Nordic Journal of Criminology | Scandinavian University Press

RESEARCH PUBLICATION

Volume 24, nr. 1-2023, pp. 1–21
ISSN online: 2578-9821
DOI: https://doi.org/10.18261/njc.24.1.1

Community-Level Relationships Between Mental Health Treatment and Criminal Justice Outcomes in Finland

Fred E. Markowitz
Professor, Department of Sociology, Northern Illinois University
https://orcid.org/0000-0003-2026-791X
fredm@niu.edu

Abstract

Advancing macro-level research on relationships between mental healthcare and criminal justice systems, I examine the associations between a more comprehensive set of mental health treatment variables and criminal justice outcomes at the community level in a Nordic country with universal healthcare. Using panel data over a 14-year period for 294 municipalities and 20 hospital districts in Finland, I estimate a series of fixed and random-effects models for the associations between provision of mental health inpatient, outpatient, and supportive housing services and rates of violent crime and imprisonment, taking into account a range of covariates. I find a positive association between rates of psychiatric hospitalization and violent crime. Although much of the relationship between mental healthcare services and criminal justice outcomes is due to shared association with prevalence of mental health problems and alcohol use, I find that provision of supportive housing for persons with a serious mental illness and visits with non-physician mental healthcare personnel may have potential crime-reducing effects.

Keywords
crime, violence, mental illness, substance abuse, psychiatric hospitals, community treatment

Introduction

Precipitated by a variety of factors, including the advent of anti-psychotic medication, laws restricting involuntary hospitalization, and government cost-saving measures, treatment of persons with serious mental illness has shifted from primarily institutional care to 'community' treatment in developed nations (Fakhoury & Priebe, 2007). However, in many places, a lack of inpatient beds and community treatment resources has resulted in formidable social problems, including revolving-door hospital admissions, homelessness, and the overrepresentation of persons with mental illness in criminal justice systems (Alanko, 2017; Lamb, 2015; Markowitz, 2011). Thus, some have argued that many persons with serious mental illness have not been 'deinstitutionalized', but have been 'trans-institutionalized' and 'criminalized' (Slate et al., 2021).

It is not simply that persons with a mental illness are 'criminalized' for having such an illness. Epidemiological studies in several countries show that the risk of violence and criminal behavior is elevated among persons with depression, psychosis, and bipolar disorders (e.g., Sariaslan et al., 2020). The risk is especially pronounced when persons have

co-occurring substance disorders and live in higher-crime communities (Silver, 2000; Silver et al., 2002). Consequently, persons with a mental illness are more likely to be arrested compared to those without a mental illness (Swartz & Lurigio, 2007). They are also more likely to be the victims of violence (Sariaslan et al., 2020; Teplin et al., 2005).

Beyond individual-level processes, there are enduring, macro-level questions regarding the crime-controlling effects of psychiatric treatment (Kim, 2016; Markowitz, 2006; Raphael & Stoll, 2013). Research in this area goes back to Penrose (1939), who found an inverse correlation between the rates of persons in psychiatric hospitals and homicide, imprisonment, and suicide rates across 14 European countries. Findings from contemporary macro-level studies, mostly on the U.S., are mixed, and depend on which indicators are examined, the units of analysis, study design (e.g., cross-sectional or longitudinal), and whether control variables were included (Kim, 2016). Findings from other countries are also somewhat mixed, due to varying economic factors, healthcare systems, and other, unexamined forms of psychiatric services, such as outpatient treatment (Fakhoury & Priebe, 2007; Large & Nielssen, 2009).

In this study, I identify several avenues for advancing macro-level research on the relationships between mental healthcare and criminal justice outcomes. I focus on Finland for several reasons. Despite Finland's relatively greater level of economic equality, the extent of mental health problems and service utilization varies considerably across communities (Karolaakso et al., 2021). The majority of Finnish prison inmates have a history of mental health or substance abuse problems (Joukamaa et al., 2010). Moreover, its universal healthcare system provides data that enable us to examine municipal-level relationships between a wider array of mental health service provision and criminal justice variables. Specifically, I examine the effects of mental health and substance abuse inpatient, outpatient, and housing services on rates of violent crime and imprisonment, taking into account indicators of the prevalence of mental health problems, alcohol use, and a range of socio-demographic structural factors.

Background

An important distinction in macro-level research on mental healthcare and criminal justice outcomes is between *capacity* (e.g., number of available beds) and *utilization* (e.g., persons hospitalized). Capacity affects the number of persons who can be treated, while utilization indicates the number of persons who receive treatment (Kim, 2016; Liska et al., 1999). Studies in the U.S. have mostly focused on the relationship between inpatient treatment utilization and imprisonment rates across states or time-series analysis of the U.S. as a whole (Kim, 2016). The findings from these studies are mixed, and mostly do not include controls for other structural variables that may underlie the relationship. Research from other countries is also mixed, although one study of 158 countries, adjusting for GDP, found that psychiatric capacity (beds) and the number of prisoners were positively correlated in low- and middle-income countries, but not in high-income countries (Large & Nielssen, 2009).

One of the main limitations of prior research is the lack of data on services at subnational levels (Kim, 2016). While there is considerable variation in services and crime across nations (and states), this subsumes substantial variation at lower levels. Criminologists have long-recognized crime as due, in part, to *community-level* factors, such as poverty, unemployment, racial composition, and lack of collective efficacy (Faris and Dunham, 1939; Sampson et al., 2002). Therefore, the ability to link city-level mental healthcare variables with city-level rates of crime, arrest, and incarceration is critical for understanding the dynamics of mental healthcare and criminal justice outcomes.

Another important limitation of previous macro-level research is the neglect of *outpatient*, or community treatment. The prior focus exclusively on hospitalization is understandable, given the historic role that hospitals have played in managing persons with serious mental illness (Mechanic & Rochefort, 1990). Moreover, availability of data on hospital beds and numbers of patients as part of administrative reporting requirements makes research on hospitalization possible. However, the majority of contemporary mental health treatment takes place in primary and specialty care settings on an outpatient basis (Mechanic et al., 2014). At the same time, persons with serious illnesses such as bipolar disorder and schizophrenia are likely to be hospitalized at some point (Mechanic et al., 2014). The ability to examine outpatient care in relation to criminal justice outcomes requires comprehensive, aggregate-level data.

Macro-level research has also not fully examined the role of *substance abuse treatment*. Epidemiological research shows that the risk of criminal behavior and violence among persons with serious mental illnesses is increased with co-occurring substance disorders (Fazel et al., 2009). Evidence indicates that discontinuation of substance-abuse treatment increases the risk of criminal offending (Kaskela & Pitkänen, 2021). Without appropriate data, it is difficult to examine the relationships between substance abuse treatment and crime at the community level. One exception is the study by Bondurant et al. (2018) who found an inverse relationship between substance-abuse treatment capacity, as measured by the total numbers of residential and outpatient substance-abuse treatment centers, and crime across U.S. counties. This still leaves macro-level questions regarding the *utilization* of substance abuse treatment and criminal justice outcomes at the municipal level unexamined, particularly in other countries.

Because serious psychiatric illnesses can impede the ability of persons to obtain stable housing, homelessness is an important pathway to the criminal justice system. Evidence suggests that a sizable portion of released prisoners in Finland—many with mental health and substance abuse problems—face difficulties finding housing, which can potentially increase the risk of re-offending (Aaltonen et al, 2021). However, questions regarding how provision of supportive housing is related to criminal justice outcomes at the community level remain unexamined.

Yet another challenge to research in this area is accounting for underlying variables that may affect mental healthcare capacity, utilization, and crime (Frank & McGuire, 2011). For example, "social threat" variables, such as economic disadvantage or percent of racial minorities, can affect the capacity and utilization of social control institutions, beyond the crime rate (Liska et al., 1999). Also, questions regarding the extent to which the prevalence of mental health problems across communities account for covariation between treatment variables and criminal justice outcomes have not been examined. Ideally, studies of the relationships between mental healthcare systems and criminal justice outcomes need to take prevalence of mental health problems and demographic factors into account (Kim, 2016).

Mental Healthcare and Criminal Justice Outcomes in Finland

European counties generally experienced 'de-hospitalization' of treatment for persons with serious mental illness later than the U.S., with a substantial decline in psychiatric beds from the late 1980s through the 2000s (Korkeila, 2021; Mederiros et al., 2008). Findings from the few studies of mental health system changes in relation to criminal justice outcomes in Europe and other countries are mixed. For example, one study found a statistically significant negative relationship between psychiatric hospital beds and prison population sizes for 26 European countries from 1993 to 2011 (Blüml et al., 2015). Studies in Sweden and

Norway found that the decrease in psychiatric hospital beds was associated with an increase in crime rates from the 1960s to the 2000s (Hartvig and Kjelsberg, 2009). However, these capacity-focused studies did not take into consideration the number of persons hospitalized, inpatient treatment, or common sources of covariation, or examine more local, community-level relationships.

Because of its universal healthcare system and associated data, Finland offers an opportunity to overcome the above limitations, permitting examination of community-level relationships between mental healthcare provision and criminal justice outcomes. As an advanced social-welfare democracy, Finland is characterized by comparatively lower levels of economic inequality, crime, and homelessness, and has a universal healthcare system that guarantees access to health services as a basic human right (Alanko, 2017). Despite these considerations, there is significant regional variation in mental health problems and service engagement (Karolaakso et al., 2021; Pirkola et al., 2009; Sadeniemi et al., 2021). From 2006 to 2018, Finland experienced a 20% decline in the rate of psychiatric hospitalizations, concurrent with a 42% increase in the rate of psychiatric outpatients (Martikainen and Järvelin, 2019).

In Finland, mental health, substance abuse problems, and violent crime are closely related (Seppänen et al., 2020). In a Finnish birth cohort study, those with psychiatric disorders accounted for almost half of all crimes (Elonheimo et al., 2007). Prison inmate health surveys indicate that about 78-84% of prisoners have had a substance dependence problem, about 1/3 have been hospitalized for psychiatric reasons, and half have received outpatient psychiatric care (Joukamaa et al., 2010). Half of the deaths in prison are suicides (Joukamaa, 1997). In the last couple of decades, involuntary psychiatric hospitalizations decreased by 32%, concurrent with a 10-fold rise in the number of prisoners with psychosis from 2005 to 2016, thought to possibly result from reduced hospital treatment (Jüriloo et al., 2017). To some extent, the high prevalence of Finnish prisoners with substance abuse problems (apart from alcohol) may be due to the criminalization of drug use. About 23% of prisoners are sentenced for narcotics offenses (Rikosseuraamuslaitos, 2020). Several authors have pointed out that community-level processes that link mental health treatment and criminal justice outcomes in Finland (and elsewhere) have not been adequately examined (Hartvig & Kjelsberg, 2009; Joukamaa et al., 2010; Markowitz, 2011; Putkonen & Taylor, 2018).

Finnish mental healthcare data provides distinct analytic advantages for community-level analysis (especially compared to the U.S.). Although funding comes from both local and state (national) taxation, the provision of outpatient health services has been the responsibility of the municipalities (Alanko, 2017; Korkeila, 2021). Municipalities are also responsible for providing housing services for persons with mental health and substance abuse problems. For inpatient care, municipalities are grouped into 21 hospital districts. Because residents have a unique ID code and their place of residence is registered, when persons receive health services, it is possible to know how many persons receive various services in each municipality. This data is compiled by the Finnish Institute for Health and Welfare (THL) and Statistics Finland. Thus, it is possible to link aggregate rates of service utilization for each municipality (and hospital district) with data on crime and other indicators.

Because of its comparatively lower levels of economic inequality and availability of micro-level registry data, research on health outcomes and other social problems in Finland tends to be more individually-oriented. There is, however, precedent for examining macro-level relationships involving psychiatric treatment variables. For example, Hirschovits-Gerz (2019) described patterns of mental health service provision, need, homelessness, and crime rates in seven large municipalities. While she showed there is indeed variation in

these indicators, she pointed to the need to study a larger number of municipalities over a longer timeframe to examine correlations between these variables. Ala-Nikkola et al. (2014, 2016, 2018), in a series of studies, made use of surveys administered to municipal authorities to map the types of services provided in 56 municipalities in three hospital districts, combined into 13 'catchment areas'. Among the findings from their cross-sectional data was that areas with larger populations tended to provide a more diverse range of community services (e.g. day treatment, informal self-help groups) and that areas with 'worse' scores on the community 'mental health index' had increased rates of inpatient psychiatric treatment. A similar, but larger, cross-sectional study found substantial variation in suicide rates across municipalities that was inversely associated with provision of community mental health services, adjusting for economic strain, alcohol use, and other demographic factors (Pirkola et al., 2009). That study also noted a positive association between suicide rates and violent crime, but did not focus on the relationship between service provision and crime. In general, this research indicates significant variation in mental health outcomes and service provision across communities in Finland (Karolaakso et al., 2021). However, research has not yet fully examined community-level relationships between mental health service utilization and criminal justice outcomes in Finland.

Present Study

Given the limitations of prior studies discussed above, I take advantage of data from Finland to estimate models of the relationships between mental health treatment and criminal justice outcomes. Finnish data provides an opportunity to extend research in this area to include indicators of a more comprehensive range of mental health services across a large number of municipalities over time. Specifically, I examine relationships between a set of inpatient (psychiatric hospitalization, substance abuse hospitalization, and detoxification clinic use) and outpatient treatment variables (specialty, primary, and substance abuse), supportive housing services (for mental health and substance abuse), violent crime, and prison rates. Given the enhanced risk of violence when substance use is involved, I compare effects in models of violent crime and violent crime committed while under the influence. I estimate a set of fixed and random effects models for municipal-level outcomes (explained in detail below). Importantly, I estimate the relationships between service use and outcomes with and without controls to examine the extent to which they may be due to shared associations with the extent of community mental health problems, alcohol use, and demographic factors.

Because evidence indicates a substantial portion of criminal offenders have a history of mental health problems and hospitalization, we might expect that communities that have higher levels of service utilization also have higher rates of violent crime and incarceration. Alternatively, in line with the 'Penrose hypothesis', to the extent that treatment variables are negatively related to crime and imprisonment rates, this suggests that some forms of treatment engagement, net of the extent of mental health problems in a community, may have crime-controlling effects.

Methods

Data

Excluding the municipalities of the autonomous Åland island region, I was able to construct panel data for 294 municipalities, embedded in 20 hospital districts, over a 14-year period (2007-2020). Due to occasional missing data, the exact number of observations varies in each equation, depending on the outcome and explanatory variables included (explained

below). Data for all indicators come from the Finnish Institute for Health and Welfare (THL), Statistics Finland, and the Finnish Criminal Sanctions Unit (RISE).

Criminal Justice Outcomes

I employ two measures of crime. First is the reported number of *violent crimes per 1,000 persons*. Violent crimes include homicides and assaults. Most violent crimes are assaults and a significant portion of violence in Finland involves alcohol (Savolainen, 2005). An estimated 80% of homicides, 70% of assaults, and 56% of robberies involve alcohol or other drugs (Lehti & Sirén, 2020). Given the role of substance abuse in violence among persons with mental health problems, I also examine the number of *violent crimes while under the influence of alcohol or drugs per 1,000 persons* (VUI). Of course, like all research using official statistics, the numbers of recorded offenses are under-estimates of the true extent of violent crime, as the majority of violent crimes go unreported. However, I am interested primarily in the covariation of violent crimes with psychiatric treatment variables. To examine cross-system relationships, I include a third outcome measure, the *number of prisoners per 1,000 adults* from each municipality.[1]

Inpatient Mental Health Service Variables

I focus on three major dimensions of inpatient treatment: *psychiatric hospital inpatients*, *substance abuse hospital inpatients*, and *substance abuse institution (rehab) clients*.[2] Because inpatient care is organized by the hospital district in which a municipality is located, I compare municipal-level estimates of inpatient care to hospital district-level estimates in multilevel models. Each of these variables is expressed as the number of patients per 1,000 persons.

Outpatient Mental Health Service Variables

I focus on four indicators of outpatient treatment: *outpatient psychiatry visits*, *primary care mental health visits*, *specialty outpatient visits for substance abuse problems*, and *other (non-physician) mental health visits*. 'Other' visits are generally with nurses, who provide care management, including evaluations, medication monitoring, and short-term psychotherapy (Korkeila, 2021). The data on outpatient primary and specialty healthcare are derived from the Care Registers for Social Welfare and Health Care. The number of visits is tabulated by each municipality. These variables are expressed as the number of client visits per 1,000 persons in each municipality.

Housing Variables

I consider two housing variables: *residents with mental health problems in service and supported housing* and *residents with substance abuse problems receiving housing services* per 10,000 persons in each municipality. Residents in supported housing receive visits from staff ranging from a weekly basis to every day, depending on their needs, with the goal

1 In analyses involving prison rates, the number of municipalities drops to 186 because of restrictions on reporting the number of prisoners from municipalities with fewer than five prisoners.

2 I also examined models including measures of psychiatric beds. However, because Finland generally provides beds for those in need of inpatient treatment, beds are recorded as *provided beds*, calculated as the number of inpatients in a given year divided by the number of days in the year. The pooled correlation between beds and inpatients is .66. The results are very similar whether beds or inpatients are used. In order to maintain consistency with the other treatment utilization measures, I report results using the inpatients measure.

of being able to transfer to independent living. Service housing is intended for persons who need constant help, but not institutional care. Residents may receive services such as domestic aid, meal service, help with personal hygiene, and health care services. For residents with substance abuse problems, this may include stays in overnight shelters.

Control Variables

The two main control variables are the *mental health index* and *alcohol consumption* in each municipality, both of which are related to service use and crime. The mental health index, used in prior macro-level studies in Finland (Ala-Nikkola et al., 2014, 2018; Hirschovits-Gerz, 2019; Sadeniemi et al., 2014), is a composite index of three, equally weighted indicators: the number of suicides and attempted suicides, reimbursements for psychosis medication, and number of persons receiving disability payments for mental health problems. The index is on a scale from ±100, where 100 is the average score for the country as a whole. Thus, the index provides an estimate of the burden of illness in a municipality and consequent demand for services in the community compared with the country as a whole. Alcohol consumption has long been considered an important problem in Finland and is a predictor of violent crime in other Finnish community-level studies (e.g., Burchfield et al., 2022; Savolainen, 2005). Alcohol sales in Finland are highly regulated and taxed. Alcohol consumption is measured as the number of liters sold per 1,000 persons in each municipality.

I also include a set of demographic variables that may be related to crime, mental health problems, and service utilization (Ala-Nikkola et al., 2014, 2018; Cresswell-Smith, 2017; Sadeniemi et al., 2021; Savolainen, 2005). For each municipality, I include data on the *percent of the population aged 15–29*, *average number of years beyond required basic education*, *percent unemployed*, *percent of persons at risk of poverty* (living in households with less than 60% of median household income), *population density* (persons/sq. km), *percent foreign-born*, *divorce rate* (per 1,000 married persons), and *percent single-person households*.

Analysis Plan

First, I show trends in rates of violent crime, prisoners, and psychiatric inpatients in Finland. Next, I report descriptive statistics for all study variables, providing perspective on the extent to which there is variation within municipalities over time compared to variation between municipalities. I then estimate a series of linear multiple regression equations to examine relationships between mental health service variables (inpatient, outpatient, supportive housing) and criminal justice outcomes (violent crime, violent crime under the influence, prison rates). I estimate three types of equations: (1) fixed effects (maximum likelihood), (2) random-effects (generalized least squares), and because inpatient treatment in Finland is structured by hospital districts, (3) I estimate multi-level models (using maximum likelihood) with the effects of hospital-district level inpatient variables on municipal-level outcomes, comparing findings between the outcomes and between the different estimation techniques. Regression analyses were conducted using 'xtreg' and 'mixed' procedures in Stata 16.

Fixed effects models take into account time-invariant differences in unmeasured confounders across municipalities and estimate the net effects of predictor variables on within-unit, over-time variation (Allison, 2009). For example, in Finland, some communities in outlying regions may have particular cultural differences or long travel distances that inhibit treatment-seeking. However, because the variation, or changes in some predictor

variables across time within municipalities is modest, and differences in outcomes are likely to be due to differences between municipal units, I also estimate random effects models. The random effects models estimate the net effects of the predictor variables as a weighted average of the within- and between-unit effects. However, random effects models assume that unmeasured causes of the dependent variable are uncorrelated with the other independent variables. This is a tradeoff—estimating fixed effects explains within-municipality variation, but in an unbiased way (Clark & Linzer, 2015). Estimating random effects captures between-municipality variation, but runs the risk of some bias in parameter estimates.

I estimate the series of equations without and with the control variables, as I am concerned with the extent to which relationships between mental health service variables and outcomes may be due to common factors (alcohol consumption, mental health index, socio-demographic structure). I also adjust for time effects by including a set of dichotomous ('dummy') year variables, and in the random-effects and multi-level models, I control for hospital district. In the prisoner equations, I estimate effects of mental health treatment variables net of the violent crime rate.

Results

Descriptive Statistics

Figure 1 shows the trends in violent crime, imprisonment, and inpatient treatment in Finland from 2000 to 2020. In contrast to the U.S. (see Harcourt, 2011), rates of incarceration and inpatient psychiatric treatment do not show inverse trends. Rates of inpatient treatment declined, yet rates of incarceration remained low and stable. Since the early 2000s, violent crimes increased slightly (by 10%), but have remained stable since 2015. However, I am primarily interested in how mental health treatment variables covary with criminal justice outcomes at the municipal level.

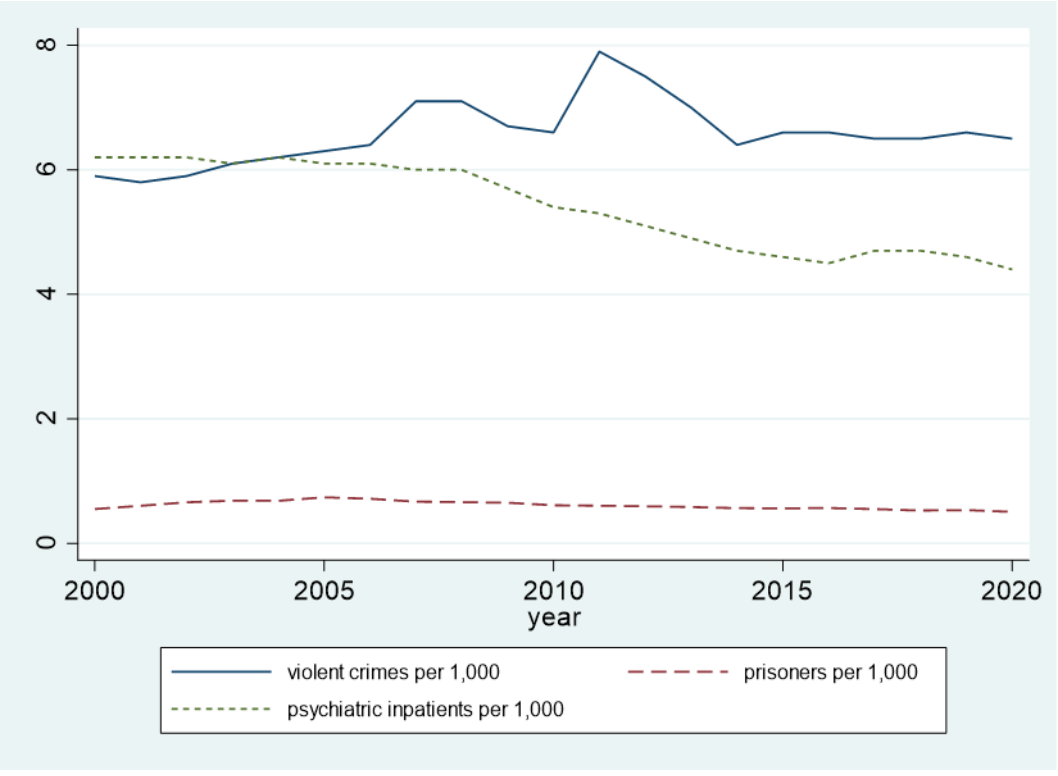


Figure 1. Violent crime, prisoners, and psychiatric inpatients in Finland 2000–2020

Descriptive statistics for all variables are shown in Table 1. Note that there is a generally comparable amount of between- and within-municipality variation in violent crime rates and treatment indicators, but there is much greater between-municipal variation in prisoners, in line with the trend of consistent, comparatively low rates of incarceration in Finland over time. Some of the within-municipality variation in crime rates may be due to smaller municipalities having lower population-adjusted rates that can vary considerably from year to year. In the Appendix, I present a pooled correlation matrix of the key variables and figures illustrating pooled averages of the hospital-district criminal justice, inpatient, and outpatient variables.[3]

Table 1. Descriptive statistics

	Mean	Overall SD	Between SD	Within SD
Criminal justice outcomes				
Violent crime	5.278	2.387	1.716	1.662
VUI	3.423	2.311	1.821	1.834
Prisoners	.748	.362	.468	.216
Mental health/alcohol				
Mental health index	112.114	34.205	31.112	14.310
Alcohol sales	6.940	4.508	4.358	1.181
Inpatients				
Psychiatric hospital	5.196	1.800	1.303	1.250
Substance hospital	3.975	1.950	1.621	1.100
Rehab center	1.811	1.761	1.179	1.310
Outpatient visits				
Psychiatric	219.700	167.040	137.135	95.974
Primary	17.753	30.453	21.168	21.908
Other	175.234	198.351	154.305	124.833
Substance abuse	5.765	6.609	4.842	4.493
Housing				
Mental health	15.336	14.620	11.764	9.630
Substance	.386	.796	.566	.553
Demographics				
Age 15 to 29	14.894	2.848	2.574	1.226
Education	2.836	.688	.497	.477
Unemployment	11.129	3.983	3.435	2.019
Poverty risk	15.121	3.439	4.081	1.520
Density	58.733	230.813	230.881	11.307
Foreign born	12.840	1.969	1.620	1.118
Divorce	12.840	5.339	3.271	4.224
Single households	37.523	6.043	5.433	2.674

3 Prior to the multivariate analysis, I examined the pooled bivariate correlations between all independent variables (shown in the Appendix), to ensure there weren't unusually high correlations among the treatment variables that might reflect an underlying 'service usage' factor. That was not the case. Inpatient psychiatric hospitalization is positively correlated with inpatient substance abuse hospitalization (r = .41). This could reflect the comorbidity between substance abuse and other mental illnesses. Outpatient visits are negatively correlated with 'other' visits (r = –.53) and primary care visits for mental health reasons (r = –.30).

Multivariate Equations

Next, results from multiple regression equations that estimate the net associations between the treatment variables and violent crime (equations 1 and 2), violent crimes under the influence (equations 3 and 4), and imprisonment rates (equations 5 and 6) are shown in Table 2. Here, we see that, in the fixed effects models, inpatient psychiatric and substance abuse hospitalization are not significantly related to violent crime, but are positively associated with rates of violent crime under the influence and prisoners within municipalities over time (equations 3 and 5). Psychiatric outpatient visits are positively associated with rates of violent crime, but negatively associated with rates of violent crimes under the influence (equations 1 and 3). 'Other' (nurse) visits are negatively associated with all three of the outcomes. Rates of housing for mental health problems are negatively associated with violent crime under the influence (equation 3).

Table 2. Mental health service variables and criminal justice outcomes (without controls)

	(1)	(2)	(3)	(4)	(5)	(6)
	Violent crime		Violent crime under the influence		Prisoners	
	B_{fixed}	B_{random}	B_{fixed}	B_{random}	B_{fixed}	B_{random}
Inpatients						
Psychiatric hospital	–.009	.036	.157**	.180***	.038***	.033***
	(.022)	(.021)	(.022)	(.020)	(.007)	(.007)
Substance hospital	–.013	.068**	.108***	.198***	.033***	.048***
	(.025)	(.026)	(.025)	(.022)	(.009)	(.008)
Rehab center	.036	.045*	–.019	–.028	.003	.002
	(.019)	(.019)	(.019)	(.018)	(.005)	(.005)
Outpatient visits						
Psychiatric	.001*	.001***	–.001***	–.001***	–.000	–.001***
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Primary	.000	.001	–.000	–.000	.000	.000
	(.001)	(.001)	(.001)	(.001)	(.000)	(.000)
Other	–.001**	–.000	–.001***	–.001**	–.001**	–.001**
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Substance abuse	.006	.025***	.009	.015*	(.002)	.001
	(.007)	(.007)	(.007)	(.006)	(.002)	(.002)
Housing						
Mental health	.004	.008*	–.018***	–.012***	–.001	–.000
	(.003)	(.003)	(.003)	(.003)	(.001)	(.001)
Substance	.051	.146**	–.080	–.043	–.010	–.015
	(.053)	(.050)	(.051)	(.047)	(.011)	(.010)

β = Unstandardized regression coefficients (standard error in parentheses).

*$p < .05$ **$p < .01$ ***$p < .001$.

In the random effects models (Table 2, equations 2, 4, and 6), I find somewhat similar relationships, with inpatient psychiatric and substance abuse hospitalization positively associated with VUI and prison rates across municipalities over time. Substance rehabilitation use is also positively associated with violent crime (equation 2). Psychiatric outpatient visits are positively associated with violent crime (equation 2), but negatively associated with

violent crime under the influence and prison rates (equations 4 and 6). 'Other' (nurse) visits are negatively associated with violent crime and prison rates (equations 4 and 6). Substance abuse outpatient visits are positively associated with violent crime and prison rates. Rates of housing for mental health problems are also negatively associated with violent crime under the influence (equation 4). Initially, it appears that municipalities with more residents with inpatient treatment for mental health and substance abuse problems may generally have higher crime and prison rates. At the same time, mental health nurse visits and housing provision are associated with lower crime rates.

Next, I re-estimated the series of equations, including the control variables, to see whether the associations change after taking into account prevalence of mental health problems, alcohol use, and demographic variables (Table 3). In the table, for the sake of brevity, I do

Table 3. Mental health service variables and criminal justice outcomes (with controls)

	(1)	(2)	(3)	(4)	(5)	(6)
	Violent crime		Violent crime under the influence		Prisoners	
	B_{fixed}	B_{random}	B_{fixed}	B_{random}	B_{fixed}	B_{random}
Inpatients						
Psychiatric hospital	.051	.082**	.043	.043	.004	.005
	(.031)	(.028)	(.030)	(.028)	(.008)	(.008)
Substance hospital	.012	.043	–.003	.028	–.002	.001
	(.035)	(.031)	(.034)	(.030)	(.010)	(.009)
Rehab center	.012	.012	–.031	–.021	.008	.006
	(.023)	(.022)	(.023)	(.021)	(.006)	(.005)
Outpatient visits						
Psychiatric	.000	.001*	.000	.000	.000	.000
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Primary	.001	.002	.001	.001	.000	.000
	(.001)	(.001)	(.001)	(.001)	(.000)	(.000)
Other	–.001**	–.001**	–.000	–.000	–.000	–.000
	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)
Substance abuse	.001	.012	.010	.016*	.001	.001
	(.009)	(.008)	(.009)	(.008)	(.002)	(.002)
Housing						
Mental health	–.009	–.008*	–.009	–.013***	.002	.002
	(.005)	(.004)	(.005)	(.004)	(.001)	(.001)
Substance	.041	.028	–.028	–.021	–.010	–.008
	(.062)	(.056)	(.059)	(.052)	(.011)	(.011)
Controls						
Mental health index	.006**	.006**	.007**	.006***	.000	.001
	(.002)	(.002)	(.002)	(.002)	(.001)	(.001)
Alcohol	.184**	.195***	.192**	.105***	.004	–.023
	(.065)	(.025)	(.065)	(.022)	(.020)	(.009)

β = Unstandardized regression coefficients (standard error in parentheses).

Note: Additional controls include age 15–29, education, unemployment, poverty risk, density, foreign-born, divorce, single households, year, hospital district (in random effect models), and violent crime (in prisoners equations).

*$p < .05$ **$p < .01$ ***$p < .001$.

not show the effects of the demographic variables, but show the effects of the prevalence of mental health problems and alcohol use on all three outcomes, as they are consistently related to violent crime and violent crime under the influence, net of all other variables considered. Age structure (% 15–29), unemployment, poverty, and single households were positively associated with all outcomes. It is worth noting that, in separate analyses, poverty risk and single households were positively associated with the mental health index in both fixed and random effects models.

Looking first at the violent crime and VUI equations (Table 3), taking into account the control variables, I find that, of the inpatient variables, psychiatric hospitalization is still positively related to violent crime across municipalities (random effects model, equation 2), but its effect within municipalities is not quite statistically significant (equation 1, $p = .09$). In addition, the negative effect of mental health housing on violent crime and crimes under the influence remains significant in the random effects models (equations 2 and 4). However, its effect falls just short of conventional levels of statistical significance in the fixed effects models for violent crime and violent crime under the influence (equations 1 and 3, $p = .08$ and $p = .06$, respectively). Together, these effects may be indicative of a 'cycle of trouble' where municipalities have residents who move through periods of imprisonment and psychiatric hospitalization. At the same time, provision of mental health housing may offset this to a certain extent. Indeed, in further analyses (not shown), regression of inpatient psychiatric hospitalization on all other service variables (in both fixed and random effects models) shows a significant negative effect of mental health housing, suggesting that supportive housing provision may also help lower rates of hospitalization.

For the prison rate equations (Table 3, equations 5 and 6), after taking into account underlying variables (and violent crime rate), there is no effect of service provision on rates of imprisonment, either within or across municipalities. It appears that, while some types of service provision (hospitalization, nurse visits, and housing, in particular) may be related to violent crime, they are not directly related to imprisonment, after controlling for violent crime and demographic variables.

To check to see whether the findings are robust to an alternative specification of the inpatient treatment variables, I re-estimated the violent crime rate equations, substituting the municipal-level inpatient variables for their hospital-district level analogues to see whether there were any differences.[4] Although there are slight differences in coefficients, use of hospital-district inpatient variables yielded no substantive changes in the findings. Next, I examined the effects of the treatment variables on *property crime rates* (per 1,000 persons). Here, I found a very similar pattern of results to those from the violent crime equations. However, I found that the substance abuse inpatient rate was negatively associated with property crime rates, which may indicate a potential crime control effect. Third, as a way of considering the robustness of the findings to concerns of simultaneity and reverse causation (Semenza et al., 2021), I re-estimated the series of municipal-level models using one-year lagged values of the treatment variables. This did not yield any substantive differences compared to the estimates I present.

Lastly, I was able to obtain data for a limited timeframe (2006–2012) on the *number of prisoners with psychosis* from each municipality. Because these numbers are very small, I aggregated these values to the hospital district level and estimated hospital-district level

4 In these models, years of observations are nested within municipalities, nested within hospital-districts. I also estimated hospital-district level only models. In general, the findings are very similar to the municipal-level models. However, this subsumes the substantial within-district (municipal-level) variation in crime.

equations. Here, after including all control variables, I found a significant *negative* effect of substance abuse hospitalization on the rate of prisoners with psychosis in both fixed and random effects models.

Discussion

Building on prior macro-level research, I examined the relationships between several forms of mental health treatment and housing provision and key criminal justice outcomes across communities in Finland. Three main findings were generally consistent in fixed effects models taking into account stable sources of confounding and in random effects models. First, I found a positive association between numbers of residents that have been hospitalized for psychiatric illness or substance abuse and rates of violent crime. Second, I found a negative association between mental health housing provision and violent crime (and violent crime under the influence). Third, I found that the community-level relationship between inpatient treatment and violent crime rates is due, in large part, to shared association with the prevalence of mental health problems and alcohol use.

While we see a positive association between communities' psychiatric hospital inpatients and violent crime rates, this results in large part from underlying associations, including the interplay between unemployment/economic strain, mental health problems, excessive drinking, and aggressive behavior (Aaltonen et al., 2017; Berg et al., 2018). Communities that experience a greater level of these problems may end up having larger shares of their residents entering either mental health treatment or the criminal justice system, or cycling between the two. Some persons acting in a disruptive or aggressive manner in a mental health crisis may be hospitalized, yet others may act in ways that lead to arrest. While detailed data are needed on the dynamics of mental health crises in Finland, it likely that, to the extent disturbing behavior is publicly visible, involves injury, or involves resistance when police are involved, this may increase the likelihood of arrest (Slate et al., 2021).

An additional consideration is that adherence to psychiatric medication is low, particularly for those with psychotic and co-occurring substance abuse disorders (Leijala et al., 2021). For example, a large-scale trial found that about 74% of those prescribed anti-psychotic medication stopped taking it within 18 months, yet it substantially reduces the risk of violence (Bhavsar et al., 2020). While the average length of stay in psychiatric hospitals has declined significantly and is relatively short in Finland (currently around 27 days on average), evidence suggests that this has not been associated with certain adverse outcomes, such as suicide (Pirkola et al., 2019). However, more detailed examination of how risk of offending is related to length, frequency, and time since discharge of hospitalization is needed. Continuity of post-discharge mental health and substance abuse treatment engagement may be critical (Kaskela and Pitkänen, 2021). The finding of a negative effect of visits with non-physician personnel on violent crime suggests that the medication monitoring and support function that is part of community psychiatric nursing may help prevent relapse that puts persons at risk for troublesome behavior.

Another reason why persons move through the mental health and criminal justice systems is that, beyond the episodic nature of serious mental illness, the stigma associated with psychiatric hospitalization can seriously impede outcomes such as employment and relationship formation, increasing stress and vulnerability to repeat episodes of substance abuse and symptoms of other mental illnesses (Markowitz, 2001). Those who have histories of hospitalization *and* incarceration are likely subject to 'double stigma' compounding the obstacles to recovery and reintegration. Evidence suggests that when persons with

serious mental illness become more 'detached' from family, work, and community, they are at greater risk of relapse and re-offending (Törölä, 2019).

The finding of a positive relationship between psychiatric hospitalization and crime runs contrary to findings from research in the U.S. Although the U.S. is a wealthy nation (in terms of GDP), it lacks adequate inpatient treatment capacity and community support, resulting in increased homelessness and crime (Markowitz, 2006). In addition, over the last several decades, in the U.S., the trend of mass incarceration likely 'swept up' an increased share of persons with mental health problems (Parsons, 2018). Given the generally inverse associations between mental health treatment *capacity* and crime and incarceration in the U.S., jails and prisons are dysfunctional alternatives. In Finland, an advanced nation with a more equitable economic structure and universal healthcare, although community treatment is preferred, inpatient capacity is not as limited as it is in the U.S., and is supplemented by supportive housing (Alanko, 2017). However, short-term hospitalization may not preclude communities from having persons with chronic mental health problems cycling back and forth between inpatient mental health and substance abuse treatment and prison.

In supplementary analyses at the hospital district level, I found a negative association between hospitalization for substance abuse and number of prisoners with psychosis. Given the links between psychosis, untreated substance abuse disorders, and violence, hospitalization of persons with psychosis and substance abuse disorders may reduce some amount of incarceration (Lintonen et al., 2011, 2012; Obstbaum & Tyni, 2015). These findings suggest that we may have to look more closely at hospitalization for specific types of disorders. It should also be noted that, in Finland, the number of mental state examinations and offenders determined to have diminished criminal responsibility has declined substantially in recent years, likely contributing to more prisoners with psychosis who might otherwise be sent to secure forensic treatment facilities (Jüriloo et al., 2017; Seppänen et al., 2020; Törölä, 2019). Under Finnish law, offenders may not be considered criminally responsible or may have their sentences reduced if they were not able to understand the unlawfulness of their act, or the ability to control their behavior was severely diminished due to mental illness (Seppänen et al., 2020).

Lastly, the results suggest that provision of supportive housing for persons with a serious mental illness may have potential crime-reducing effects. In Finland, about 27% of prisoners—the majority of whom have histories of substance abuse and mental health problems—are in need of housing upon release (Aaltonen et al., 2021). Although its exact forms may vary across municipalities, supportive housing may reduce criminogenic conditions, as it generally involves some degree of supervision and monitoring, and is often part of a set of community-based services designed to help facilitate recovery and reintegration (Korkeila, 2021). Further study is needed to examine the relationships between service provision, homelessness, and crime in Finland.

While this study examined community-level relationships between mental health care and criminal justice outcomes in a manner not previously done, there are still some limitations. One limitation is the inability to link psychiatric treatment variables with municipal-level *victimization* data. A substantial proportion of criminal victimization—especially interpersonal violence—goes unreported and therefore omitted from crime data. This is especially important given that family members and other intimates are among the likely targets of violence among persons with mental illness (Solomon et al., 2005).

Because of universal access to services, lack of inpatient capacity is not nearly the problem in Finland that it is in the U.S., allowing for focus on service utilization. However, other factors may impede service use. For example, there may be issues related to the travel

distances, waiting times, and number of healthcare providers across areas that could reduce treatment engagement (Suomen Psykiatriyhdistys, 2021). A more detailed examination of relevant measures of these factors is necessary to determine whether this is indeed the case.

Further research is also needed to determine the extent to which these findings are generalizable to other Nordic countries. Although Nordic countries compare much more favorably to the U.S. in terms of inequality, crime, and homelessness, there are differences between Nordic mental healthcare systems in terms of processes of referral for specialty treatment and supportive housing provision (Benjaminsen et al., 2020). In addition, alcohol abuse and recidivism are higher in Finland compared to the other Nordic countries (Aaltonen et al., 2017). How these factors covary in other Nordic countries warrants further examination. As planned healthcare system reforms are implemented in Finland, responsibility for social, healthcare, and emergency services will shift from municipalities to a smaller number of new regional authorities, requiring future evaluation of the types of relationships examined here (Reissell, 2022).

Expanding on previous macro-level research, this study examined the relationships between a broader range of community-level mental health treatment and housing variables and criminal justice outcomes in Finland. The findings suggest that, in contrast to the Penrose hypothesis, communities where more persons are hospitalized for psychiatric illness also have higher rates of violent crime. However, much of the municipal-level relationship between mental healthcare services and criminal justice outcomes are due to shared association with prevalence of mental health problems and alcohol use. At the same time, however, some forms of treatment engagement (e.g., non-physician providers) and provision of supportive housing may have potential crime-reducing effects. Beyond individual clinical decisions and outcomes, at the system level, to the extent that multifaceted services, including inpatient, outpatient, and housing are well integrated and managed, they may lead to better outcomes, including community safety.

Funding

This work was supported by the Fulbright Finland Foundation and the University of Helsinki Institute of Criminology and Legal Policy.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Data Availability Statement

Study data is publicly available from Sotkanet.fi https://sotkanet.fi/sotkanet/fi/index

Acknowledgements

I appreciate the helpful comments by Mikko Aaltonen and Sami Pirkola and assistance with prison data provided by Sasu Tyni and Lauri Pesonen. I am also very grateful to Janne Kivivuori for his support.

References

Aaltonen, M., Kivivuori, J., Tyni, S., Lehti, M., & Virtanen, M. (2021). Vapautuneiden vankien asunnottomuus: kehitys, taustatekijät ja yhteys uusintarikollisuuteen. *Lakimies*, *119*(3–4), 412–438.

Aaltonen, M., Skardhamar, T., Nilsson, A, Højsgaard, L., Andersen, O., Bäckman, F. E., & Danielsson, P. (2017). Comparing employment trajectories before and after first imprisonment in four Nordic countries, *The British Journal of Criminology*, *57*(4), 828–847. https://doi.org/10.1093/bjc/azw026

Ala-Nikkola, T., Pirkola, S., Kaila, M., Joffe, G., Kontio, R., Oranta, O., Sadeniemi, M., Wahlbeck, K., & Saarni, S. I. (2018). Identifying local and centralized mental health services – the development of a new categorizing variable. *International journal of environmental research and public health*, *15*(6), 1131. https://doi.org/10.3390/ijerph15061131

Ala-Nikkola, T., Pirkola, S., Kontio, R., Joffe, G., Pankakoski, M., Malin, M., Sadeniemi, M., Kaila, M., & Wahlbeck, K. (2014). Size matters—determinants of modern, community- oriented mental health services. *International Journal of Environmental Research and Public Health*, *11*(8), 8456–8474. https://doi.org/10.3390/ijerph110808456

Ala-Nikkola, T., Sadeniemi, M., Kaila, M., Saarni, S., Kontio, R., Pirkola, S., Joffe, G., Oranta, O., & Wahlbeck, K. (2016). How size matters: Exploring the association between quality of mental health services and catchment area size. *BMC Psychiatry*, *16, 289* (1), 1–12. https://doi.org/10.1186/s12888-016-0992-5

Alanko, A. (2017). *Improving mental health care: Finnish mental health policy rationale in the era of dehospitalisation*. Department of Social Studies, University of Helsinki.

Allison, P. D. (2009). *Fixed effects regression models*. SAGE publications.

Benjaminsen, L., Dhalmann, H., Dyb, E., Knutagård, M., & Lindén, J. (2020). Measurement of homelessness in the Nordic countries. *European Journal of Homelessness*, *14*(3), 159. https://www.feantsaresearch.org/public/user/Observatory/2021/EJH_14-3_A7_v02.pdf

Berg, N., Kiviruusu, O., Huurre, T., Lintonen, T., Virtanen, P., & Hammarström, A. (2018). Associations between unemployment and heavy episodic drinking from adolescence to midlife in Sweden and Finland. *European journal of public health*, *28*(2), 258–263. https://doi.org/10.1093/eurpub/ckx207

Bhavsar, V., Kosidou, K., Widman, L., Orsini, N., Hodsoll, J., Dalman, C., & MacCabe, J. H. (2020). Clozapine treatment and offending: A within-subject study of patients with psychotic disorders in Sweden. *Schizophrenia bulletin*, *46*(2), 303–310. https://doi.org/10.1093/schbul/sbz055

Blüml, V., Waldhör, T., Kapusta, N. D., & Vyssok, B. (2015). Psychiatric hospital bed numbers and prison population sizes in 26 European countries: A critical reconsideration of the Penrose Hypothesis. *PLoS One, 10*(11). https://doi.org/10.1371/journal.pone.0142163

Bondurant, S. R., Lindo, J. M., & Swensen, I. D. (2018). Substance abuse treatment centers and local crime. *Journal of Urban Economics*, *104*, 124–133. https://doi.org/10.1016/j.jue.2018.01.007

Burchfield, K. B., Markowitz, F. E. & Koskela, T. (2022). An Examination of community-level correlates of animal welfare offenses and violent crime in Finland. *International Journal of Criminology*, *2*, 174–187. https://doi.org/10.1007/s43576-021-00039-6

Clark, T., & Linzer, D. (2015). Should I use fixed or random effects? *Political Science Research and Methods, 3*(2), 399–408. https://doi:10.1017/psrm.2014.32

Cresswell-Smith, J. (2017). Primary care mental health services in Finland, a hidden lynchpin of psychiatric re-hospitalisation. Faculdade de Ciências Médicas Universidade NOVA de Lisboa.

Elonheimo, H., Niemelä, S., Parkkola, K., Multimäki, P., Helenius, H., Nuutila, A. M., & Sourander, A. (2007). Police-registered offenses and psychiatric disorders among young males: the Finnish "from a boy to a man" birth cohort study. *Social psychiatry and psychiatric epidemiology*, *42*(6), 477–484. https://doi.org/10.1007/s00127-007-0192-1

Fakhoury, W., & Priebe, S. (2007). Deinstitutionalization and re-institutionalization: Major changes in the provision of mental healthcare. *Psychiatry*, *6*, 313–316. http://dx.doi.org/10.1016/j.mppsy.2007.05.008

Faris, R. E. L., & Dunham, H. W. (1939). *Mental disorders in urban areas: an ecological study of schizophrenia and other psychoses.* University of Chicago Press.

Fazel, S., Gulati, G., Linsell, L., Geddes, J. R., & Grann, M. (2009). Schizophrenia and violence: systematic review and meta-analysis. *PLoS medicine*, *6*(8), e1000120. https://doi.org/10.1371/journal.pmed.1000120

Frank, R. & McGuire. T. G. (2011). Mental health treatment and criminal justice outcomes. Pp. 167–212 in Cook, P. J., Ludwig, J., & McCrary, J., Eds. *Controlling crime: Strategies and tradeoffs*. University of Chicago Press.

Harcourt, B. E. (2011). An institutionalization effect: The impact of mental hospitalization and imprisonment on homicide in the United States, 1934–2001. *The Journal of Legal Studies*, *40*(1), 39–83. https://doi.org/10.1086/658404

Hartvig, P. & Kjelsberg, E. (2009). Penrose's law revisited: The relationship between mental institution beds, prison population, and crime rate. *Nordic Journal of Psychiatry, 63*(1), 51–56. https://doi.org/10.1080/08039480802298697

Hirschovits-Gerz, T., Kuussaari, K., Stenius, K., & Tammi, T. (2019). Estimating the needs of substance problem use services: An exercise in seven Finnish municipalities using nationally collected, municipal-level survey and register data. *Journal of Studies on Alcohol and Drugs, Supplement*, (s18), 76–86. https://doi.org/10.15288/jsads.2019.s18.76

Joukamaa, M. (1997). Prison suicide in Finland, 1969–1992. *Forensic science international*, *89*(3), 167–174. https://doi.org/10.1016/s0379-0738(97)00119-9

Joukamaa, M., Aarnio, J., von Gruenewaldt, V., Hakamäki, S., Hypen, K., Lauerma, H., Lintonen, T., Mattila, A., Tyni, S., Vartiainen, H., Viitanen, P., & Wuolijoki, T. (2010). Rikosseuraamusasiakkaiden terveys, työkyky ja hoidontarve Perustulosraportti. Criminal Sanctions Agency.

Jüriloo, A., Pesonen, L., & Lauerma, H. (2017). Knocking on prison's door: A 10-fold rise in the number of psychotic prisoners in Finland during the years 2005–2016. *Nordic Journal of Psychiatry*, *71*(7), 543–548. https://doi.org/10.1080/08039488.2017.1351579

Karolaakso, T., Autio, R., Näppilä, T., Leppänen, H., Rissanen, P., Tuomisto, M., Karvonen, S., & Pirkola, S. (2021). Contextual and mental health service factors in mental disorder-based disability pensioning in Finland – a regional comparison. *BMC Health Services Research*, 21, 1081. https://doi.org/10.1186/s12913-021-07099-4

Kaskela, T., & Pitkänen, T. (2021). Association between the discontinuation of substance use inpatient treatment and the risk of committing a crime leading to imprisonment: A Finnish registry-based 5-year follow-up. *Criminal behaviour and mental health: CBMH*, *31*(3), 171–182. https://doi.org/10.1002/cbm.2198

Kim, D. Y. (2016). Psychiatric deinstitutionalization and prison population growth: A literature review and its implications. *Criminal Justice Policy Review, 27*, 2–21. https://doi.org/10.1177%2F0887403414547043

Korkeila J. (2021). Organization of community psychiatric services in Finland. *Consortium Psychiatricum, 2*(1), 55–64. https://doi.org/10.17816/CP64

Lamb H. R. (2015). Does deinstitutionalization cause criminalization? The Penrose hypothesis. *JAMA Psychiatry*, *72*(2), 105–106. https://doi.org/10.1001/jamapsychiatry.2014.2444

Large, M. M. & Nielssen, O. (2009). The Penrose hypothesis in 2004: Patient and prisoner numbers are positively correlated in low-and-middle income countries but are unrelated in high-income countries. *Psychology and Psychotherapy: Theory, Research and Practice, 82,* 113–119. https://doi.org/10.1348/147608308X320099

Lehti M. & Sirén, R. (2020). The impact of alcohol consumption on homicide: A time-series analysis of three Nordic countries. *European Journal of Criminology, 17*(3), 352–369. https://doi.org/10.1177/1477370818802524

Leijala, J., Kampman, O., Suvisaari, J., & Eskelinin, S. (2021). Daily functioning and symptom factors contributing to attitudes toward antipsychotic treatment and treatment adherence in outpatients with schizophrenia spectrum disorders. *BMC Psychiatry*, *21***,** 37. https://doi.org/10.1186/s12888-021-03037-0

Lintonen, T. P., Vartiainen, H., Aarnio, J., Hakamäki, S., Viitanen, P., Wuolijoki, T., & Joukamaa, M. (2011). Drug use among prisoners: By any definition, it's a big problem. *Substance Use & Misuse*, *46*(4), 440–451. https://doi.org/10.3109/10826081003682271

Lintonen, T., Obstbaum, Y., Aarnio, J., von Gruenewaldt, V., Hakamäki, S., Kääriäinen, J., Mattila, A., Vartiainen, H., Viitanen, P., Wuolijoki, T., & Joukamaa, M. (2012). The changing picture of substance abuse problems among Finnish prisoners. *Social Psychiatry and Psychiatric Epidemiology*, *47*(5), 835–842. https://doi.org/10.1007/s00127-011-0390-8

Liska, A. E., Markowitz, F. E., Whaley, R. B., & Bellair, P. (1999). Modeling the relationship between the criminal justice and mental health systems. *American Journal of Sociology*, *104*(6), 1744–1775. https://doi.org/10.1086/210222

Markowitz, F. E. (2006). Psychiatric hospital capacity, homelessness, and crime and arrest rates. *Criminology*, *44*, 45–72. https://doi.org/10.1111/j.1745-9125.2006.00042.x

Markowitz, F. E. (2001). Modeling processes in recovery from mental illness: relationships between symptoms, life satisfaction, and self-concept. *Journal of Health and Social Behavior*, *42*(1), 64–79. https://doi.org/10.2307/3090227

Markowitz, F. E. (2011). Mental illness, crime, and violence: Risk, context, and social control. *Aggression and Violent Behavior*, *16*, 36–44. https://doi.org/10.1016/j.avb.2010.10.003

Martikainen, V. & Järvelin, J. (2019). Psykiatrinen erikoissairaanhoito 2018. THL Tilastoraportti 42. Terveyden ja hyvinvoinnin laitos. https://urn.fi/URN:NBN:fi-fe20201217101056

Mechanic, D., McAlpine, D., & Rochefort, D. A. (2014). *Mental health and social policy: Beyond managed care* (6th ed.). Pearson.

Mechanic, D. & Rochefort, D. A. (1990). Deinstitutionalization: An appraisal of reform. *Annual Review of Sociology, 16*, 301–327. https://doi.org/10.1146/annurev.so.16.080190.001505

Mederiros, H., McDaid, D., Knapp, M., & The MHEEN Group. (2008). *Shifting care from hospital to the community in Europe: Economic challenges and opportunities*. MHEEN Policy Briefing. London: MHEEN Network.

Obstbaum, Y. & Tyni, S. (2015). Who receives substance abuse treatment in the 'real world' of the prison? A register-based study of Finnish inmates. *Journal of Scandinavian Studies in Criminology and Crime Prevention*, *16*(1), 76–96. https://doi.org/10.1080/14043858.2014.1003709

Parsons, A. E., (2018). *From asylum to prison: Deinstitutionalization and the rise of mass incarceration after 1945*. University of North Carolina Press.

Penrose, L. S. (1939). Mental disease and crime: outline of a comparative study of European statistics. *British Journal of Medical Psychology, 18,* 1– 15. https://doi.org/10.1111/j.2044-8341.1939.tb00704.x

Pirkola, S., Sund, R., Sailas, E., & Wahlbeck, K. (2009). Community mental-health services and suicide rate in Finland: a nationwide small-area analysis. *Lancet (London, England)*, *373*(9658), 147–153. https://doi.org/10.1016/S0140-6736(08)61848-6

Putkonen, H., & Taylor, P. J. (2018). Making sense of mental health service changes. *Nordic Journal of Psychiatry*, *72*(2), 82–83. https://doi.org/10.1080/08039488.2017.1398275

Raphael, S. & Stoll, M. A. (2013). Assessing the contribution of the deinstitutionalization of the mentally ill to growth in the U.S. incarceration rate. *The Journal of Legal Studies 42*, 187–222. https://www.journals.uchicago.edu/doi/10.1086/667773

Reissell, E. (2022). Finnish health and welfare system and its reform. Welfare State Research and Reform, THL: Helsinki. https://coincide.nl/wp-content/uploads/2022/07/THL-Finnish-Health-and-welfare-system-its-reform.pdf

Rikosseuraamuslaitos. (2020). *Statistical yearbook*. Rikosseuraamuslaitos: Helsinki.

Sadeniemi, M., Joffe, G., Pirkola, S., Ala-Nikkola, T., Kontio, R., & Wahlbeck, K. (2021). Residential services as a major cost driver in mental health and substance use services in southern Finland. *Psychiatria Fennica, 52*, 60–74. https://www.psykiatriantutkimussaatio.fi/wp-content/uploads/2021/11/Psychiatria_Fennica-2021-Sadeniemi_et_al.pdf

Sadeniemi, M., Pirkola, S., Pankakoski, M., Joffe, G., Kontio, R., Malin, M., Ala-Nikkola, T., & Wahlbeck, K. (2014). Does primary care mental health resourcing affect the use and costs of secondary psychiatric services?. *International Journal of Environmental Research and Public Health*, *11*(9), 8743–8754. https://doi.org/10.3390/ijerph110908743

Sampson, R. J., Morenoff, J. D., & Gannon-Rowley, T. (2002). Assessing "neighborhood Effects": Social processes and new directions in research. *Annual Review of Sociology, 28*, 443–478. https://doi.org/10.1146/annurev.soc.28.110601.141114

Sariaslan, A., Arseneault, L., Larsson, H., Lichtenstein, P., & Fazel, S. (2020). Risk of subjection to violence and perpetration of violence in persons with psychiatric disorders in Sweden. *JAMA Psychiatry*, *77*(4), 359. https://doi.org/10.1001/jamapsychiatry.2019.4275

Savolainen, J. (2005). Think nationally, act locally: The municipal-level effects of the national crime prevention program in Finland. *European Journal on Criminal Policy and Research, 11*, 175–191. http://dx.doi.org/10.1007/s10609-005-0239-5

Semenza, D. C., Stansfield, R., Steidley, T., & Mancik, A. M. (2021). Firearm availability, homicide, and the context of structural disadvantage. *Homicide Studies*. https://doi.org/10.1177/10887679211043806

Seppänen, A., Joelsson, P., Ahlgren-Rimpiläinen, A., & Repo-Tiihonen, E. (2020). Forensic psychiatry in Finland: an overview of past, present and future. *International journal of mental health systems*, *14*, 29. https://doi.org/10.1186/s13033-020-00362-x

Silver, E. (2000). Extending social disorganization theory: A multilevel approach to the study of violence among persons with mental illnesses. *Criminology*, *38*(4), 1043–1074. https://doi.org/10.1111/j.1745-9125.2000.tb01414.x

Silver, E., Mulvey, E. P., & Swanson, J. W. (2002). Neighborhood structural characteristics and mental disorder: Faris and Dunham revisited. *Social Science & Medicine, 55*(8), 1457–1470. https://doi.org/10.1016/S0277-9536(01)00266-0

Slate, R. N., Frailing, K., Johnson, W. W., & Buffington, J. K. (2021). *The Criminalization of mental illness: Crisis and opportunity for the justice system* (3rd ed.). Carolina Academic Press.

Solomon, P. L., Cavanaugh, M. M., & Gelles, R. J. (2005). Family violence among adults with severe mental illness: a neglected area of research. *Trauma, Violence & Abuse*, *6*(1), 40– 54. https://doi.org/10.1177/1524838004272464

Somers, J. M., Rezansoff, S. N., Moniruzzaman, A., Palepu, A., & Patterson, M. (2013). Housing first reduces re-offending among formerly homeless adults with mental disorders: results of a randomized controlled trial. *PloS one*, *8*(9), e72946. https://doi.org/10.1371/journal.pone.0072946

Suomen Psykiatriyhdistys. (2021). Psykiatriyhdistyksen hallitus pohti psykiatripulaa. https://www.psy.fi/blogit_ja_kannanotot/psykiatriyhdistyksen_hallitus_pohti_psykiatripu laa.1367.blog

Swartz, J. A. & Lurigio, A. J. (2007). Serious mental illness and arrest: The generalized mediating effect of substance use. *Crime & Delinquency, 53*(4), 581–604. https://doi.org/10.1177/0011128706288054

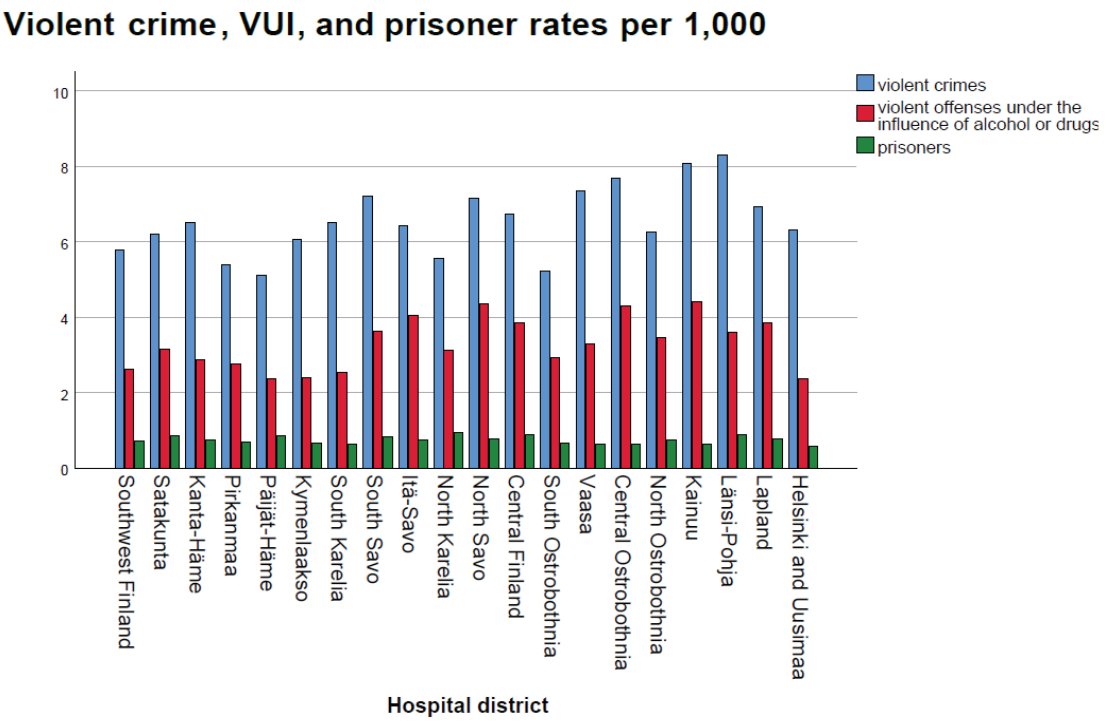
Teplin, L. A., McClelland, G. M., Abram, K. M., & Weiner, D. A. (2005). Crime victimization in adults with severe mental illness: Comparison with the National Crime Victimization Survey. *Archives of General Psychiatry*, *62*(8), 911–921. https://doi.org/10.1001/archpsyc.62.8.911

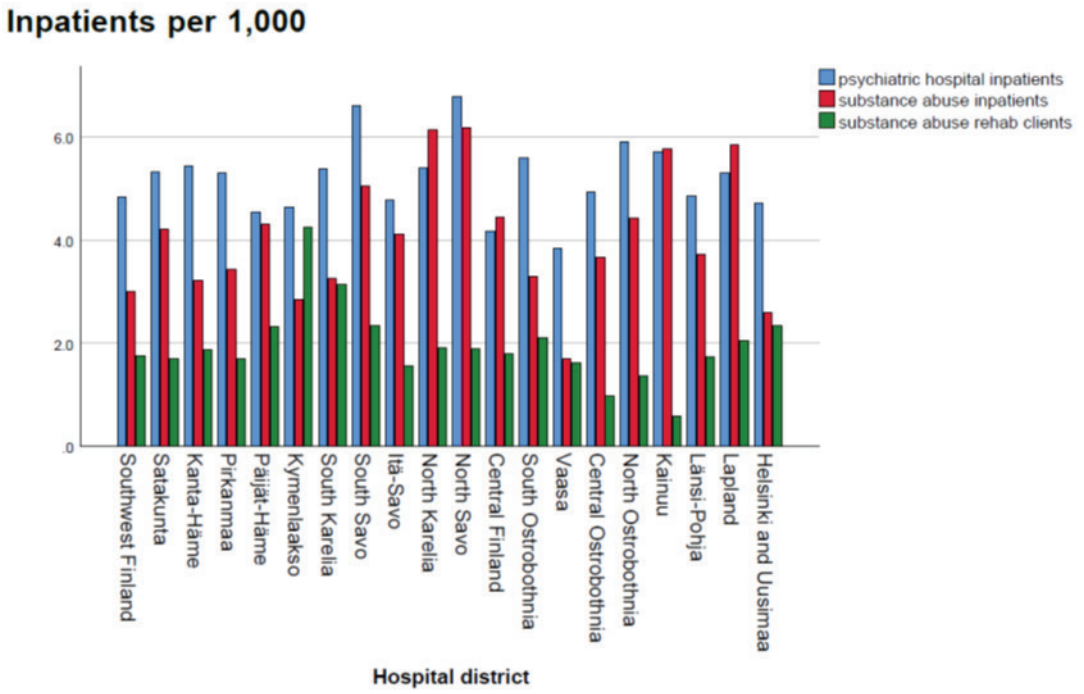
Törölä, M. (2019). Not criminally responsible offenders with mental illness in Finland: Social control and situational characteristics of offences. *Sosiologia, 56*, 382–400. https://urn.fi/URN:NBN:fi:ELE-017361491

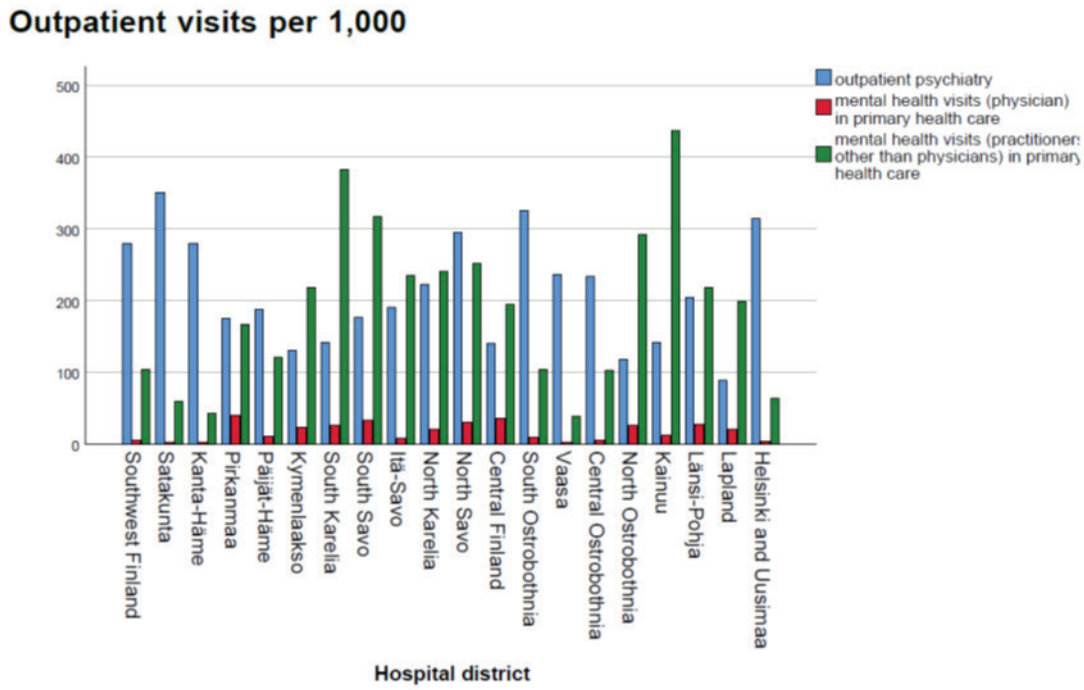
Appendix

Correlation Matrix of Key Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(1) Prisoners	1.000												
(2) VUI	0.279	1.000											
(3) Violent crime	0.140	0.664	1.000										
(4) Psychiatric inpatients	0.224	0.386	0.346	1.000									
(5) Substance patients	0.411	0.388	0.135	0.410	1.000								
(6) Rehab clients	0.068	0.062	0.187	0.080	–0.007	1.000							
(7) Outpatient visits	–0.048	–0.010	0.157	0.101	–0.149	0.121	1.000						
(8) Primary visits	0.049	0.110	0.043	0.097	0.142	–0.043	–0.302	1.000					
(9) Other visits	0.084	0.161	0.011	0.102	0.333	–0.081	–0.531	0.433	1.000				
(10) MH housing	0.155	0.046	0.014	0.069	0.182	0.055	–0.098	0.168	0.170	1.000			
(11) SA housing	–0.014	0.030	0.192	0.020	–0.147	0.212	0.137	–0.077	–0.166	0.007	1.000		
(12) MH index	0.374	0.388	0.247	0.350	0.576	0.073	–0.161	0.180	0.348	0.421	0.002	1.000	
(13) Alcohol	0.170	0.426	0.456	0.401	0.279	0.137	0.007	0.140	0.132	0.045	0.107	0.235	1.000




Inpatients per 1,000
psychiatric hospital inpatients
substance abuse inpatients
substance abuse rehab clients
6.0
4.0
2.0
.0
Southwest Finland
Satakunta
Kanta-Häme
Pirkanmaa
Päijät-Häme
Kymenlaakso
South Karelia
South Savo
Itä-Savo
North Karelia
North Savo
Central Finland
South Ostrobothnia
Vaasa
Central Ostrobothnia
North Ostrobothnia
Kainuu
Länsi-Pohja
Lapland
Helsinki and Uusimaa
Hospital district


Outpatient visits per 1,000
outpatient psychiatry
mental health visits (physician) in primary health care
mental health visits (practitioners other than physicians) in primary health care
500
400
300
200
100
0
Southwest Finland
Satakunta
Kanta-Häme
Pirkanmaa
Päijät-Häme
Kymenlaakso
South Karelia
South Savo
Itä-Savo
North Karelia
North Savo
Central Finland
South Ostrobothnia
Vaasa
Central Ostrobothnia
North Ostrobothnia
Kainuu
Länsi-Pohja
Lapland
Helsinki and Uusimaa
Hospital district