Effect of Employment Deprivation, Crime Rate, and Alcohol Consumption on Depression in Edinburgh

Jiazheng Wei
University College London, WC1E6BT, London.

Abstract: Depression is becoming one of the factors threatening human life safety.According to the statistics of the World Health Organization in 2020, it is estimated that 350 million people worldwide suffer from depression, but the pathogenesis of depression is still not fully understood. At present, the research direction of influencing factors of depression is mostly medical field and personal mental level. It is thought that 14 per cent of Edinburgh's population suffers from depression, anxiety or psychosis. Edinburgh is the most depressed or anxious city in the UK, a survey has revealed. There are many things that frustrate people who live in cities. The aim of the project was to understand spatially the extent to which employment deprivation, crime rates and alcohol consumption predicted the proportion of people with depression, anxiety or psychosis in the Edinburgh population. Because the socioeconomic composition of cities may contribute to higher rates of depression. Through spatial data analysis combined with GIS technology, this study concluded that the socioeconomic composition of the city may lead to the high incidence of depression from the influencing factors of social interaction.

Keywords: Depression; Employment in the Community; Alcohol Consumption

1. Introduction

Depression in communities is becoming an issue of concern in the UK (Shevlin et al., 2020; Arias de la Torre et al., 2021). Results of the 2019-20 Community Link Worker Annual Report showed that mental health issues in Edinburgh have seen notable increase. It has been argued that 14% of Edinburgh's population have been living with depression, anxiety, or psychosis (Millard et al., 2016). A recent survey shows that Edinburgh is the most depressed or anxious city in the UK. There are many things that can make people living in a city depressed. The purpose of this project is to understand, from a spatial perspective, the extent to which employment deprivation, crime rate, and alcohol consumption predict proportion of people living depression, anxiety, or psychosis within the Edinburgh population. Socioeconomic composition of the city may contribute to the high rates of depression (Weisburd, 2018; Millard et al., 2016).

2. Rationale

Although research has been conducted to understand the effect of such socioeconomic and demographic factors as employment, alcohol consumption and crime rate on depression, these studies have been conducted at the individual level. There are few studies that have investigated the effect of socioeconomic factors on mental health issues at a community or contextual level, rather than individual level. Previous research has also relied heavily on standard statistical techniques, such as regression, which may not reveal the spatial nature of depression. In this light, the present study relies on spatial techniques to understand how employment deprivation, alcohol-related hospital stays, and crime rate affect depression in Edinburgh.

3. Literature Review

3.1 Employment in the Community

Employment is considered as one of the factors that predict depressive symptoms in people (Pelzer et al., 2014). Pelzer et al. (2014) used video behaviors analysis and experimental groups to examine the relationship between employment and depressive symptoms. The study found that unemployed participants expressed more symptoms of depression as compared to those that were in employment. These findings suggest that unemployment is a significant stressor in most communities (Pelzer et al., 2014). Pharr et al. (2012) also examined the impact unemployment has on physical and mental health, access to healthcare, and health risk behaviors(Bulloch,2012). The study established that unemployed people tend to show vitally worse perceived mental health profiles. These findings suggest that unemployment does have a statistically significant impact on peoples' mental health (Pharr et al., 2012). Paul et al. (2009) also show that unemployment often leads to increased levels of mental health issues like depression. Bordea (2017) furthers these findings by assessing the association between stress, anxiety, and depression levels and the type of coping mechanisms unemployed people adopt. The study established that anxiety, stress, and depression are impacted by the type of coping mechanisms unemployed people adopt. Consistently, Zuelke et al. (2018) used a larger population sample to analyze the relationship between employment and depression, the difference of the same where gender is concerned, types of unemployment, and how material and social resources impact this relation. The study established that there are increased risks of depression among people who are unemployed who were receiving mean-test gains from male participants. These findings suggest that unemployed individuals who tend to receive means-tested treatments are at greater risk of being depressed and require specific attention within the healthcare and social security systems.

3.2 Heath in the Community: Alcohol Consumption

There is a statistically significant relationship between alcohol consumption and depression and this relation has a bilateral causal effect (Sullivan et al., 2005). Sullivan et al. (2005) examined this hypothesis and determined that issues linked to excessive consumption of alcohol are associated with increased depressive symptoms with outcomes such as social function, suicide, and use of healthcare surfacing. Consistently, Graham et al. (2007) also found that depression is primarily associated with drinking increased quantities of alcohol on an occasion. The study also established that people recovering from alcoholism show increased rates of depressive symptoms or recently developed depression symptoms as compared to light drinkers. Sullivan et al. (2011) go further to show that both HIV infected and uninfected people that drink alcohol excessively demonstrate more severe symptoms and depression that are similar to those people who abuse or are addicted to alcohol. Gémes et al. (2019) add that the link between alcohol consumption and depression is highly complex. The study argues that the direction of this link is often uncertain and to make it clearer, the study examined whether alcohol consumption results in increased rates of depression. Gémes et al. (2019) used the marginal structural model to examine this relationship and found that reasonable and light alcohol consumption is associated with a lower risk of developing depression. Conversely, when hazardous drinking is involved, the risk of developing depression increases significantly. The study also established that the relationship between increased consumption of alcohol and depression was independent of previous habits of consuming alcohol and other psychological, lifestyle, and socioeconomic factors. Karpyak et al. (2019) similarly examined the impact of comorbid depression and other positive and negative emotional states of alcohol consumption in people who are dependent on alcohol. The findings show that major history of lifetime depression is associated with fewer drinking days and reduced heavy drinking days for men. As for women, the study established that present major depressive disorder is linked with increased alcohol consumption on a daily basis specifically on alcohol-dependent women.

Coulson et al.'s (2014) also used a population-based sample of around 514 men aged 65 and above to examine the link between alcohol consumption and self-reported depression mainly in elderly people. The findings of the study established that highly increased selfreported rates of depression were from people who do not drink while people who drink on a daily basis also have increased rates of depression as opposed to moderate drinkers. These findings suggest that moderate drinkers show fewer cases of depression rates as compared to non-drinkers and heavy drinkers. Bulloch et al. (2012) also indicate that the consumption of alcohol may contribute to the development of depressive symptoms. The researchers found that alcohol-dependent people are at an increased risk of experiencing

major depressive symptoms. These findings are however not consistent with other alcohol consumption issues like binge drinking and exceeding guidelines for moderate drinking. As such, alcohol dependence tends to increase the risk of major depressive symptoms while vice versa is also true but not for male participants (Bulloch et al., 2012). Kwon et al. (2010) however assert that there is a statistically significant link between depression and alcohol consumption which means that one factor may be as a result of the other(Coulson,2014).

3.3 The Crime Rate in the Community

An increase in crime rates within a community often leads to stress and trauma which in turn leads to people experiencing extensive depressive symptoms. According to Weisburd (2018), there is a statistically significant link between mental health and the environment at the macro-geological level. That is, people living in places that experience increased crime rates and violence experience more stress levels as opposed to those living in more peaceful and considerably safer environments. Stirling et al. (2015) concurs with these findings by indicating that unsafe communities are among the factors that posit depressive symptoms among schoolgoing children. Giurgescu et al. (2015) also found that living in considerably unsafe and lower quality areas increases depressive symptoms among pregnant and postpartum women. These findings are consistent with Curry et al (2008) who suggests that violence is associated with psychological distress via neighbourhoods disorder and violence distress perspective. Therefore, neighbourhoods that are unsafe often have people who are highly stressed about their homes as they have to live in constant worry and fear of theft, violence, and other forms of dreadful experiences which lead to increased depression levels. (Karpyak, 2019.).

4. Research Methods

4.1 Source of data

The data for the present study comes from the Scottish Index of Multiple Deprivation 2020 (SIMD2020) which is publicly available at the Scottish government website. The data for the City of Edinburgh Council Area was selected since the focus of the study was the City of Edinburgh.

4.2 Variables and operationalization

The dependent variable in the present study was depression. Depression was operationalized as a percentage. It was considered as the proportion of the population in the city of Edinburgh council area, that is being prescribed drugs for anxiety, depression, or psychosis. In other words, depression was considered as the proportion of Edinburgh's population that is living with depression, psychosis, or anxiety.

There were three independent variables. These were employment deprivation, alcohol consumption, and crime rate. Employment deprivation was a percentage, and was considered as the percentage of people who are employment deprived. Alcohol consumption was a standard ratio, and was considered as the hospital stays related to alcohol use. Lastly, crime rate was operated as the rate per 10,000 population, and was the recorded crimes in neighbourhoods.(Kwon,2010.) Crimes were diverse, and could include violence, common assault, sexual offences, vandalism, domestic housebreaking, and drugs offences.

5. Data Analysis

To answer the research questions, spatial techniques were used. Spatial analysis is an effective technique in revealing insights or patterns that are usually hidden and cannot be identified through standard statistical techniques (Fotheringham and Rogerson, 2008). There were two spatial statistical techniques used in the present study. These included K means clustering and geographic regression. Geospatial clustering includes involves grouping data into categories called 'clusters', where members of a cluster have similar attributes. In the present study, clustering helped group the neighbourhoods in Edinburgh based on the four variables in this study: depression, alcohol consumption, crime rate, and employment deprivation. This helped answer the first research question.

Geographically weighted regression takes into account non-stationary variables such as characteristics of the physical environment and demographic factors of an area. And models the connections between the predictors and the outcome. Geographically weighted regression (GWR) augments standard multiple regression by allowing for local variation of the relationship between the independent and dependent variables (Rogerson, 2019). This helped answer the second research question.

In order to conduct the analysis, data cleaning and adjustments on the data were done. Here is the summary of how the data is cleaned:

All the relevant columns(DEPRESS, ALCOHOL, employment &crime_rate) have to be converted into numerical.

All the values which are 0 are considered missing values and will be dropped

All the outliers according to IQR will be dropped.

In order to remove multicollinearity, VIF is applied and the columns, whose VIF values are greater than 5 will be dropped.

5.1 Dealing with outliers

According the boxcharts, all the variables contain outliers, which will be dropped by applying interquantile range methodology, meaning all the values fall outside 1.5 interquantile will be considered as outliers.

After the data cleaning process (including removing missing values and outliers), 91 observations are dropped.

5.2 Multi-collinearity

In order to avoid multi-collinearity in the regression model, variance inflation factor(VIF) is applied. Usually, VIF above 5 indicates severe collinearity and the column should removed so that the estimates the coefficients won't be biased. And based on result, all the independent variables VIFs are below 5.

5.3 Data visulization - Correlation map

Based on the correlation map, we can conclude that the depression is positively associated with employment deprivation(0.76), alcohol hospitalization (0.51) and then crime rate(0.43). Scatter plot grid also demonstrates evidence there is a strong linear relationship between depression and employment deprivation. However, we can also observe some independent variables are correlated with each other and this might be concerning since the estimates of coefficients will be biased due to this. (Paul,2009)

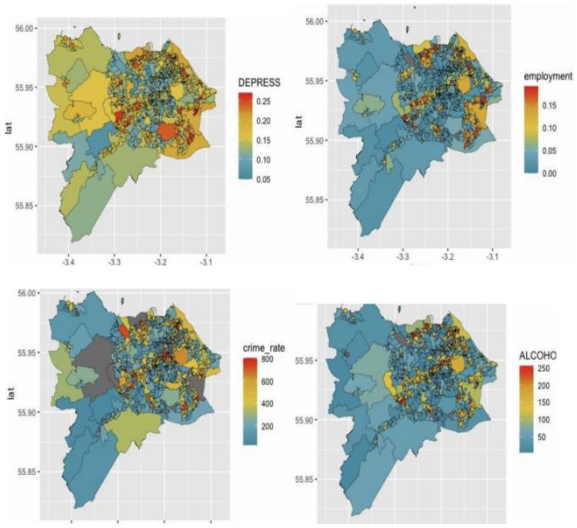
6. Results

6.1 Data, Methods, and data cleaning

The data contains 597 zones in Edinburgh. The present analysis is based on four features: hospital stays related to alcohol use, percentage of people who are employment deprived and recorded crimes of violence, sexual offences, domestic housebreaking, vandalism, drugs offences, and common assault per 10,000 people. The overall focus of the study was to understand impact of these three features on proportion of population being prescribed drugs for anxiety, depression or psychosis.

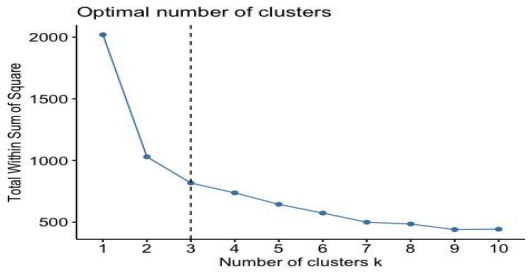
6.2 Data visulization - Heat Map

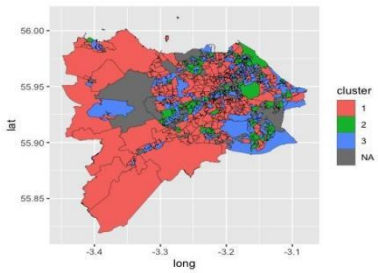
If the data is projected on the map of Edinburg, it's very interesting to see areas with higher depression are clustered dispersedly in different locations of Edinburg and the same observation also applies to employment deprivation, which we have already observed preserving strong linear relationship with depression.



6.3 K-means and cluster map

K-means is applied to create clusters and based on the elbow, a heuristic used in determining the number of clusters, the optimal number of clusters is 3. And if we project the clusters back to the map, we can see the locations of cluster 2 highly aligns with the areas of with high depression, employment deprivation, alcohol hospitalization and crime rate. Cluster 1, though still quite off, covers most of the areas of lesser depression(Pharr,2012.).





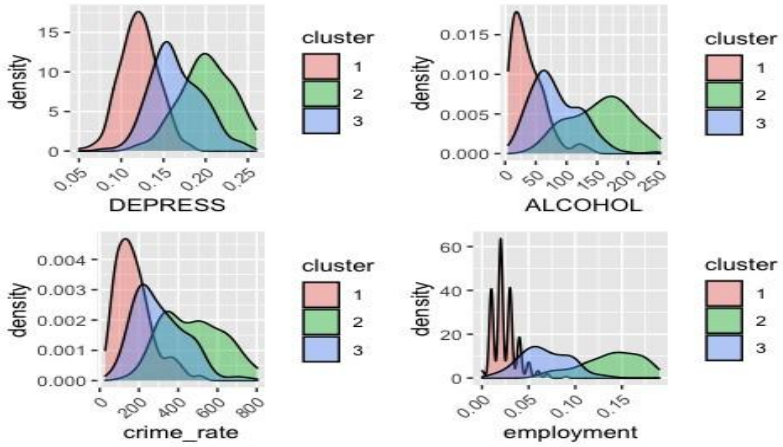
Please see the summary of cluster profiles along with the chart below:

Cluster 1 has the least depression rate and the lowest crime rate, alcohol hospitalization and employment deprivation.

Cluster 2 has the most depression rate and the highest crime rate, alcohol hospitalization and employment deprivation.

Cluster 3 is in the middle between Cluster 1 and 2.

Most areas belong to Cluster 1, which has the least depression rate.



6.4 Results of geographically weighted regression(GWR)

Results of geographically weighted regression show that the model can explain 58.63% of the total variance in the proportion of people with depression, anxiety, or psychosis. Employment deprivation statistically significantly contributed to the model for predicting the proportion of people with depression, anxiety or psychosis. The results show that one percent increase in employment deprivation will lead to an increase of 0.7095 in the proportion of people living with depression, anxiety, psychosis. However, hospital stays resulting from alcohol consumption and crime rate did not have statistically significant effect on the proportion of people with depression. This is an indication that, the proportion of people with depression, anxiety or psychosis does not change based on the number of people who have been hospitalized due to alcohol consumption or the recorded crime rate in the neighbourhood. (Sullivan,2011)

7. Discussion and Conclusion

The purpose of the present study was to understand the effect of employment deprivation, unhealthy alcohol consumption, and crime rate on the proportion of people living with depression, anxiety, or psychosis. The results show that the model accounted for 58.63% of the variance in the proportion of the population with depression, anxiety, or psychosis. Results of geographic regression show that employment depression has a statistically significant effect on the proportion of people with depression. The results show that a percentage increase in the people experiencing employment deprivation will be associated with a notable increase in the

proportion of people with depression, anxiety, or psychosis. These results are not surprising because employment has been shown to play an important role in depression. For instance, Pelzer et al. (2014) found that unemployed people were more likely to be depressed when compared to those that were in employment. Moreover, Pharr et al. (2012) found that unemployed people tend to have poor perceived mental health outcomes. There is consistent evidence that unemployment is associated with poor mental health, including depression.

However, the results show that alcohol-related hospital stays and crime rate did not significantly contribute to the proportion of people with depression. These findings are surprising, because previous research shows that alcoholism and crime rate contribute significantly to depression and other mental health issues. For example, Sullivan et al. (2005) found that ecessive consumption of alcohol is associated with mental health problems such as depression. Similarly, Graham et al. (20070 reported that depression is significantly associated with drinking, where unhealthy alcohol consumption leads to depression. However, it has been argued that the link between alcohol consumption and depression is very complex (Gemes et al., 2019), which may make it difficult to understand how alcohol consumption is related to mental health problems like depression. In this light, it has been argued that light alcohol consumption is associated lower chances of developing depressive symptoms while harzadous drinking increases the risk of developing depression. Fewer drinking drays and reduced heavy drinking days also determine how alcohol consumption will affect depression (Karpyak et al., 2019).

References

[1] Bulloch, A., Lavorato, D., Williams, J. and Patten, S., 2012. Alcohol consumption and major depression in the general population: the critical importance of dependence. Depression and anxiety, 29(12), pp.1058-1064.

[2] Coulson, C.E., Williams, L.J., Berk, M., Lubman, D.I., Quirk, S.E. and Pasco, J.A., 2014. Association between alcohol consumption and self-reported depression among elderly Australian men. Geriatric Mental Health Care, 2(1-2), pp.3-8.

[3] Karpyak, V.M., Geske, J.R., Hall-Flavin, D.K., Loukianova, L.L., Schneekloth, T.D., Skime, M.K., Seppala, M., Dawson, G., Frye, M.A., Choi, D.S. and Biernacka, J.M., 2019. Sex-specific association of depressive disorder and transient emotional states with alcohol consumption in male and female alcoholics. Drug and alcohol dependence, 196, pp.31-39.

[4] Kwon, T.Y., Kahng, S.K. and Kim, H., 2010. The reciprocal relationship between depressive symptoms and alcohol consumption: Group comparison by employment status. Asian Social Work and Policy Review, 4(1), pp.43-56.

[5] Paul, K.I., Geithner, E. and Moser, K., 2009. Latent deprivation among people who are employed, unemployed, or out of the labor force. The Journal of psychology, 143(5), pp.477-491.

[6] Pharr, J.R., Moonie, S. and Bungum, T.J., 2012. The impact of unemployment on mental and physical health, access to health care and health risk behaviors. International Scholarly Research Notices, 2012.

[7] Sullivan, L.E., Goulet, J.L., Justice, A.C. and Fiellin, D.A., 2011. Alcohol consumption and depressive symptoms over time: a longitudinal study of patients with and without HIV infection. Drug and alcohol dependence, 117(2-3), pp.158-163.

Author's brief introduction

Jiazheng Wei(1996.03.01-),Male, Han nationality, Yulin City, Shaanxi Province, Master of Science, Research direction: Smart city and data analysis.