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Mental Wellbeing and Economics of Crime: A County Level Analysis in the U.S.

Ruh Sağlığı ve Suç Ekonomisi: Amerika Birleşik Devletleri Örneğinde İlçe Düzeyinde Panel Veri Analizi

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Abstract: Increasing number of crimes has become an important problem of the economic development during the last decades. In addition to the economic and social determinants of criminal activities, access to healthcare services is considered as an important factor to decrease a person's risk of committing a crime. This study aims to analyze the impact of mental health problems on crime in an economic framework. Panel data on violent and property crimes for the counties for the period from 2011 to 2013 in the USA are employed. Based on information and statistics from the Federal Bureau of Investigation (FBI), the U.S. Department of Health & Human Services, and the SAMSHA, a simple model of crime is proposed to analyze the relationship of mental wellness and crime rate. A fixed - effect approach is used to estimate the potential correlation. Then, the findings are compared with the estimation results from one step dynamic panel model and between - groups model. The results from the fixed effect approach show that physical inactivity and number of mental health providers are significantly related to crime. An increase in the number of mental health providers results in decrease in all crime categories but grand larceny and property crimes per 100,000 people. Additionally, the estimation results from the between groups model are highly consist with estimations from the fixed effect results.

Keywords: Crime, Health and Economic Development, Health Economics, Economics of Crime

JEL Classification; K42, I15, C33, I10

Öz: Son yıllarda suç oranlarında görülen artış, devletlerin kalkınma hedeflerine ulaşmalarındaki önemli engellerden biri haline gelmiştir. Ekonomik ve sosyolojik faktörlerin suçu etkileyen dinamikler olmasının yanında sağlık merkezlerine erişim de suç oranlarını etkileyen faktörlerden biri olarak kabul edilmektedir. Bu çalışma, ruh sağlığı problemlerinin suç oranlarıyla ilişkisini iktisadi bir model çerçevesinde analiz etmektedir. Amerika Birleşik Devletleri'nde ilçe düzeyinde şiddet ve mala karşı işlenmiş suçları içeren 2011-2013 yılları arasını kapsayan panel veri seti kullanılmıştır. Amerika Federal Soruşturma Bürosu (FBI) ve Amerika sağlık ve insan hizmetleri departmanında elde edilmiş olan veriler suç ekonomisi modeli kapsamında incelenmiştir. Potansiyel korelasyonu tahmin etmek için sabit etki modeli uygulanmıştır. Daha sonra sonuçlar, dinamik panel modeli ve gruplara arası model yaklaşımlarından elde edilen sonuçlar ile karşılaştırılmıştır. Gruplar arası model ile sabit etki modeli tahminlerinin birbiriyle büyük ölçüde uyumlu olduğu görülmektedir. Sonuçlar, fiziksel hareketsizlik ve ruh sağlığı birimlerinin sayısının toplumdaki suç oranlarıyla önemli derecede ilişkili olduğunu göstermiştir.

Anahtar Kelimeler: Suç, Sağlık ve Ekonomik Kalkınma, Sağlık Ekonomisi, Suç Ekonomisi

JEL Sınıflandırması: K42, I15, C33, 110

1. Introduction

Economists agree that a high crime rate is one of the important obstacles to development (Fajnzlber, Lederman, & Loayza, 2000). The crime rate can reduce the quality of economic development and growth. One of the negative effects of an increase in the crime rates against economic development in a community is the increase in production costs. An increase in the criminal activities might affect the foreign direct investments and production levels. In addition to the production levels and costs, Detotto and Otranto

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(2010) states that criminal activities have negative impacts on both domestic investments and the foreign direct investments. To give an example; source allocations, firm competitiveness, and uncertainty because of the high crime rates may affect the investment decisions (Detotto & Otranto, 2010). Also, it is important to state that high crime rates can directly affect the economy in several other ways. Some recent studies found out that the house prices are crime rates are negatively associated with each other (Graaff & Zietz, 2020 ;Tita, Petras, & Greenbaum , 2006). Similarly, loss of tourism, productivity loss, economic deficiency, and victims' treatments can be some other economic costs of the crime rates.

After Becker's groundbreaking study (1968), a growing literature focused on the cost of crime and determinants of crime (Corman & Mocan, 2000; Lochner & Moretti,2004; Fajnzlber, Lederman, & Loayza, 2000). While a number of studies estimate the determinants of crime, there is little research to analyze the relationship between mental wellness and crime. One can see that nearly 25% of inmates in state prisons and jail have mental health problems (MentalHealth.gov, 2014). Moreover, statistics from the Department of Justice Statistics (2006) and U.S. Department of Health & Human Services show that one in five American adults have mental health problem and only 44% of adults have a diagnosable mental health problem (MentalHealth.gov, 2014).

The purpose of this study is to analyze the impact of mental health problems on crime. The literature on economics of crime shows that economists are generally interested in social and economic determinants of crime and crime's social cost on society (Corman & Mocan, 2000; Lochner & Moretti, 2004; Fajnzlber, Lederman, & Loayza, 2000). On the other hand, the literature on mental health and economics shows that studies on economics of mental health is mostly conducted by psychologists. In particular, these studies on crime and mental health focus on the casualty direction between mental illness and crime (Marcotte & Markowitz, 2010; Frank & McGuire, 2010). Despite the many studies from within the psychology discipline explaining the impact of mental illness on crime, empirical researches on crime and mental wellness is not commonly undertaken by economists. The main difficulty to estimate the relationship between crime and mental health is the direction of causality and unobserved characteristics of mental illness. Another difficulty is to see that the same variables have impact on both mental illness and crime[1].

The remainder of this paper is organized as follows: Section 1 provides a review of literature on mental wellness and crime. Section 2 provides a simple model of crime and theoretical background

[1] Economic stress and poverty can have impact on both crime and mental health. According to Bourguigno's analysis (2009), poverty and inequality has significant impact on crime. Additionally, the relationship between mental illness and crime is conducted by psychiatrics (Murali & Oyebode, 2004)

(Fajnzylber, Lederman, & Loayz, 2002). Section 3 presents econometric model, empirical specification and econometric methodology Section 4 explains the data. Finally, the results and conclusion are discussed under section 5 and section 6.

2. Literature Review

The cost of mental illness and crime has become a growing concern among social scientists. As stated by economists, high crime rate is one the important obstacles to development (Fajnzlber, Lederman, & Loayza, 2000). Comparing other crime prevention policies, the treatment of mental health problems can be a cost-efficient way to reduce crime. One can see two main reasons behind it: (I) health care externalities, (II) treatment as a crime prevention tool. By benefiting from the health care externalities, individuals might benefit other's healthiness because it decreases the likeliness of people to catching the illness or negative externalities of mental health problems. Secondly, the relationship between crime and mental health problems is generally accepted. A treatment of mental health problems is possibly to prevent the crime incidence.

In the present study, the literature on crime and mental wellness are divided into two main parts: (i) the link between physical inactivity and mental wellbeing; and (ii)socio- economic factors affecting crime levels.

2.1. Mental Health Indicators

Several studies show that mental health and physical activity are closely related to each other. The extant literature supports that number of mental health providers, access to recreational facilities, and physical activity are significantly related to mental well-being. (Paluska & Schwenk, 2000; Pretty, Peacock, Hine , & Se, 2007; Sturm & Cohen, 2014) . The physical inactivity plays an important role to increase anxiety and depression. According to a study conducted by Paluska and Schwenk (2000), people with mental health problems are less physically active. Then, both illnesses result in lower education level, unemployment and income problems (Weissman, 1996). To deal with mental illness, physical activity has an important role to moderate the mental health problems (Paluska & Schwenk, 2000; Pretty, Peacock, Hine , & Se, 2007; Sturm & Cohen, 2014).

According to another study which is conducted by Sturm and Cohen (2014), access to the recreational facilities is positively associated with mental wellness. Their study is based on secondary data analysis from Los Angeles. The findings indicate that distance to recreational facilities or parks has an impact on the frequency of park use and physical activity minutes (Sturm & Cohen, 2014).

Another study conducted by Dhaval et al. (2011) estimates that physical inactivity indirectly affects mental health. As stated by the authors, physical inactivity is closely related to the obesity problem and the obesity problem positively related to mental health problems (Dave, Tennant, & Gregory, 2011).

In addition to physical inactivity and access to recreational facilities, the number of mental health providers plays an important role in the treatment or prevention of the mental health problems. While there is limited economics literature on the relationship between number of mental health providers and crime, the literature of psychology shows that the causality direction between the number of mental health services and mental health is not clear. On the other hand, one of the studies which conducted by Richardson et al. (2005), supported that the promotion of physical activity into mental health providers is important to treat mental illness.

2.2. Social and Economic Indicators

The recent literature on crime focuses on the relationship between crime and number of law enforcement. One of the studies on police officer numbers and crime was conducted by Tella and Schargrodsky in 2004. Their study was based on an information collection on the number of motor vehicle thefts before and after the terrorist attack in Buenos Aires in 1994. The findings support that there was a large deterrent effect of observable police on crime (Tella & Schargrodsky, 2004).

Also, education is one of the highly important determinants of crime and incarceration rate. There is a number of reasons to expect that crime and education are negatively related. (Billings, Deming, & Rockoff, 2014; Deming, 2011; Alzer & Doyle, 2015; Lochner & Moretti, 2003; Groot & Brink, 2010; Cook & Kang, 2016). Loncher and Moretti's study based on data from Census Bureau and the FBI finds that "the social benefits of a one percent increase in male U.S. high school graduation rates (from reduced crime alone) would have amounted to $1.4 billion" (Lochner & Moretti, 2003-pg 25). Another study conducted in 2007 shows that the schooling years and probability of committing crimes are negatively related with each other. On the other hand, white collar crime is seen more often with an increase in the schooling years (Groot & Brink, 2010).

Additionally, the previous studies on economics of crime provide a number of reasons to show the impacts of median income and unemployment rate on crime (Burdett, Lagos, & Wright, 2003; Wu & Wu, 2011; Fougére, Kramar, & Pouget, 2009) . The influence of unemployment on property crime between 1990 and 2000 in France is analyzed with regional level data by Fougére, et al. The results show that unemployment level and crime are positively associated. An increase in the youth

unemployment rate results in an increase in crime (Fougére, Kramar, & Pouget, 2009). Another study conducted in 2003 developed a search equilibrium framework. This framework is expected to be helpful to the analyze the relationship between crime and unemployment. The estimation results show that particularly youth employment is significantly sensitive to unemployment and wage indicators.

3. The Simple Model of Criminal Behavior

The economic model of crime was developed by Becker (1968) and then improved by Ehrlich (1973). After these two pioneer studies, a large literature on crime and determinants was developed by economists. In this section, a simple economics of crime model is presented to explain the framework.

As pointed out in Becker's study (1968), Crime and Punishment: An Economic Approach, crime is an economically important subject. Since the turn of the 20th century, the cost of crime has become an increasingly important problem. Thus, understanding the roots of crime in order to decrease the cost of crime is highly important (Becker, 1968). The "social loss function" is formulated by Becker as measurement of the social and economic losses from illegal behaviors. As explained by Becker's social loss function (1968), crime has three components. The first one is the net social result. This component is about the social gain from illegal behavior and social damage to the victim:

(1) $H_i = H_i(O_i)$

(2) $H_i' = \frac{dH_i}{dO_i} > 0$

H_i presents the harm from the offensive activities and is a function of harmful activities which is presented by O_i. Furthermore, the theory assumes that the expected gains to offenders are also positively related to harmful activities (Equation 3).

(3) $G = G\ (O)$

(4) $G' = \frac{dG}{dO} > 0$

(5) $D(O) = H(O) - G(O)$

Equation 4 presents that an increase in harmful activity leads to an increase in the expected gain to offenders. As seen in equation 5, the net gain to society from these activities $D(O)$ is calculated by the harm $H(O)$ minus the utility for offenders $G(O)$.

The second component is the cost of apprehension and conviction. A represents the illegal activity and is a function of manpower, material and capital. Based on the literature, an increase in the activity leads to an increase in the economic cost. Where p is the probability of offense ratio, the assumption says "an increase in either the probability of conviction or the number of offenses would increase total costs." (Becker, 1968, p.174).

(6) $C = C(A)$

(7) $C' = \frac{dC}{dA} > 0$

(8) $C_p = \frac{\partial C(pO)}{\partial P} = C' > 0$

The last one is related to the supply of offenses. This approach points out:

(9) $O_j = O_j(P_j, f_j, u_j)$

(10) $O_{P_j} = \frac{\partial O_j}{\partial P_j} < 0$

(11) $O_{f_j} = \frac{\partial O_j}{\partial f_j} < 0$

where O_j is the number of illegal activities seen during the period j, P_j presents the probability of conviction, f_j is punishment and u_j symbolizes all the other explanatories One can see an example of "price discrimination" since only convicted persons are punished. So, an increase in the probability of conviction and punishment is negatively related to offense rate.

The present study differs from common literature in one point. The literature supposes that if a person commits crime, he/she able to think about pros and cons of the crime. So, after an analyzing, crime is committed by rational people. On the other hand, some people do not have enough ability to think about the risks of crime and their criminal behaviors are not result of their rationality. So, the criminal behaviors committed by mentally unhealthy people are not rational behaviors. The following sections empirically estimate the impact of mental illness on crime.

4. Econometric Methodology

The mental health factors which are mentioned above are classified as the medical factors. The existence study also analyses some other variables related to crime factors: (i) number of police officers, (ii) high school graduation rate, (iii) median income, and (iv) unemployment rate.

In this section a simple model is used to explain the main logic behind the economics of crime. Three econometric models are used to estimate the impact of mental wellness on crime. The first one is the fixed effect model. The crime literature with panel data mostly employed the fixed effect model (Levitt, 2004; Fletcher, 2010; Jacob & Lefgren, 2003; Johnson & Raphael, 2012). In addition to fixed effect model, one-step dynamic panel model and between-groups are estimated. The basic equation is stated below:

(1) $CR_i = (PhyInact_i, NumMhp_i, HSGrad_i, Unemp_i, MHHIncome_i$
$Munhealthy_i, RecFacRat_i, Tlawenf_i, u_i)$

(2) $Munheathy_i = g\,(PhyInact_i, RecFacRat_i, , NumMhp_i, e_i)$

(3) $Tlawenf_i = h\,(MHHIncome_i, \varepsilon_i)$

Equation (1) presents a crime supply equation where "CR_i" is the crime rate, "$PhyInact_i$" is physical inactivity rate, "$NumMhp$" is number of mental health providers, "$HSGrad_i$" is high school graduate rate, "$Unemp_i$" is unemployment rate, "$MHHIncome_i$" is median household income,

"$Munhealthy_i$" is Number of poor mental health days, "$RecFacRat_i$" is recreation facility rate and "$Tlawenf$" is the total number of law enforcement. Equation 2 shows that Number of poor mental health days are function of physical inactivity, number of mental health providers and recreation facility rate. As demonstrated by "u", some characteristics may have an impact on both offensive behaviors and mental illness.

Equation 3 shows that the number of police enforcement is a function of median household income. This economic model of crime estimates that an increase in the median household income should increase the number of police officer employed in the related county. Based on equation (1), an increase in the number of police officers may lead a decrease in the crime rate. In this case, the answer of how the impact of median household income and law enforcement size on crime ($\frac{\partial CR_i}{\partial Tlawenf_i}$) is very impactful question to predict the model.

(4) $Crime_{ijt} = \alpha + \beta_1 PhyInact_{ijt} + \beta_2 NumMhP_{ijt} + \beta_3 HSGrad_{ijt} + \beta_4 Unemp_{ijt} \beta_5 MHHIncome_{ijt} + \beta_6 Munhealthy_{ijt} + \beta_7 RecFacRat_{ijt} + \beta_8 Tlawenf_{ijt} + \omega_t + \mu_i + \varepsilon_{ijt}$

In the equation 4, "i" refers to counties, "j" to states and "t" to years.

5. Data

The sample of 3143 counties in the USA is analyzed for each year between 2011 and 2013. For each county in this study, statistics are collected from the public data sources. Crime rate provides the number of offences occurred in the calendar year. By county level population data from the Census Bureau, offense statistics are calculated as a per capita offense rate. Therefore, the model is controlled by population density. Data availability has become one of the reasons to apply this research question for the U.S counties. The FBI provides county level crime statistics for each crime categorized and the dataset is publicly available for researchers. Each variable and data sources are explained below:

5.1. Data on Crime Rate

In this study, crime is employed as the dependent variable. Nearly 18,000 law enforcement agencies in the United States provide crime statistics. The report of FBI has two main crime categories they are violent crime and property crime. As literature suggest, high levels of violent crime related with physical psychological well-being and safety. Crime data for eight main crime sub-categories are obtained from the FBI statistic department. The FBI's Uniform Crime Reporting Program divides violent crime into four offense categories: murder, forcible rape, robbery, and aggravated assault. For property crime, there are also four crime categories: burglary, larceny-theft, motor vehicle theft, and

arson. Because of the limited participation of law enforcement and limited data availability for arson, this crime type is not analyzed in our study. Additionally, the crime data suffers from two points. First one, for a number of causes people do not choose to inform the law enforcement. Thus, one can see that there are a number of crimes which are not reported. So, the data suffers to explain each crime occurred in a calendar year. Second point is that FBI UCR program does not have data for every state. So, there is not any crime information for some states (i.e. Alaska).

5.2. Data on Mental Illness

Based on the literature, the present study uses four independent variables which are associated with mental-wellbeing.

Increased physical inactivity leads several mental health disorders. "Physical inactivity" data shows the percentage of the population who do not have time for physical activity. Physical activity includes activities such as running, walking, golf, and gardening. The data was obtained from the National Diabetes Surveillance System. Additionally, the county level estimations are derived by using Bayesian multilevel modelling techniques.

Mental health provider data is the number of mental health providers in a county. The number of mental health providers covers psychiatrists, psychologists, licensed clinical social workers, counselors, marriage and family therapists and advanced practice nurses specializing in mental health care (countyhealthrankings.gov, 2016). The dataset shows that nearly 30% of the population has problems accessing mental health services. The statistics are gathered from the National Provider Identification Registry. Mental health service data has a limitation. The providers should obtain an identification number. On the other hand, a small number of the providers do not have an identification number.

The other independent variable which is used is Number of poor mental health days. The data is based on survey results. The survey question is: "Thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?". The data gives the number of days which people reported having poor mental health. The data comes from The Behavioral Risk Factor Surveillance System (BRFSS). BRFSS has surveys on the phone and apply nearly 400,000 people annually to obtain state level data. The limitation of the number of mentally unhealthy data is the survey answers are based on individuals' explanations; it is not a medical report.

The last mental wellness variable is access to exercise opportunities rate. Locations for exercise are defined as parks and recreational facilities. Parks includes national, local and state parks. The

dataset has three different categories for reside, urban and rural areas. Urban areas are a maximum of one mile away from recreational facilities, rural areas are a maximum of three miles away from recreational facilities, and reside areas are in a census block within a half mile of a park are considered as having adequate opportunity for exercise.

5.3. Data Social-Economic Factors

In addition to mental-wellbeing, our study uses some other social-economic variables which are mentioned above. One of them is unemployment rate. The unemployment rate shows the percentage of the population who is more than 16 years old, unemployed and seeking for a job. The unemployment rate data comes from The Local Area Unemployment Statistics (LAUS) program of the Bureau of Labor Statistics (BLS). These estimates are consistent with the unemployment measures from the Current Population Surveys. The second independent variable is median household income. County-level median household income data are obtained from Census Bureau, the Small Area Income and Poverty Estimates (SAIPE) program. High school graduation rate is another independent variable in the present study. High school graduation data is the percentage of cohort graduation rate from public high school in four years. At the beginning of the school year, each state has to submit their cohort graduation rate. Thus, this data is available to the public on EDFacts.

The last independent variable which is used in this study is the number of police officers. Civilian employees define full-time agency personnel as clerks, radio dispatchers, meter attendants, stenographers, jailers, correctional officers, and mechanics. Total law enforcement officers are defined as people who carry a firearm and also a badge, have full arrest powers, and are paid from governmental funds set aside specifically to pay sworn law enforcement. The data is calculated per capita (U.S. Department of Justice, 2011 - 2013).

6. Results

The estimation results are reported separately for each crime type. Additionally, three different panel data models are estimated. Our basic equation has seven independent variables: Physical inactivity, number of mental health providers, high school graduation rate, unemployment rate, median household income, Number of poor mental health days, access to recreation facilities rate and number of law enforcement. Additionally, the number of law enforcement variable has two more subcategories: total officers number and total civilian workers number. As explained in the previous sections, our fixed effect model is our main econometric methodology. To compare the results from other methodologies, the one step dynamic

model and between models are also estimated. The model has a problem with the physical inactivity rate. So, this variable is switched from "physical inactivity rate" form to "number of physically inactive people".

Table 1 shows the summary statistics for dependent and independent variables included in the model. The crime statistics are estimated as the number of crimes per 100,000 people. The smallest county included in the data set has less than 3000 population (South Dakota). Tables 2 through 9 compare the estimation results from fixed effect model, one step dynamic panel model and between groups model. The results from each model are explained in the following sections:

6.1. Fixed Effect Model

Table 2 presents the main results regarding mental health problems and economic conditions on murder crime in US counties. Column 1 presents the results from the fixed effect model, column 2 presents the results from 1-dynamic model, column 3 presents the results from the between group model. By following the similar order, Table 3 present the findings for rape, Table 4 presents the findings for robbery, Table 5 presents the findings for assault, Table 6 presents the findings for property crime, table 7 presents the findings for burglary, table 8 presents the findings for grand larceny, and finally table 8 presents the findings for motor vehicle theft.

The results show that physical inactivity, number of mental health providers and median household income are highly related to violence. Table 2 shows that physical inactivity has a positive coefficient for each crime categories which implies that people with a higher physical inactive life are more likely to commit a crime. Also, the number of mental health providers is another significant variable in the present model. The results show that an increase in number of mental health providers results in a decrease in violence. Similarly, median household income has a negative association with crime. One can see that an increase in median household income results in a decrease in violence.

Violent crime categories are divided into four sub-categories: The first one is murder. The results show that physical inactivity, number of mental health providers and median household income are also significantly related to murder. Additionally, total civilian workers are another significant variable which has an impact on murder. An increase in total the number of civilian workers decreases murder.

The second violent crime category is rape. As seen on Table 3,the fixed effect model for rape show that high school graduation rate also has an impact on crime. An increase in the high school graduation rate decreases the rape crime. It is important to note that education is a very important indicator with the externalities. As stated by Lochner and Moretti (2003), "The externality is about 14-26% of the

private return, suggesting that a significant part of the social return to completing high school comes in the form of externalities from crime reduction."

The third and fourth violent categories are robbery and assault. Table 4 and Table 5 show that the estimation results from the fixed effect model imply that physical inactivity, number of mental health providers and median household income are related to assault and robbery crime. An increase in physical inactivity results in an increase in robbery and assault. Moreover, the number of mental health providers has a negative impact on assault and robbery.

To sum up, physical inactivity, number of mental health providers and median household income are highly related to each crime type. While median household income is negatively related to violence, it is positively related to rape, murder, assault and robbery. On the other hand, the impact of income level on crime is almost zero. The literature on crime and income relationship is not conclusive.

For property, there are three sub-categories: burglary, larceny and motor theft. Table 6, 7, 8, 9 show the estimation results for each property crime categories. For each property crime sub-category physical inactivity and number of mental health providers have a significant impact on each of property crime type. Individuals with higher physical inactivity are more likely to commit crime. Additionally, the number of mental health providers have an important impact on decreasing property crime. Moreover, except with motor vehicle theft, high school graduation rate is one of the other important variables which has a negative impact on crime. The estimation results show that high school graduation is negatively related to property crimes. In sum, one can see that physical inactivity, number of mental health providers and high school graduation rate is generally related to each crime categories.

6.2. Estimations of One Step Dynamic Model and Between Groups Models

Estimation results from the between groups model are highly consistent with estimations from the fixed effect results. On the other hand, the results from the one step dynamic panel model have a few differences.

The one step dynamic panel data shows that Number of poor mental health days are positively related to all crime except for robbery. Additionally, the total civilian workers number is another variable which decreases crime. Also, one can see that the estimation results from between groups are mostly consistent with literature except the impact of total law enforcement on violence.

7. Conclusion

In the present study, panel data on violent and property crimes for the counties for the period from 2011 to 2013 in the USA are employed. The fixed effect model is employed as a primary approach to test the impact of mental health indicators and economic conditions on the crime rates. These results from the other two approach (between group model and 1 step dynamic model) serve as a robustness check of the fixed effects only because of the large number of counties without any crimes that may bias the results. The results from the panel data analysis provide evidence on the role of mental health indicators on crime. Both social-economic and mental health indicators have an impact on crime level. Additionally, the results from three different estimations show that physical inactivity and the number of mental health providers are highly significant on crime. These variables -- total civilian workers, high school graduate rate, number of mental health providers and physical inactivity -- worked well for violence and property crime. Additionally, most of the positive/negative relationships between dependent and independent variables are consistent with the literature.

Also, the findings show that accessing mental health providers is extremely important to decrease mental health problems related to crimes. Therefore, the policymakers should consider of importance of the mental health providers on decreasing the crime rates and crime costs. As explained by Becker (1968), criminal activities are functions of the risks and the potential gains. People with mental health problems might be unable to estimate the social results of the criminal activities. Another finding from the estimations shows that unemployment rate and income level are two important economic indicators of crime (criminal behaviors). Income level motivated illegal activities such as robbery, motor vehicle theft, and burglary are more likely to be associated with the changes in individuals' welfare and income level changes.

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TABLES AND FIGURES

Table 1. Summary Statistics

Variable	Name	Mean	Median	Minimum	Maximum
PhyInact	Physical Inactivity	23212	7131	0	1957549
MHProviders	Number of Mental Health Providers	46	2	0	7110
HSGrad	High School Graduation Rate	55	75	0	7441
Unemp	Unemployment Rate	6	7	0	30
MHHIncome	Median Household Income	43726	41831	19182	119525
Munhealthy	Number of poor mental health days	3	3	0	10
RecFacRate	Recreational Facilities Rate	8	7	0	150
Total Officers	Number of law enforcements	68	20	1	9274
Violent	Violent	82	18	0	8589
Murder	Murder	1	0	0	106
Rape	Rape	7	2	0	448
Robbery	Robbery	15	1	0	3260
Assault	Assault	57	12	0	4942
Property	Property	639	177	0	52551
Burglary	Burglary	188	56	0	13848
Larceny	Grand Larceny	409	106	0	32259
Mtheft	Motor Vehicle Theft	45	9	0	6444

Table 2. Estimation results for murder

	Fixed Effect Model		1-step Dynamic Model		Between Group Model	
	Coefficients	St error	Coefficients	St error	Coefficients	St error
Const	2.372***	0.741	-0.016	0.146	1.33***	0.356
Physical Inactivity	0.000***	0.000	0.000	0.000	0.000***	0.000
Number of Mental Health Providers	-0.003***	-0.000	-0.003***	0.001	-0.022***	0.003
High School Graduation Rate	-0.008	0.009	-0.002	0.011	-0006***	0.002
Unemployment Rate	-0.015	0.033	-0.063	0.045	0.04**	0.017
Median Household Income	0.000**	0.000	0.000	0.000	0.000***	0.000
Number of poor mental health days	-0.014	0.075	0.161*	0.079	-0.0005	0.057
RecreationalFacilities Rate	0.002	0.008	-0.007	0009	-0.002	0.007
Number of law enforcements	-0.047	0.035	-0.064***	0.023	0.01	0.0.054

Note 1: Triple asterisks (***) show the significant level at 1%, double asterisks (**) show the significant level at 5%, and single asterisk shows the significant level at 10%.

Table 3. Estimation results for rape

	Fixed Effect Model		1-step Dynamic Model		Between Group Model	
	Coefficients	St error	Coefficients	St error	Coefficients	St error
Const	3.65	4.032	-0.34	0.771	3.33*	1.90
Physical Inactivity	0.000***	0.000	0.000	0.000	0.00***	0.000
Number of Mental Health Providers	0.03***	-0.002	-0.025***	0.01	-0.012***	0.005
High School Graduation Rate	0.07*	0.044	-0.003	0.06	-0.082***	0.011
Unemployment Rate	-0.24	0.17	-0.435*	0.24	0.27***	0.087
Median Household Income	0.00***	0.000	0.000***	0.000	0.00*	0.000
Number of poor mental health days	0.09	0.394	1.33***	0.511	0.11	0.331
RecreationalFacilities Rate	0.00	0.045	-0.018	0.051	-0.001	0.031
Number of law enforcements	-0.02	0.017	-0.06	0.144	0.15	0.270

Note 1: Triple asterisks (***) show the significant level at 1%, double asterisks (**) show the significant level at 5%, and single asterisk shows the significant level at 10%.

Table 4. Estimation results for robbery

	Fixed Effect Model		1-step Dynamic Model		Between Group Model	
	Coefficients	St error	Coefficients	St error	Coefficients	St error
Const	26.80	17.9	1.14	4.11	15.79**	7.721
Physical Inactivity	0.000***	0.000	0.007	0.005	0.000***	0.000
Number of Mental Health Providers	-0.044***	0.097	-1.103**	0.005	-0.051***	0.006
High School Graduation Rate	-0.093	0.212	0.28	0.281	0.025	0.046
Unemployment Rate	-0.184	0.793	-1.16	1.17	-0.168	0.371
Median Household Income	0.000***	0.000	0.000	0.000	0.000***	0.000
Number of poor mental health days	-1.163	1.81	2.31	2.032	-2.19*	1.244
RecreationalFacilities Rate	0.032	0.201	0.09	0.267	-0.049	0.159
Number of law enforcements	0.887	0.834	-0.55	0.731	2.23*	1.165

Note 1: Triple asterisks (***) show the significant level at 1%, double asterisks (**) show the significant level at 5%, and single asterisk shows the significant level at 10%.

Table 5. Estimation results for assault

	Fixed Effect Model		1-step Dynamic Model		Between Group Model	
	Coefficients	St error	Coefficients	St error	Coefficients	St error
Const	86.44**	33.78	-6.29	6.77	43.35***	14.60
Physical Inactivity	0.00***	0.000	0.001	0.001	0.00***	0.000
Number of Mental Health Providers	-0.12***	-0.018	-0.25***	0.091	-0.09***	0.011
High School Graduation Rate	-0.64	0.399	-0.21	0.572	-0.39***	0.087
Unemployment Rate	-0.51	1.498	-3.2*	1.80	3.09***	0.70
Median Household Income	0.000*	0.000	0.006	0.007	-0.008***	0.000
Number of poor mental health days	0.33	3.425	6.91**	3.501	1.45	2.35
Recreational Facilities Rate	0.14	0.387	0.28	0.381	0.17	0.300
Number of law enforcements	0.64	1.571	-2.39*	1.311	3.47	2.221

Note 1: Triple asterisks (***) show the significant level at 1%, double asterisks (**) show the significant level at 5%, and single asterisk shows the significant level at 10%.

Table 6. Estimation results for property crime

	Fixed Effect Model		1-step Dynamic Model		Between Group Model	
	Coefficients	St error	Coefficients	St error	Coefficients	St error
Const	243.6	369.1	77.66	74.57	414.9**	168.7
Physical Inactivity	0.001***	0.001	0.019*	0.01	0.01***	0.001
Number of Mental Health Providers	-1.99	0.202	-3.68***	1.035	-1.58***	0.013
High School Graduation Rate	7.72*	4.361	-2.85	5.32	-3.41***	1.000
Unemployment Rate	1.12	16.36	-9.46	22.97	29.76***	8.081
Median Household Income	0.01***	0.003	0.03***	0.008	-0.004	0.003
Number of poor mental health days	15.24	37.39	116.3***	33.17	-24.00	27.18
Recreational Facilities Rate	2.35	4.231	4.61	4.770	0.19	3.470
Number of law enforcements	25.37	17.176	17.4	14.881	45.74	25.450

Note 1: Triple asterisks (***) show the significant level at 1%, double asterisks (**) show the significant level at 5%, and single asterisk shows the significant level at 10%.

Table 7. Estimation results for burglary

	Fixed Effect Model		1-step Dynamic Model		Between Group Model	
	Coefficients	St error	Coefficients	St error	Coefficients	St error
Const	130.0	101.7	6.84	22.8	164.0***	45.970
Physical Inactivity	0.00***	0.000	0.005**	0.0003	0.003***	0.003
Number of Mental Health Providers	-0.48***	0.056	-0.75***	0.026	-0.362***	0.030
High School Graduation Rate	-2.22*	1.200	-0.89	1.650	-1.77***	0.027
Unemployment Rate	-1.40	4.510	-4.07	6.910	15.60***	2.200
Median Household Income	0.00	0.001	0.007***	0.002	-0.002**	0.000
Number of poor mental health days	8.17	10.310	40.07***	11.26	-4.49	7.411
RecreationalFacilities Rate	0.73	1.167	1.08	1.080	0.12	0.959
Number of law enforcements	1.35	4.734	-1.44	3.801	8.9	6.942
	(4.734)		-3.8		-6.94	

Note 1: Triple asterisks (***) show the significant level at 1%, double asterisks (**) show the significant level at 5%, and single asterisk shows the significant level at 10%.

Table 8. Estimation results for grand larceny

	Fixed Effect Model		1-step Dynamic Model		Between Group Model	
	Coefficients	St error	Coefficients	St error	Coefficients	St error
Const	45.43	256.14	52.95	45.55	163.6	116.0
Physical Inactivity	0.01***	0.000	0.012*	0.006	0.005***	0.007
Number of Mental Health Providers	-1.39	0.134	-2.14***	0.711	-1.12***	0.090
High School Graduation Rate	-5.41*	2.971	-1.75	3.350	-1.57**	0.690
Unemployment Rate	2.02	10.91	-2.14	14.47	13.35**	5.57
Median Household Income	0.01***	0.002	0.02***	0.005	-0.000	0.002
Number of poor mental health days	10.30	24.96	73.66***	21.23	-13.53	18.71
Recreational Facilities Rate	1.44	2.825	4.02)	2.990	0.35	2.390
Number of law enforcements	23.92**	11.46	19.98*	10.23	33.8*	17.55

Note 1: Triple asterisks (***) show the significant level at 1%, double asterisks (**) show the significant level at 5%, and single asterisk shows the significant level at 10%.

Table 9. Estimation results for motor vehicle theft

	Fixed Effect Model		1-step Dynamic Model		Between Group Model	
	Coefficients	St error	Coefficients	St error	Coefficients	St error
Const	60.57	39.53	9.87	8.980	65.9***	17.00
Physical Inactivity	0.001***	0.001	0.001	0.001	0.001***	0.000
Number of Mental Health Providers	-0.137***	-0.022	-0.19*	0.111	-0.096***	0.013
High School Graduation Rate	-0.215	0.467	0.082	0.580	(0.085)	0.111
Unemployment Rate	0.698	1.753	-1.69	2.360	0.86	0.810
Median Household Income	-0.001**	0.000	0.001	0.001	-0.001***	0.003
Number of poor mental health days	-1.717	4.011	1.19	3.811	-4.86	2.740
Recreational Facilities Rate	-0.051	0.453	-0.23	0.567	-0.19	0.351
Number of law enforcements	0.099	1.839	-1.47	1.591	2.87	2.570

Note 1: Triple asterisks (***) show the significant level at 1%, double asterisk (**) show the significant level at 5%, and single asterisk shows the significant level at 10%.