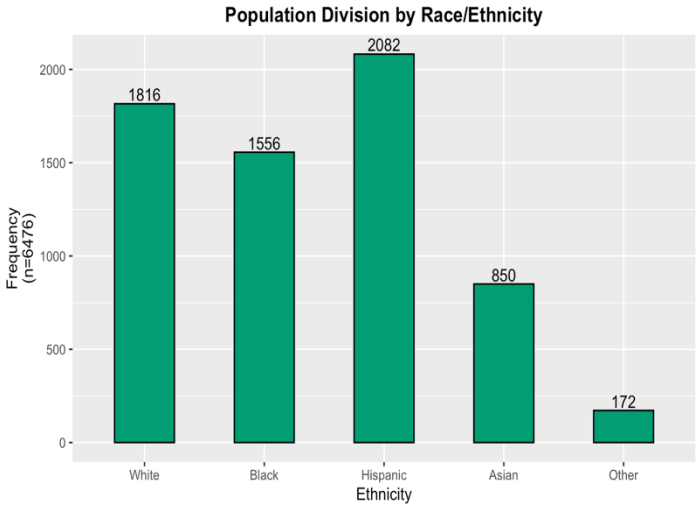
Statistic	Min	Max	St. Dev	Median	Mean
PHQ-8	0.00	24.00	4.28	1.00	3.09
"Yes" to Depression Within 2 Weeks	1.00	2.00	0.28	1.912	1.91

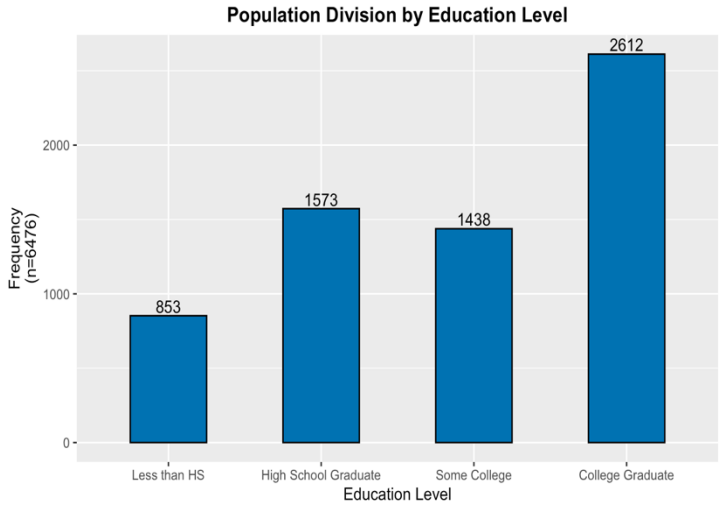
The mean of 3.09 and median of 1.00 suggest that the majority of respondents do not have depression. In the survey, respondents were asked if they currently suffer from depression, with "1" being yes and "2" being no. The mean of 1.91, median of 1.912, and the small standard deviation of 0.28 propose that the majority of people in the survey do not have depression. However, this is a self-reported measure, not an official measure like the PHQ-8. Nevertheless, it still represents how individuals currently feel about their psychological health.

The distribution of PHQ-8 scores is shown in the next histogram. It is logical that the majority of scores are below 10. However, there are 3147 people in the survey with the score at 10 or above. This suggests a different picture than the descriptive statistics of the variable, even though the general distribution is still consistent.



The independent variables are among the groups of demographic and substance use. Demographic variables are vital to describing an individual's socioeconomic status, and has been proven to affect mental health. The subgroups include education level, income, race, and gender.





Population divisions by ethnicity and education level are shown in these two graphs. The majority of the survey population are white, black, and Hispanic. College graduates lead the survey, while the next big group is high school graduate, following by people who have done some years, and lastly persons who have dropped out or never gone to high school. The distribution of these variables in this data set might be skewed by the sample size, compared to the much larger population of New York City.

Percentages of Respondents who Said 'Yes' to Having Depression in the Last 2 weeks Respective to Their Ethnicity

White	Asian	Hispanic	Other	Black
7.05	3.76	12.49	12.21	8.16

Percentage of Respondents with PHQ Greater than 10 Respective to Their Ethnicity

White	Asian	Hispanic	Other	Black
48.79	40	53.53	54.07	45.89

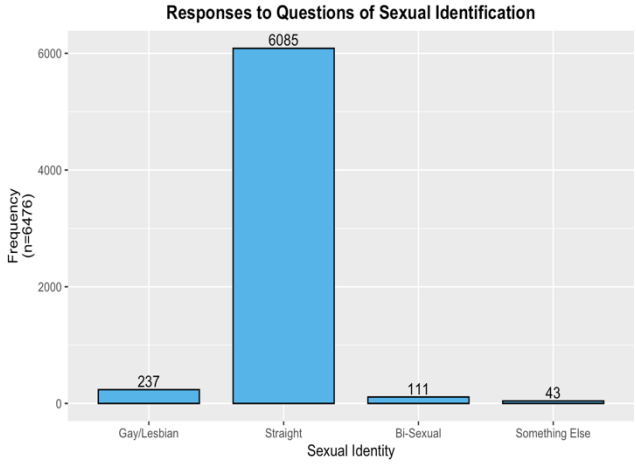
Unsurprisingly, the percentage of respondents who are currently suffering from depression, in respect to their race follows the pattern of the survey population distribution. However, it is worth noticing that the other categories, which consists of persons in ethnicities other than white, black, Asian, and Hispanic, has a significant percentage of people with mental health problems.

Percentages of Respondents who Said 'Yes' to Having Depression in the Last 2 weeks Respective to Their Gender

Straight	Not-Straight	Male	Female
8.35	15.35	8.09	9.43

Percentage of Respondents with PHQ Greater than 10 Respective to Their Gender

Straight	Not-Straight	Male	Female
47.97	58.31	46.51	50.94



As mentioned before in section II., gender and sexual attraction also play vital roles in shaping an individual's mental well-being. Evidently, both measures of depression in this study indicates that previous researches still hold, in regards to an individual's sexual identity and mental health. The distribution of the survey population for gender variables comes with no surprise, as 6085 identify as "straight," while 391 do not. These translate to approximately 93.96% and 6.04% of the survey population, respectively. Therefore, it is worth considering the percentages compared to the subgroups themselves instead of the mass. 15.35% of people who identify as "not-straight," or "not-cisgender," said "yes" when being asked about depression issues, which is almost 50% greater than their counterpart's 8.35%. For PHQ measures, the indications still carry over, however the difference is not as large, but considering the size of both subgroups, it is quite significant. Another thing worth mentioning from these statistics distributions is among the people who identify with their birth-given sex, women seem more proned to depression than man. However, that might not be significant since the total number of females in this survey is greater than the number for males (3616>2860).

The next subgroup of substance use will be tested directly in part IV.. There are only two variables of tobacco use and alcohol use. Because of that, in addition to published literature on the effects of substance on general health and mental health, it will be shown directly in the regression results. It is also worth mentioning that drug usages, which may highly affect one's mental health are not included in the data set.

IV. Methodology

Using the aforementioned Community Health Survey data set and a subset from that set, 2 multivariable analyses were conducted. The technique used to carry the regressions is "Ordinary Least Squares," or commonly known as "OLS." The open-source statistical software R is used to conduct these regressions. For the regressions, single asterisk (*) indicates a P-value of >0.1, while a double asterisk (**) and a triple asterisk (***) indicated P-values of <0.05 and <0.01, respectively.

As previously stated, the two dependent variables used in the 2 multivariate models are PHQ-9 Scores >10 and self-reported affirmation to mental health issues. That is also the only technical difference between the two regression models. On one hand, the PHQ-8 serves as a set of standardized and scientifically proven benchmark for current depression. On the other hand, individuals in this survey voluntarily reported that they are dealing with depression. In other words, the difference between these two dependent variables is while on is highly technical and objective, the other might lean towards a more subjective rationale. Therefore, comparing and contrasting the results of these two regressions is assumed to highlight whether or not diagnostic measures of mental health are consistent with how individuals feel about their states of mind.

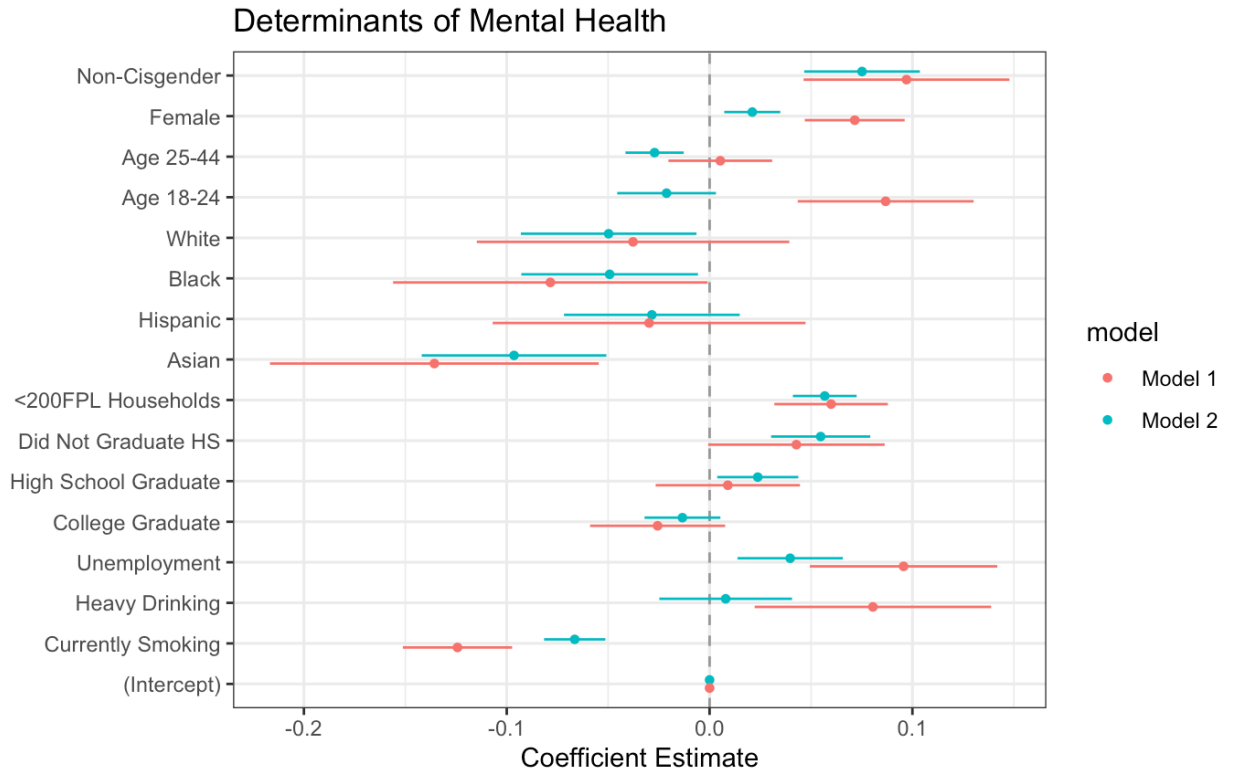
For the independent variables, there are two "sub-groups" of variables in these regressions. The first group is demographics. Female was chosen instead of Male, since the number of Female is larger and has been previously shown to have a higher proportion of depression than male. White, Black, Asian, and Hispanic are used, since they hold significant amounts in the total number of observations in the data set, compared to the category of "Other races." Households with income less than 200% of the Federal Poverty Level was chosen instead of ones with more than 200%. The reason behind this is poverty is assumed to affect mental health more than having a stable source of income. The variable of unemployment is also included for the same reason. In terms of age, the subset selected from the CHS data filtered out parts of the survey respondents that are older than 64 years. This is because the retirement age is approximately 66 years old, and 18 is when one is considered an adult by law. However, for the regressions, the variable of age from 45-64 is left out, with the assumption that these individuals suffer less from employment volatility and newly discovered sexual identities. Non-cisgender variable was used instead of straight, since it has been mentioned several times before in previous parts that changes in attraction affect one's mental health greatly. The non-cisgender variable is combined between "Gay/Lesbian, "Bi-sexual", and "Other." As demonstrated in the bar graphs in part III., college graduates appears the most and the least is "Less than High School." Therefore these should be included in the regression, with the addition of "High School Graduate." "Some College" was left out under the assumption that it does not contribute greatly to an individual's employment prospect to have attended and not graduated from college, since the two standards are GED and college diplomas.

The next independent variables represent the substance use subgroup. Former smokers are excluded under the assumption that giving up smoking leads to better general health. Of the variables in the original data set that describes alcohol usages, it is complex to separate out recreational and social drinkers from the rest. Because of that, heavy drinkers are only considered in this paper. Heavy drinkers, according to the CHS, are individuals who consume more than 2 alcoholic beverages per day.

V. Results

Determinants of Mental Health

	Dependent variable:	
	PHQ-8 Score Greater than 10	**Self-Reported Depression**
	(1)	(2)
Non-Cisgender	0.097***	0.075***
	(0.026)	(0.015)
Female	0.072***	0.021***
	(0.013)	(0.007)
Age 25-44	0.005	-0.027***
	(0.013)	(0.007)
Age 18-24	0.087***	-0.021*
	(0.022)	(0.012)
White	-0.038	-0.050**
	(0.039)	(0.022)
Black	-0.079**	-0.049**
	(0.040)	(0.022)
Hispanic	-0.030	-0.028
	(0.039)	(0.022)
Asian	-0.136***	-0.096***
	(0.041)	(0.023)
<200FPL Households	0.060***	0.057***
	(0.014)	(0.008)
Did Not Graduate HS	0.043*	0.055***
	(0.022)	(0.012)
High School Graduate	0.009	0.024**
	(0.018)	(0.010)
College Graduate	-0.026	-0.013
	(0.017)	(0.010)
Unemployment	0.096***	0.040***
	(0.024)	(0.013)
Heavy Drinking	0.081***	0.008
	(0.030)	(0.017)
Currently Smoking	-0.124***	-0.066***
	(0.014)	(0.008)
Constant	0.536***	0.141***
	(0.041)	(0.023)
Observations	6,476	6,476
R2	0.040	0.054
Adjusted R2	0.038	0.052
Residual Std. Error (df = 6460)	0.490	0.275
F Statistic (df = 15; 6460)	18.068***	24.542***
Note:	*p<0.1; **p<0.05; ***p<0.01	



The regression table shows the results of the two multivariate regression models used in this paper. With the exception of the two age variables, the rest of the variables share the same correlation over the two models. In other words, the signs of these variables' coefficients do not change from one model to another. That can also be seen in the dot and whisker plot above, as the two age variables have points on both ends of the 0-axis. Among the statistically significant variables, the standout ones are Non-Cisgender, Asian, <200FPL Households, Did Not Graduate HS, Unemployment, and especially Currently Smoking.

Expectedly, Non-Cisgender has the strongest positive coefficient in regards to both models. This indicates, again, that changes in sexual identities can greatly impact an individual's mental health. Among the ethnicities, the coefficient that the Asian variable yielded suggests a very strong negative correlation with both measures of mental health in this study. This proposes that Asians are the least likely in all ethnicities to face mental health setbacks. However, a bigger sample is needed to confirm this observation. Households with income less than 200 percent of the federal poverty line are more likely to suffer from depression, as indicated in the data. The same relationship applies to if one has never graduated from high school. Income and employment go hand in hand, so the result is consistent in which both of these variables in the regressions show positive correlations with the dependent variables.

Smoking, surprisingly, has shown a negative relationship with the y-variables in this case. On top of that, the number of current smokers from this subset is 4460, which is 68.86% of the survey sample. However, drinking is consistent with past literature on its

negative effect on mental health. Drinking is a statistically significant variable in the PHQ-8 model, but not the other one.

VI. Conclusion

Overall, the findings in section V. confirmed results of research in the past about the determinants of mental health. The null hypotheses in this paper are rejected, with the exception of tobacco use. However, such a large number of current smokers does not guarantee that those individuals smoke "heavily," per se. More researches should be conducted on the relationship between tobacco use and mental health. Socioeconomic status and its determinants, in this case are poverty level, employment, and education level, are confirmed in this study as one of the leading factors that most likely will affect mental well-being. An interesting finding from this study is that Asians are less likely to have depressions. More researches could be done to find out if that is true and why. Lastly, on the effectiveness of the PHQ-8 scores and self-reported depression, most of the results are consistent with each other. However, stronger estimates are found with the model using the PHQ-8 scores as the dependent variable. This may or may not be the result of a larger sum, compared to the other measure. Nevertheless, it shows that mental health diagnostic measures are relatively consistent with individuals' perceptions of their own mental well-being.

VII. Bibliographies

[1] Doornbos et al. "Using Community-Based Participatory Research to Explore Social Determinants of Women's Mental Health and Barriers to Help-Seeking in Three Urban, Ethnically Diverse, Impoverished, and Underserved Communities." 2013.
[2] Hunter et al. "Treating Depression and Substance Use: A randomized Controlled Trial." 2011.
[3] Kelly et al. "Determinants of Mental Health and Well-being within Rural and Remote Communities." 2011.
[4] Katz-Wise et al. "Self-Reported Changes in Attractions and Social Determinants of Mental Health in Transgender Adults." 2017.
[5] Meyer et al. "Determinants of Mental Health and Self-Rated Health: A model of Socioeconomic Status, Neighborhood Safety, and Physical Activity." 2014.
[6] "Community Health Survey." NYC.gov. < https://www1.nyc.gov/site/doh/data/data-sets/community-health-survey.page>
[7] "The PHQ-8 as a Measure of Current Depression in the General Population." PubMed.gov. < https://pubmed.ncbi.nlm.nih.gov/18752852/>