Prison, Mental Health and Family Spillovers

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Abstract: Does prison cause mental health problems among inmates and their family members? Correlational evidence reveals that the prevalence of mental health problems is much higher among inmates than among the general population, but remains silent on the issue of causality. We exploit the strengths of the Norwegian setting and the richness of the data available to measure the impacts of incarceration on the health of defendants and their family members. We first use an event study design around the case decision event. We complement this with an instrumental variable strategy that takes advantage of the random assignment of criminal cases to judges differing in their stringency. Both methods consistently show that the positive correlation is misleading: incarceration in fact lowers the prevalence of mental health disorders among defendants as measured by mental health-related visits to health-care professionals. We further demonstrate that this effect lasts long after release and is unlikely driven by a shift in health-care demand holding health status constant. Family members, especially spouses, also experience positive spillovers on their mental health.

Keywords: mental health, incarceration, family spillovers
JEL codes: K42, I10, I18

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1 Introduction

Mental health is a serious public health concern. In a report by the World Health Organization (WHO, 2021), depression is listed among the leading causes of disability worldwide, especially among young adults.[1] Mental health is particularly a problem for prison and jail inmates, of whom a majority are young male adults. For example, 37% of all inmates in the US in 2012 had been diagnosed with a mental health problem (Bronson and Berzofsky, 2017). The situation is comparable in Norway, where a survey has found that 73% of Norwegian inmates have a personality disorder (Cramer, 2014). This compares to about 20% in the general Norwegian population (Norwegian Institute of Public Health, 2018). Given the prevalence of mental health problems among inmates, it is important to understand whether, and in what situations, time spent in prison can improve or exacerbate mental health problems.

The impacts of prison on the mental health of inmates and on their family members are theoretically ambiguous, making this an interesting empirical question. On the one hand, prisons can help improve mental health if prisoners are able to obtain better access to health care than they could otherwise afford, given their average lower incomes and less formal employment. Prisons can also help inmates stay drug-free, which can improve their mental health. On the other hand, the lack of freedom, poor incarceration conditions (e.g. overcrowding, poor hygiene and nutrition) and increased (threat of) violence in prison can adversely affect inmate mental health. Further, beyond the inmates themselves, the potential effects of prison on inmate mental health can spill over to the health of close family members through increased trauma, stigma, and financial hardship when the partner, parent or child serves prison time. That said, prisons can also remove a potential negative influence from the lives of their family members. Finally, potential improvement (worsening) in inmate mental health could have direct spillovers on the well-being of family members.

The main contribution of this paper is to provide causal evidence concerning the effects of prison on the mental health of inmates and their family members. Much of the existing research has found it challenging to identify the causal effects of prison on health. Data availability is a major concern in this respect as the ideal data set requires information on repeat measures of criminal behavior and health over time, data which in most settings are regarded as highly sensitive and difficult to access and link with other data. Measuring mental health can also be challenging as the utilization of health-care services can be both suggestive of mental health problems, and preventive if it hinders more long-term serious mental health issues. Another major challenge relates to correlated unobservables. Inmates both enter and exit prison with mental health problems that could be driven by unobserved factors other than time served in prison. Finally, estimating spillovers can be even more difficult as it requires the linking of inmates to family networks of

[1] For instance, suicide is the fourth-leading cause of death among 15–29-year-olds (WHO, 2021).

spouses and children and the appropriate addressing of common environmental and demographic factors.

This paper draws on multiple strengths of the Norwegian setting to overcome these challenges as we link several administrative data sources and construct a panel with complete records of criminal behavior, prison time, and health status for every Norwegian from 2006 to 2014. Using this panel data set, we can then follow inmates for up to 5 years after the prison sentence, which allows us to assess their mental health outcomes over a prolonged period after release. In addition, we use two different research designs to identify the causal effects of prison. First, we use an event study design that takes advantage of the variation in the criminal case decision date under the identifying assumption that the timing of the case decision is conditionally random. Second, we exploit a random judge design as in Bhuller et al. (2020), where we instrument prison sentencing decisions using variation in randomly assigned judges that differ systematically in their stringency. These strategies complement each other by providing two separate sets of causal impacts of prison on inmate mental health for different subpopulations and under different identifying assumptions. The event study design provides the average treatment effect on the treated (ATT), whereas the random judge instrumental variable design provides a local average treatment effect (LATE). However, given precision concerns with the IV design, we focus on only the event study design for the heterogeneity analysis and the analysis of family spillovers.

We offer three key findings. First, both the event study and the IV estimates reveal a large decrease in mental health-related visits for inmates that persist after their release. By contrast, the ordinary least squares (OLS) estimates show a positive association between imprisonment and subsequent mental health-related visits. For instance, the event study shows that imprisonment causes a 30% decline in the probability of a mental health visit 5 years after the prison sentencing decision in court, while the OLS suggests a 14% increase.[2] Overall, the event study estimates show a 12% decline in the probability of any health-care visit 5 years after sentencing.

Second, in interpreting the evidence, we find that incapacitation only explains a small share of the decline in mental health-related visits as the impacts persist and indeed become stronger in the years after the inmate leaves prison. Furthermore, we observe a decline in both addiction- and depression-related diagnoses, suggesting that the impacts extend beyond de-addiction. We also obtain evidence consistent with our estimates reflecting an improvement in mental health and not merely a decrease in health-care demand. Several pieces of evidence support this argument. First, inmates have a very high level of health-care utilization at the baseline, and do not seem to distrust the health-care system. The relatively humane prison conditions in Norway make it unlikely that prison negatively affects this trust. Moreover, we also observe a decline in emergency health-care

[2]The event study provides an estimated 8 percentage point decrease in the monthly probability of a mental health-related visit from a baseline of 27%. By contrast, we find no meaningful impacts on nonmental health outcomes.

visits for mental health reasons and we do not see any longer run upticks in mental health diagnoses at even 5 years after the prison sentence. The opposite could have been consistent with a short-term decline, resulting in longer term increases in mental health problems. The absence of a decline in physical health-related visits also suggests that health-care demand is not affected downward.

Finally, we find significant spillovers on spouses, for whom we also observe a large decrease in mental health-related visits. At 5 years after the sentencing of the inmate, only about 40% of inmates and their spouses are still together, and the spillovers to spouses are driven by those that split up, suggesting that the "removal of a bad influence" channel could be at play. Children and parents also experience a decrease, albeit smaller, in mental health-related visits in the longer term. We also find a reduction in child protection-related incidents in these families. Taken together, spillovers to spouses and fewer child protection-related incidents in these families suggest that prison can have important positive spillovers on family health and well-being. The potential benefits of rehabilitation through improvements in mental health are therefore large and go beyond the direct effects on the inmates themselves.

This paper provides an important contribution to the existing literature on prison and health. The majority of studies on this topic are correlational (Binswanger et al., 2007; Weidner and Schultz, 2019; Haglund et al., 2014; Sailas et al., 2006; Turney et al., 2012), often relying on comparisons of incarcerated and nonincarcerated individuals matched on some observable characteristic such as age or gender. Typically, this literature finds that incarceration is associated with higher levels of morbidity, mortality, and mental health disorders.[3] However, this positive association does not inform us about whether incarceration causes poorer health outcomes, as incarcerated and nonincarcerated individuals are likely to differ significantly along unobservable dimensions. The causal literature focusing on mortality is limited to a few studies. Norris et al. (2020) use a difference-in-differences (DiD) strategy around the removal of the treatment (release from prison) using US data and show a negative effect of prison on mortality during incapacitation. The decrease found is strongest for homicides and overdoses, but also marked for suicides and mortality from natural causes, and while Norris et al. (2020) are unable to estimate the effect precisely, they rule out any post-release positive impact of incarceration on mortality. For Sweden, Hjalmarsson and Lindquist (2020) use policy-induced variation at the intensive margin (prison length) and find a decrease in mortality risk, especially when they focus on specific subgroups or causes of death (e.g., suicide, violent death), which they argue is driven by in-prison health treatment and services. We extend this literature by using alternative research designs, focusing on the extensive margin of prison and on less extreme health outcomes.[4] Beyond the extreme outcome of death, we are therefore able to capture improvements or deteriorations in health that have dramatic consequences for the daily

[3] See also a recent overview by Western (2021).

[4] The extensive margin makes particular sense in the Norwegian setting where long prison sentences are rare.

lives of inmates. We further present new evidence on the family health spillovers of prison.

Our work is also related to a large literature concerning the effects of prison on other outcomes, particularly recidivism and employment. Descriptive studies (Gottfredson, 1999; Western et al., 2001) report a positive correlation between imprisonment and recidivism and nonemployment. A smaller set of studies use a judge fixed-effects instrument with mixed findings. For example, using US data, Green and Winik (2010) and Loeffler (2013) fail to detect any effect of incarceration on recidivism, whereas Kling et al. (1999) provides suggestive evidence of a positive though imprecise impact on post-release labor market outcomes. However, Aizer and Doyle Jr (2015) and Mueller-Smith (2015) both find a negative effect of incarceration on future outcomes: Aizer and Doyle Jr (2015) measure lower high school completion rates and higher future incarceration rates on a population of juveniles, while Mueller-Smith (2015) reports higher recidivism rates and poorer labor market outcomes. In Ohio, Norris et al. (2021) find that incarceration reduces the number of crimes committed by inmates over the 3 years following judge assignment, an observation consistent with incapacitation effects, but do not conclude any significant post-incarceration effect. Their paper closely relates to ours in that they also examine spillovers, and reveal that the incarceration of a parent or sibling has a negative effect on the likelihood of being charged for children, with no detectable effect on education. Using an alternative methodology relying on discontinuities in North Carolina's sentencing guidelines, Rose and Shem-Tov (2021) find that incarceration has a reoffending-reducing effect that diminishes with sentence length. In the Norwegian context, Bhuller et al. (2020) show that incarceration discourages future criminal behavior and improves future employment prospects. An assessment of the impact of incarceration on other dimensions, including health, and on the whole family, is necessary for a comprehensive understanding of the effects of prison. Our paper therefore contributes to this comprehensive assessment to aid the better design of sanctions.

Finally, our study relates to the broader literature on the causes and consequences of mental health. This often focuses on an adolescent population and relies on the use of sibling fixed effects, and individual and neighborhood controls. It has been shown, for instance, that mental health problems are associated with poorer education and labor market outcomes, lower future marriage stability, and higher criminal activity later in life (Goodman et al., 2011; Lundborg et al., 2014; Currie and Stabile, 2006; Anderson et al., 2015; Fletcher and Wolfe, 2009).[5] A set of studies, taking advantage of changes in health policy or the local availability of treatment, also suggests a causal link between mental health and employment, human capital, and criminal outcomes in the adult population (Bütikofer et al., 2020; Deza et al., 2020; Bondurant et al., 2018). For instance, exploiting family fixed effects and a change in the treatment of bipolar disorders, Biasi et al. (2021)

[5]The literature on the consequences of mental health issues among adolescents is relevant to the extent that our sample is quite young, with a median age of just 31 years.

demonstrate that the large earnings penalties entailed by mental health disorders are partly offset by access to treatment. Relying on a difference-in-differences estimation, Jácome (2020) reports the positive effect of a loss in Medicaid eligibility on future criminal behavior, especially among those with mental health histories. The multidimensional impacts of mental health disorders highlight the fact that a positive (negative) impact of incarceration on mental health could therefore help with the (impaired) rehabilitation of inmates. Studies finding mental health disorders involve a higher likelihood of past inmates being involved in post-release criminal activity again emphasize the need to account for potential reverse causality and selection in the relationship between incarceration and mental health.

The remainder of this paper proceeds as follows: Section 2 describes the institutional setting and data sources, while Section 3 details the methodology. Section 4 presents the results on inmates' mental health. Spillover effects on family members are analyzed in Section 5. Section 6 concludes.

2 Institutional Setting and Data Sources

We describe below the key features of our institutional setting. Our setting is similar to the one in Bhuller et al. (2020) used to estimate the causal effects of incarceration on defendant's recidivism and future employment. We begin by briefly describing the court system in Norway and how cases are assigned to judges. We then describe the prison system, and how health care is provided in prisons. We finish the section by describing our data sources and sample restrictions.

2.1 The Norwegian Court System

We study defendants facing trial in the Norwegian criminal justice system. If the police suspect an individual of a crime, they file a formal report. A public prosecutor then decides whether the individual should be charged with a crime as well as whether the case should proceed to a court trial. About half of all police reports lead to a formal criminal charge. Of these charged cases, the public prosecutor advances about 40% to trial. The other charged cases are either dismissed, directly assigned a fine, or sent to mediation by the public prosecutor.

Of the cases that proceed to trial, some 60% are nonconfession cases, while the remaining are cases where the defendant has confessed to the charges filed by the public prosecutor.[6] We focus on nonconfession cases in this paper. Once a case proceeds to trial, it is assigned to a judge. If the judge finds the accused guilty, they can assign a combination of punishments that are not necessarily mutually exclusive. Slightly over half of all cases result in incarceration, with probation,

[6] A defendant chooses whether to confess prior to knowing who their assigned judge will be. The absence of plea bargaining makes the interpretation of our IV estimates easier (see Dobbie et al. 2018).

community service, and fines combined accounting for 44% of outcomes. From 2009 onwards, electronic home monitoring became an alternative to prison time, and is currently used in 18% of cases in which defendants face an incarceration decision.[7] In a small number of cases (5%), the defendant is found not guilty.[8] If multiple individuals are charged in the same case, they take part in the same trial, but can have different charges and varying sentences depending on their role in the crime. Figure A1 in Appendix A plots the typical timeline of events with the average and median time between each step from the date of the crime to prison release for our sample of incarcerated offenders.

The law in Norway dictates that cases are assigned to judges according to the principle of randomization (NOU, 2002; Bohn, 2000). There are a few exceptions, such as for especially severe crimes or cases involving juveniles, which we exclude from our sample. To obtain a sample of randomly assigned cases for the same pool of judges, we limit our sample to regular judges handling nonconfession cases. Regular judges are permanent civil servants (versus deputy judges who generally serve for a limited 3-year term).[9]

We measure the strictness of a judge based on their incarceration rate for all other cases they handled between 2005 and 2014. There are 596 judges, each of whom presided over an average of 241 randomly assigned court cases. To construct our judge stringency measure for the random judge design, we calculate the leave-out mean judge incarceration rate conditional on the fully interacted court and year fixed effects to account for the fact that randomization occurs only within the pool of available judges.

2.2 The Norwegian Prison System

To assist interpretation, we briefly describe prison conditions in Norway (see kriminalomsorgen.no). Generally, prisons in Norway emphasize rehabilitation and follow the "principle of normality" set forth by the Norwegian Correctional Services. This principle dictates that "life inside will resemble life outside as much as possible" and that "offenders shall be placed in the lowest possible security regime." This means that the main punishment is the restriction of liberty, and that no other rights should be taken away from inmates serving time in Norwegian prisons.

There are a total of 61 prisons in Norway. The largest prison (in Oslo) has 392 cells, while the smallest has just 13 cells. Norway has a strict policy of one prisoner per cell and attempts in

[7] This includes defendants that partly served prison time in combination with electronic monitoring. This policy was introduced in some regions from September 2008 and implemented nationally from May 2014 onwards.

[8] The justice system in Norway further allows for forced psychiatric care/confinement ("tvungen psykisk helsevern") as part of the sentencing guidelines. However, these sentences are rare (only 44 forced confinements were made in 2020) and often relate to extreme cases such as murder or severe violence, which are some of the exceptional cases nonrandomly assigned to judges and thus excluded from our sample. Details below.

[9] We further restrict the data set to judges that handle at least 50 randomly assigned cases and to courts with at least two regular judges each year.

so far is possible to place prisoners close to home so that inmates can maintain links with their families. Further, there are two types of prisons based on the level of security. A high-security prison (also referred to as a closed prison) has a wall or high fence around the prison area. All doors are locked. When the inmates are not at work or at school or participating in leisure activities under the control of the prison guards, they are locked in their cells.[10] Closed prisons make up nearly 70% of all prison beds in Norway. Prisons with lower security levels (also referred to as open prisons) have fewer physical security measures than do high-security prisons, but also usually have a fence around the prison area and do not permit inmates to leave the facility.[11] Inmates in open prisons have more freedoms and responsibilities compared with closed prisons. Whether a convicted defendant is initially sent to an open or closed prison depends on the severity of the crime, as well as geographical proximity and the available space at open versus closed prisons. The two types of prisons create a separation between minor and more hardened criminals, at least until the hardened criminals have demonstrated good behavior. While more serious offenders serve most of their sentence in closed prisons, they are usually transferred to open prisons for resocialization and further rehabilitation prior to release.

To promote and facilitate rehabilitation, prisons commonly offer education, mental health, and training programs. The mental health programs are targeted at social or emotional skills such as anger management and interpersonal relationships and programs aimed to combat recidivism or drug addiction. Between 2009 and 2014, around 28% and 36% of inmates in open and closed prisons, respectively, participated in some type of mental health program. The most common programs are for high school and work-related training, but inmates can also take other miscellaneous courses. Closed prisons are also more likely to have formal employment and education programs (82.5% vs. 79% and 74.3% vs. 58.8%, respectively). All inmates are involved in some type of regular daily activity, unless they have a serious mental or physical disability. If they are not enrolled in an educational or training program, they must work within prison.[12] All inmates have the right to daily physical exercise and access to a library and newspapers. After release, there is an emphasis on helping offenders reintegrate into society, with access to programs set up to help ex-prisoners find a job and access social services like housing support.

[10] Moreover, the cells in closed prisons are examined by the staff once a day, and the number of items such as books, CDs, etc., that the inmates are allowed to have in their cell is limited.

[11] The prison buildings are locked at night, but the inmates are not locked in their cells. Inmates can share rooms, and a great emphasis is placed on the possibility of contact with society through various types of outings, visiting arrangements and more lenient control measures. There are several options for using the phone, but calls can be intercepted.

[12] All prisoners, whether working or participating in training or education programs, receive a small stipend while in prison (around $8 per day in 2015).

2.3 Health Care in Prison

By law, prisoners have the same rights to health-care services as the population-at-large. Norwegian prisons follow the "import model", which means that all public care and health services should be provided in the same conditions inside as outside prison (Moe, 2018). By guaranteeing access to services in prison that are "as good as outside", Norwegian prisons seek to avoid disruption in the quality of health-care provision. In addition, these services are delivered from the community to prisons by local and municipal providers. This allows for better continuity of care upon release, as inmates have already established contact with these public service providers. Health care is part of these services, meaning that inmates may be already familiar with some health-care professionals practicing in their municipality or region, making it easier to consult with them upon release.

The Norwegian Directorate of Health is responsible for managing health programs for inmates. Following the import model, prison health workers are financially and administratively independent from the correctional facility and the Department of Justice, and funded through the Department of Health and Social Welfare. The medical staff is often specifically trained in addiction and mental health disorders.[13] Kjelsberg et al. (2006) provide a description of mental health consultations offered in six medium-to-large Norwegian prisons representing one third of the Norwegian prison population in 2005. As discussed there, within the first few weeks of incarceration, all new prisoners are screened for health problems by a primary health worker. They first conduct a personal interview and then provide treatment and refer to specialist services if needed. Each inmate is assigned a prison officer as their primary contact, who will oversee a consultation with a primary health care worker if needed. Then, if deemed necessary, the primary health worker arranges a psychiatric consultation for the inmate. In the six studied prisons, there was about one psychotherapist for every 100 inmates, on top of the administrative staff and primary health workers.[14]

2.4 Comparison to Other Countries

Along many dimensions, the Norwegian criminal justice system looks like most Western European countries and to a lesser extent, the US. In Norway, the incarceration rate was 72 per 100,000 in 2015, close to the rate in Western European countries of about 100 per 100,000 (World Prison Brief, Institute for Crime & Justice Policy Research). The US is an outlier in that respect, as its incarceration rate was 672 per 100,000 in 2015, with only 11 countries worldwide with incarceration rates exceeding 400 per 100,000.

While Norway shows many similarities with other Western European countries and with the

[13] According to the Norwegian Directorate of Health, around 60% of nurses have received specific training to handle these issues, and prisons have access to psychologists or psychotherapists.

[14] None of the surveyed psychotherapists had a waiting list at the time of the study, suggesting that there was sufficient capacity to meet demand.

US in terms of inmate population characteristics (Aebi et al. (2015); Carson (2015); Kristoffersen (2014); Raphael and Stoll (2013)), it differs regarding prison expenditures and conditions. Similar to Sweden, Denmark, and the Netherlands, Norway spends about $118 thousand per inmate per year, almost double that spent on average in Western European countries ($66 thousand per inmate per year), and four times that in the US ($31 thousand).[15]

Consequently, Norway can ensure better prison conditions, with an emphasis on rehabilitation and the principle of normality rather than punishment and the removal of privileges (Bhuller et al., 2018).[16] Some of these conditions may play a crucial role in mediating the impact of prison on health. Norwegian cells are individual, and prisons are not overcrowded.[17] This may particularly matter as identifying mental health issues entails allocating specific resources to the mentally ill inmates, including space resources, which are not necessarily available where there is overcrowding. Detecting signs of a worsening mental health condition also requires close monitoring by prison staff, which is made easier with the lower inmate-to-staff ratio and reduced physical barriers in Norwegian prisons.[18] Overcrowding and a lack of resources and staff have been highlighted as potential factors explaining that mentally ill inmates are often undiagnosed in US prisons (Haney, 2017).[19] Prisons in the US also offer job training, education and drug treatment programs. However, those offered in the US are often not accessible in practice because of a lack of funding, and long waiting lists (Davis et al. 2014; GAO, 2012). Finally, the Norwegian system provides intensive post-release support, e.g., active labor market programs specifically designed for ex-prisoners, housing support, social assistance, and disability insurance, etc.[20]

[15] However, there is substantial heterogeneity within the US, with per inmate expenditures ranging from $60 thousand in New York state to $17 thousand in Alabama. Cost estimates are calculated by dividing total prison budgets by the number of prisoners. The numbers for Western Europe are for 2013 and are purchasing power parity-adjusted (Aebi et al., 2015). The data for 40 US states are for 2010 (Henrichson and Ruth Delaney, 2012).

[16] This approach not only determines prison conditions, but also potentially creates a different culture with more interpersonal trust and closeness between inmates and correctional staff, which could help in the identification of symptoms and the treatment of mental disorders.

[17] The occupancy rate is 76% in Norway, which ranks at the lower end of the highest occupancy rate distribution (42^{nd} out of the 57 European countries in the /www.prisonstudies.org). The US rate is 99.8%.

[18] In 2016, the number of personnel in adult prisons per 100,000 inhabitants was 96.5 in Norway, ranking 6^{th} of the 33 European countries for which we have data (Eurostat).

[19] The overcrowding that came with the era of mass incarceration in the US has also triggered the rise of a punitive mind-set with the use of harsher discipline, e.g., segregated placement and solitary confinement (Haney, 2017). These negative forms of institutional control may place the mental health of inmates in jeopardy by increasing the level of stress, anger, and psychological pain, and by reducing social contact.

[20] By contrast, offenders in the US are not eligible for unemployment insurance benefits upon release, have little access to public housing (Council of Economic Advisers, 2016), and are often denied access to food stamps, leading to higher rates of recidivism (Tuttle, 2019).

2.5 Data

Our analysis employs several data sources that we can link using unique individual identifiers. Information on the court cases is from the Norwegian Courts Administration. The main data set contains information on all court cases over the period 2005–2014. We observe the start and end dates of every trial, various case characteristics, the verdict, and unique identifiers for judges, defendants, and district courts. We link this information with administrative data containing a complete record of all criminal charges, including the type of crime, when it took place, and suspected offenders. These data can additionally be linked to the prison register with information on the actual time spent in prison.

We merge the court data with administrative registers provided by Statistics Norway using a rich longitudinal database that covers every resident from 1967 to 2019. For each year, it contains individual demographic information (including sex, age, and the number of children), socioeconomic data (such as years of education, earnings, and employment), as well as geographical and firm identifiers. Finally, we link these data to a registry of all health-care visits and their associated diagnosis codes for the period 2006–2019. This registry is filled by health-care professionals to handle reimbursement claims to the national health insurance system.[21] The database stores information about the health-care provider (e.g., type of practice, specialty, municipality of practice), the patient (e.g., identification number, date of birth, municipality of residence, sex, age, diagnosis), the date and time of the visit, and the reimbursement rate and deductible paid by the patient.

As in Bhuller et al. (2020), to ensure the validity of the random judge design, we restrict the sample to randomly allocated nonconfession cases decided by a regular judge. Our main sample uses cases decided between 2006 and 2014 so that each defendant's health outcomes can be followed for up to 5 years after the decision, while the judge stringency instrument is based on the entire period from 2005 to 2014. Our baseline estimation sample includes 59,560 cases, 37,934 unique defendants, and 596 judges.

The main outcome variables we examine are the total number of health-care visits or the probability of any health-care visit over a given period. We further decompose this outcome into mental or physical health-related visits. This categorization is based on the diagnosis codes associated to each visit, which follow international classifications. Diagnosis codes give the reason for the visit, even when it is not a first-time diagnosis. This means that, after a patient has been diagnosed with a certain disease for the first time, any follow-up visits are assigned the same diagnosis code. Each visit can be associated with single or multiple codes, and all of them are used in our definition. This implies that a visit associated with multiple codes related to a physical and mental health issue will be defined as both a physical and a mental health-related visit. The international classifications used

[21] For each contact a patient has with a publicly-funded health-care provider, a bill is sent to the Norwegian Health Economics Administration (HELFO).

are the International Classification of Diseases (10^{th} version) and the International Classification of Primary Care (2^{nd} version).[22]

Mental health visits are defined as visits associated with a code in the psychological category of the international classifications, or with a code whose label includes some specific words such as "depression", "suicide", and "addiction"[23] Given the distribution of mental health diagnoses (see Table A1 in Appendix A), we further decompose mental health visits into addiction- and non-addiction-related subcategories. The "addiction" category includes all substance abuse-related visits, whereas the "other" category includes all other mental health diagnoses. Substance abuse visits account for about 48.5% of mental health visits,[24] and principally correspond to drug abuse, but also alcohol, medication, and stimulant abuse (Table A2). The "other" category primarily consists of depression, anxiety and stress-related diagnoses (see Table A3).[25] For simplicity, we hereafter refer to this category as mood disorder diagnoses, although the category is in truth much broader. Physical health visits are defined as visits associated with a code not belonging to the mental health category. Table A4 in Appendix A indicates that the most common diagnoses in this category are very often either general or related to a musculoskeletal disorder.

2.6 Descriptive Statistics

Table A6 in Appendix A provides descriptive statistics for our main sample. Overall, the defendants in our sample are young, very frequently male, low educated and have a high rate of unemployment. About half of the cases in our sample are sentenced to prison, and more than one quarter involve a violent crime. Economic, property, and drug crimes make up slightly more than 10% each of all crimes. Prison sentences are usually short, with a median of 6 months (the full distribution of sentence length is available in Appendix A, Figure A2). Interestingly, health-care utilization is high among defendants, with 90% having at least one health-care visit the year preceding the crime, and 50% having more than eight visits over the same period. Mental health problems are also highly prevalent, with 54% of the sample having at least one mental health visit the year preceding the crime. Table A7 (Appendix A) provides the same statistics for the event study sample, which we restrict to cases sentenced to prison in 2009–2014. This sample is quite similar to our main sample, with a slightly higher proportion of men, and a higher likelihood of having been charged in the 5 years before the crime.

Table A5 compares the prevalence of health-care visits in the sample and general population

[22] More information can be found here and here.

[23] In practice, 99.9% of mental health visits defined this way are associated with a code entering the psychological category of the international classification.

[24] As measured in the data set of all health-care visits for our sample of defendants in 2010.

[25] This categorization is also based on descriptive studies run in Norwegian prisons finding that substance use, depression, anxiety, and personality disorders are the most prevalent mental disorders (Kjelsberg et al., 2006).

for 2010. Columns 3–5 systematically display significant differences, even when controlling for age and gender. Column 5 reports the standardized coefficients. In 2010, the sample of defendants had, on average, a 1.1 standard deviation higher number of mental health visits (i.e., five) than the general population. The difference is lower for physical health visits, down to 0.3 standard deviations.

Table A8 provides detailed descriptive statistics on the distribution of different types of health-care visits in the sample, comprising the average monthly probability and number of visits computed over the 30–36 months before the crime. This confirms the high prevalence of mental health visits, with an average probability of 20% having at least one mental health visit each month. Among mental health visits, the most common reasons are for substance abuse (includes any type of substance, such as alcohol, drugs, medication, etc.), severe mood disorders (i.e., depression), and light mood disorders (i.e., anxiety, stress, or sleep disturbance). Differences between defendants sentenced and not sentenced to prison after the case decision are a small magnitude, and indicate that incarcerated defendants have a slightly higher prevalence of mental health problems.

Overall, the descriptive statistics support the idea that the population of defendants is negatively selected in terms of health, calling for the use of econometric methods dealing with this selection. They also point to a high level of health-care utilization among the sample of defendants, seemingly despite their less favorable socioeconomic status.[26]

3 Methodology

To evaluate the causal impact of incarceration on the health of the defendants and their families we use two different methodologies. We start by presenting the two-way fixed-effects (TWFE) methodology that accounts for unobserved permanent heterogeneity by including case-by-defendant FEs and common time effects, relying effectively on variation in the timing of court decisions. We then describe how we exploit the random assignment of cases to judges in an IV strategy.

3.1 Event Study Design

Our first methodology relies on an event study that compares the evolution of outcomes for defendants incarcerated at different points in time. For this analysis, we restrict the sample to cases of incarcerated defendants decided between 2009 and 2014 to be able to observe outcomes 3 years before the case decision. We define the event as the incarceration decision[27] and estimate the

[26] We return to the distinction between health and health-care utilization in Section 4.2.

[27] The time of the incarceration decision is chosen as it complements the timing for the IV strategy presented below. Alternatives to incarceration decisions include the time of the crime, which we use to provide robustness to the main findings by specifying the time of crime as the running variable.

following equation:

$$Y_{i,t} = \alpha_{ic} + \sum_{\substack{j=-36 \\ j\neq -1}}^{60} \beta_j D_j + \gamma_t + \varepsilon_{i,t} \quad (1)$$

where $Y_{i,t}$ is the outcome variable (e.g. number of health-care visits) in month t for individual i, D_j are dummies measuring the distance to the month of the court's incarceration decision (i.e., the event), α_{ic} are case-by-defendant FEs, and γ_t are common calendar time (month $\times$ year) effects. By including case-by-defendant FEs, we control for all factors that are time-invariant at the individual and case levels. Calendar month $\times$ year FEs account for the common influence of time trends on the defendant's outcome.

The event study relies on the identification assumption that the timing of the court decision is random, conditional on α_{ic} and γ_t. Under this assumption, an OLS estimation of equation (1) would provide estimates of $\hat{\beta}_j$ that can be interpreted as the average treatment effect at month j as the case decision event for defendants who were incarcerated. However, as we only include incarcerated individuals in the event study estimation (no never-treated units),[28] we can run into the issues related to (i) under-identification, (ii) negative weights, and (iii) identification of long-term causal effects, as highlighted by Borusyak et al. (2021). We therefore implement the methodology they propose in all our TWFE estimations.[29]

A potential threat to identification could come from cooccurring influences of events that precede the event of incarceration. In our context, the event of incarceration is always preceded by the events of crime and the onset of trial. If defendant health outcomes are also affected by these events, then we could expect changes in defendant outcomes already prior to incarceration. A visual inspection of pre-trends from the event studies can be informative about the presence of such influences. We return to this in Section 4.3, where we also provide robustness checks by alternating the reference points used in the event studies.

[28] We could have included nonincarcerated defendants as never-treated units in our estimation, but the selection into incarceration makes it unsuitable as a control group. Indeed, even if we condition on committing a crime, being incarcerated is very likely correlated with the severity of the crime, and this could, for instance, influence health outcomes on top of the effect of incarceration.

[29] Underidentification refers to the fact that in the absence of never-treated units and when unit and time FEs are included, it is impossible to point identify the distance to the event dummies D_j in the fully dynamic specification. In addition, in the 'static' specification where all pre- and post-event distance dummies are aggregated into a binary post variable, the long-term effects are associated with negative weights because it is implicitly assumed that the effect of each period is constant. Finally, this also leads to the spurious identification of the long-term effects given that no nontreated unit can serve as a reference group in the final period. We therefore implement the methodology and associated Stata package *did_imputation* developed by Borusyak (2021). See Borusyak et al. (2021) for further details.

3.2 Random Judge Design

We complement the event study design with an IV strategy that takes advantage of the random assignment of cases to judges, as in Bhuller et al. (2020). We are interested in estimating the following relationship:

$$Y_{i,t} = \beta_t I_{i,0} + X_i^{'}\theta_t + \upsilon_{i,t} \quad (2)$$

where β_t is the coefficient of interest, $I_{i,0}$ is an indicator variable equal to one if individual i has been sentenced to prison at time zero (normalized to be the time of the court decision), and $Y_{i,t}$ is the outcome variable (e.g., number of health-care visits) measured in time t after individual i's court decision. As the randomization of judges to cases occurs within the pool of available judges within a court-by-year cell, we always include fully interacted court-by-year FEs among the vector of controls $X_i^{'}$.

The OLS estimation of Equation (2) could raise concerns of a selection bias, as defendants that are and are not incarcerated are unlikely to be comparable. Indeed, Table A8 in Appendix A confirms that these differ among many of their observed background characteristics. The random judge design addresses this concern by exploiting the fact that cases are conditionally randomly assigned to judges and that some judges are systematically more stringent that others. Taken together, this leads to as-good-as random variation in the probability a defendant will be incarcerated depending on which judge the case is assigned. We utilize this exogenous variation in $I_{i,0}$ to draw inferences about the causal effects of incarceration on defendant health. Our main analysis is based on the two-stage least squares (2SLS) estimation of β_t with Equation (2) as the second-stage equation and a first-stage equation specified as:

$$I_{i,0} = \gamma Z_{j(i)} + X_i^{'}\delta + \eta_{i,0} \quad (3)$$

where $Z_{j(i)}$ is the leave-out mean incarceration stringency of judge j assigned to handle the case of individual i.[30] Under the assumptions of instrument exogeneity and monotonicity, the 2SLS estimand can be interpreted as the positive weighted average of the causal effect of incarceration among the subgroup of defendants that is more likely to receive an incarceration decision if assigned to a stricter judge, and vice versa. This means that, unlike the event study, the IV approach yields an estimate of the effect of incarceration on the population of compliers. To improve precision in the IV regressions, we include, in addition to the court-by-year FEs, a rich set of background characteristics capturing defendants demography, type of crime, past work, and criminal history in

[30] As described in Section 2.1, we calculate judge stringency as the leave-out mean judge incarceration rate for all randomly-assigned cases each judge has handled over the 2005–2014 period, including both past and future confession and nonconfession cases.

the vector of control variables X_i'.

The validity of our IV strategy requires the instrument to be relevant, i.e., that judge stringency has a significant impact on the incarceration probability of defendants. Table A10 in Appendix reports first-stage estimates with and without the set of control variables. As shown, the first-stage estimates are stable across specifications and by year following the court decision. For a 10-percentage point increase in judge stringency, the probability of a defendant of being incarcerated increases by about 3.6 percentage points on average.

For our instrument to be valid, the stringency of a judge must be uncorrelated with both the defendant and case characteristics that could affect a defendant's future outcomes (after controlling for fully interacted court and year dummies). Table A11 tests the assumption of the random assignment of cases to judges. The results show that demography, type of crime, past work, and criminal history variables are highly predictive of the incarceration probability. However, running the same regression on the judge stringency instrument yields very few significant coefficients. The three significant coefficients are of very low magnitude, and the entire set of included variables are not jointly significant. This provides strong evidence that criminal court cases are randomly assigned in our sample, conditional on the fully interacted court and year FEs. Figure A3 in Appendix A further supports the randomization assumption as it shows no systematic correlation between the predicted number of health-care visits in months t to $t+12$ after the case decision computed using the same set of covariates as those in Table A11 and the judge stringency instrument.

The conditional random assignment of cases to judges is sufficient for a causal interpretation of the reduced form impact of being assigned to a stricter judge on defendant outcomes. However, interpreting the IV estimates as measuring the causal effect of incarceration requires an exclusion restriction: the incarceration rate of the judge should affect the defendant's outcomes only through the incarceration sentencing channel and not directly in any other way. Furthermore, with heterogeneous effects, monotonicity must also be assumed. As the random judge design is identical to that in Bhuller et al. (2020), we refer to Section IV.B in that paper for an additional discussion of the exclusion and monotonicity assumptions in this context.[31]

4 The Impacts of Incarceration on Defendant Health

We now provide evidence on the impact of incarceration on defendant mental health using the event study design and the random judge design discussed in Section 3.

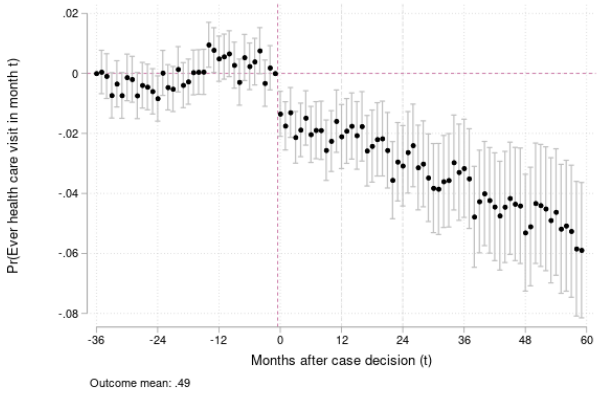
[31] There may be a variety of reasons why a judge is more or less likely to incarcerate. While we do not observe the personal characteristics of judges in our data for privacy reasons, we can measure how many cases they have handled. Using an OLS regression with the same controls as in Table A11, we find no relationship between the number of cases handled and judge stringency in our baseline sample. While other characteristics may influence the likelihood of incarcerating, if the randomization of cases holds, it should not matter for our analysis.

4.1 Main Results

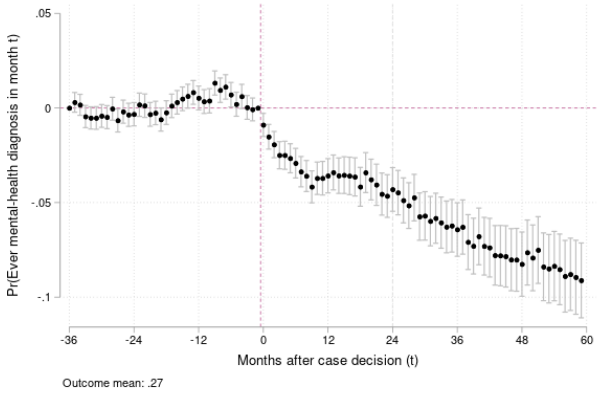
We start by estimating Equation (1) using the monthly panel of incarcerated defendants with cases decided between 2009 and 2014, following each defendant across the 36 months before and the 60 months after the court decision. Figure 1 graphically illustrates the results of this event study where we plot the coefficient estimates of the time-to-event dummies $\hat{\beta}_t$ along with the corresponding 95% confidence intervals.[32] These coefficient estimates should be interpreted as showing the effects of being incarcerated at time zero, relative to the pre-event period.

Figure 1: The Effects of Incarceration on Health-Care Visits.

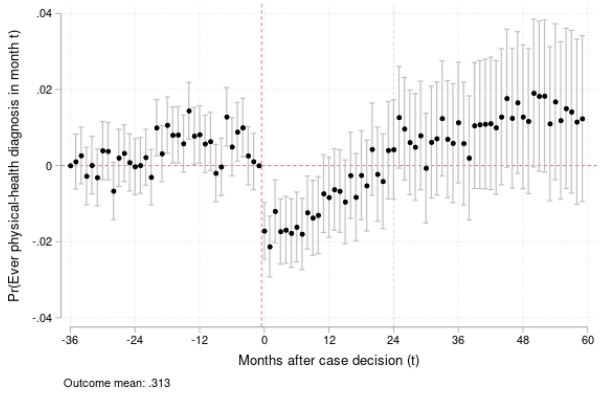
(a) Any Health-care Visit



(b) Mental Health Visit



(c) Physical Health Visit



Notes: The sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph plots the coefficients from the distance dummies.

We first consider whether a defendant had any visits to a health-care provider in a month, irrespective of the nature of the visit or the type of health diagnosis. Figure 1a indicates that there

[32] As we include both time and unit FEs in the event study specification, for the graphical representation of the event dummies, we exclude two time-to-event dummies to identify calendar time effects separately from the time-to-event effects (Borusyak and Jaravel, 2017). We exclude both the first time-to-event dummy (i.e., 36^{th} months before the court decision) and the last one before the event (i.e., 1 month before the court decision).

are no changes in the probability of a health-care visit prior to the incarceration event, and large, persistent and statistically significant reductions post-event. At 60 months after the incarceration event, incarcerated defendants have a six percentage point lower probability of a health-care visit, which suggests a 12 percent reduction when compared with the pre-event mean of 49 percent.

Table 1: The Effects of Incarceration on Mental Health.

A. Probability of Mental Health Visit			
	OLS	TWFE	IV
	(1)	(2)	(3)
Months 1–12	0.018***	-0.035***	-0.192*
	(0.003)	(0.002)	(0.104)
Dependent Mean	0.25	0.25	0.25
Months 13–60	0.037***	-0.069***	-0.096
	(0.003)	(0.005)	(0.086)
Dependent Mean	0.25	0.25	0.25
B. Number of Mental Health Visits			
	OLS	TWFE	IV
	(1)	(2)	(3)
Months 1–12	0.033***	-0.083***	-0.915**
	(0.013)	(0.009)	(0.412)
Dependent Mean	0.61	0.61	0.61
Months 13–60	0.115***	-0.133***	-0.679*
	(0.011)	(0.019)	(0.360)
Dependent Mean	0.66	0.63	0.66
Controls:			
Demographics			✓
Type of Crime			✓
Past Work & Crime History			✓
Case x Individual FEs		✓	
Period FEs		✓	
Court x Case Entry Year FEs			✓

Notes: The sample of nonconfession criminal cases processed in 2009–2014. Standard errors clustered at the case level in the OLS and TWFE estimations and two-way clustered at the judge and defendant level in the IV estimation. 95% confidence intervals.The table reports the estimates of the effect of being incarcerated on the probability (Panel A) and number (Panel B) of mental health visits. Column (1) reports the OLS estimates without controls or FEs, while column (2) reports the TWFE estimates which includes case and period (month $\times$year) FEs. Column (3) reports the estimates from the IV, where the prison indicator is instrumented with the stringency score of the judge to whom the case has been assigned, and where we control for demographics (age, sex, foreign-born status, number of children, marital status, level of education), type of crime, past work, and crime history (indicator for being employed in year t-1 to t-5 before the year of the crime, indicator for being ever charged in year t-1 to t-5 before the year of the crime, indicator for being ever incarcerated in year t-1 to t-5 before the year of the case decision) and court-by-case entry year FEs. The dependent mean is the mean of the outcome in the sample included in the regression.*p<0.1, **p<0.05, ***p<0.01.

Next, we decompose health-care visits depending on whether the visit is related to a mental or nonmental health problem. Focusing on mental health-related visits in Figure 1b, we again find negligible changes in the probability of a mental health visit prior to the event, and large, persistent and statistically significant reductions post-event. In relative terms, we find that incarcerated defendants experience a 30 percent reduction in the probability of a mental health visit at 60 months after the event, when we compare the estimated 8 percentage point reduction to the pre-event mean

of 27 percent. By contrast, we do not find any meaningful impacts on the probability of a physical (nonmental) health visit beyond a reduction in the first 12 months. We return to an interpretation of this temporary reduction in Section 4.2.

In the following, we focus exclusively on mental health-related visits. Table 1 provides results from TWFE and random judge estimations, along with standard OLS estimates. Panel A shows estimates for the probability of a mental health visit per month, while Panel B shows estimates for the number of monthly mental health visits. In each panel, we further distinguish between health visits that take place during months 1–12 and months 13–60 after the event, respectively. Comparing columns (1)-(3), we find striking differences between the positive OLS estimates reported in column (1) and the negative TWFE and IV estimates in columns (2)-(3), which indicate that incarceration lowers the probability of a mental health visit. Consistent with the descriptive evidence presented in Section 2.6, the OLS estimates suggest that mental health visits are more common among incarcerated defendants. By comparison, the TWFE estimates show significant reductions in both the probability of having at least one mental health visit per month and the average number of monthly mental health visits. Finally, the IV estimates also indicate strong reductions in mental health visits.

The contrasts between the different sets of estimates in Table 1 are informative about the importance of selection bias in observational comparisons of incarcerated and unincarcerated defendants. The positive OLS estimates reported in column (1) are likely due to selection bias–incarcerated defendants have worse health outcomes than do unincarcerated defendants, not because the former faced incarceration and the latter did not, but because the two groups also differ in background characteristics, either observed or unobserved, that correlate with their health. Once permanent individual characteristics are accounted for–as in the TWFE estimates in column (2)–the incarceration effect estimates change signs and become negative. The latter finding indicates that incarceration may instead reduce the mental health adversities facing incarcerated defendants. When we rely on cross-sectional comparisons between incarcerated and unincarcerated defendants that otherwise are identical along their observed or unobserved background characteristics–as in the random judge estimates in column (3)–we again reach the conclusion that incarceration improves defendants' mental health outcomes.

In terms of magnitude, the effect is large. Using the TWFE coefficient over the 5 years after the case decision, a back of the envelope computation leads to an estimate of about 0.5 mental health-related visits per year per inmate that did not occur because of incarceration. This can be compared to the average number of mental health related visits per inhabitant per year in the general population of 0.96 in 2010.[33]

[33] Another way to benchmark our result is to compare it with other interventions that impacted mental health. For instance, in Baicker et al. (2013), the approach takes advantage of an Oregon experiment where Medicaid coverage was randomly allocated to people on a waiting list with a lottery. Using the lottery as an instrument for actual Medicaid

Finally, we note that the IV point estimates in Table 1, column (3), are substantially higher than the corresponding TWFE estimates in column (2), although the former also has larger standard errors. There are at least two explanations for these differences in point estimates. First, under heterogeneous treatment effects and monotonicity in judicial decision-making, the IV estimates provide the LATE for compliers who are incarcerated solely because their case was assigned to a strict judge and who otherwise would have remained unincarcerated (Angrist and Imbens, 1994). By contrast, the TWFE estimates provide the ATT. Thus, if compliers have larger mental health responses to being incarcerated than do always-takers, then the effects of heterogeneity could appear in the IV and TWFE estimates. Second, while the IV estimates rely on the conditional randomization of similar cases to judges that differ in their stringency, the TWFE estimates effectively rely on changes in pre- and post-event outcomes for incarcerated defendants, conditional on their permanent characteristics and common calendar time effects. Even if defendants who are incarcerated at different times have similar trends in outcomes prior to the event, one concern could be that contemporaneous shocks arise at the same time as the incarceration event (e.g., job displacement, family disruption, victimization) which may also influence defendants' health outcomes and thus confound the effects of incarceration. On the contrary, to the extent that such events are contemporary to or correlated with, but not caused by, incarceration, the IV estimates purge their influence on health outcomes.

4.2 Interpreting the Evidence

We now discuss the possible mechanisms behind the impacts of incarceration on mental health.

Incapacitation. One explanation for the observed drop in mental health visits immediately after the incarceration event is that when inmates are incapacitated, they might also be restrained from accessing out-of-prison health services.[34] If reductions in mental health visits are driven solely by such incapacitation effects, then we would expect to find only temporary declines over the duration of a prison spell, and no differences beyond this. By contrast, the negative effects on monthly mental health visits reported in Figure 1b extend up to 5 years after the incarceration decision, with gradually stronger effects as we move further away from the incarceration event. This evidence thus

enrolment, they identifed a 30% decrease in the likelihood of a positive depression screening. Although the context and measure of mental health (using an eight-question version of the Patient Health Questionnaire (PHQ-8)) are different, it suggests that our effect is sizable.

[34]Note that inmates in Norwegian prisons have equal rights to public health services as the population at large (Moe, 2018). However, the health-care database to which we have access (KUHR) primarily covers out-of-prison public health services, along with health services procured by the prison authorities from out-of-prison practitioners for inmates that require such special services. Standard in-prison health services or checkups are not usually recorded in this database. To the extent that in-prison health services substitute for out-of-prison health services, we would expect a decline in health-care utilization measures based on the KUHR database during the period inmates are incarcerated.

lends strong support against the declines in mental health visits being driven mainly by prisoner incapacitation.[35] Indeed, prison sentences are typically short in Norway, with a median length of 6 months, and with most inmates having a sentence of 1 year or less (see Figure A2). We reach the same conclusion based on the evidence in Table 1, where we split the window of observation to be the first year and then the ensuing 4 years post-incarceration. By contrast, the temporary decline in physical health visits and no significant differences beyond the first year that we found in Figure 1c could be attributed to incapacitation effects.

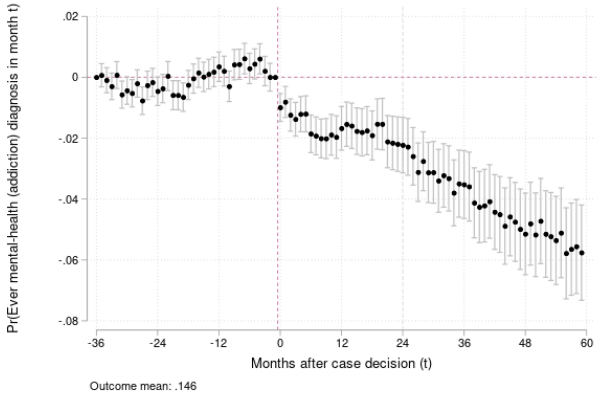
De-addiction. Drug use is highly prevalent among prison populations, with survey evidence for Norwegian inmates suggesting that six of every 10 inmates consumed illegal drugs in the month prior to the prison spell served at the time of the interview (Friestad and Kjelsberg, 2009). To help inmates suffering from substance abuse, the Norwegian correctional services provide extensive de-addiction prison programs, besides maintaining provisions for open prisons and offering prison work, education, and other rehabilitation services (see Section 2.2). Thus, one explanation for the observed drop in mental health visits could be that spending time in prison helps former inmates recover from drug-related problems, implying that they need fewer addiction-related treatments post-release. Substance abuse is also widely recognized as being strongly associated with mental health problems (National Institute on Drug Abuse, 2020). To the extent drug-related problems impair mental health (e.g., by causing depression, mood disorders), we may also expect fewer visits related to such mental health problems among former inmates. Similarly, if prison directly improves inmate mental health, then this may collaterally reduce their propensity for substance abuse.

To investigate these channels, we decompose our measures of mental health visits into those that strictly relate to addiction or drug use and those that relate to regular mental health diagnoses such as depression, mood disorders, and suicidal tendencies. Figure 2a shows large, persistent, and statistically significant reductions in addiction-related visits to health-care providers. At 60 months post-incarceration, there is a 40 percent decline in the probability of addiction-related visits, comparing the 6 percentage points estimate to the pre-event mean of 14.6 percent. Further, Figure 2a shows equally large reductions in regular mental health visits related to depression, mood disorder, etc. This evidence suggests that the drop in mental health visits extends beyond de-addiction, either because incarceration directly improves former inmates' mental health (which possibly also lowers their inclination for substance abuse) or because de-addiction improves general mental health.

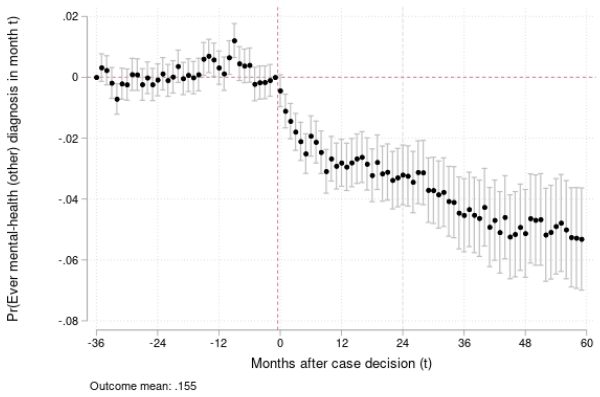
[35] Another argument could be that even the persistent reductions in mental health visits result from the incapacitation effects of *future* incarceration. Underlying this is that prison begets future crime, rather than deterring it, and thus also leads to a higher risk of future incarceration. On the contrary, Bhuller et al. (2020) find that incarceration reduces future crime in our context, with no meaningful impacts on future incarcerations.

Figure 2: The Effects of Incarceration on Addiction and Depression.

(a) Addiction-Related Visit



(b) Depression or Mood Disorder-Related Visit



Notes: The sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph plots the coefficients from the distance dummies.

Health-care utilization. Another interpretation of the observed drop in mental health visits is that this reflects a reduction in former inmates' demand for health-care services rather than a mental health improvement per se. For instance, we can argue that inmates demand fewer health-care services after release as incarceration weakens their institutional trust and leads to animosity against public authorities. In the context of Norwegian prisons that offer relatively humane prison conditions and maintain equal rights to public health services for inmates as the population at large, we expect such effects to be less pronounced. While the descriptive evidence (Table A6) suggests that our prison population maintains high levels of health-care utilization before and after prison, to test for this mechanism, we utilize detailed diagnoses attached to each health-care visit. Specifically, we consider the events of mental health emergencies (e.g., suicide attempts, acute stress disorders) and any health emergencies (i.e., mental or physical health emergencies). We envision that health emergencies more often capture changes in health conditions or behavior and not any health-care demand effects that could exist holding constant individuals' health conditions.

Table 2 provides the event study estimates of the effects of incarceration on the probabilities (Panel A) and numbers (Panel B) of mental and any health emergency, respectively. In both cases, we find reductions in health emergencies after the incarceration event, and the negative effects persist beyond the first 12 months after the event.[36] These results again support our main finding

[36]Figures showing the time profile of incarceration effects on health emergencies can be found in Appendix A (Figures A4a-A4b). Unlike the health outcomes we have considered so far, we also find some increases in health emergencies in the 12-month period prior to the incarceration event. In the period before the 12 month period prior to the incarceration event, however, there are no differences in health emergencies. One interpretation of such pre-event effects could be that incarcerated defendants changed their risk behavior (e.g., commited more crime) in the months leading up to the incarceration event, which also increased their risk of experiencing health emergencies. As noted earlier, one way to address the concern of such pre-event effects is to shift the pre-event window to before the onset of pre-event behavioral changes. We return to this point below when we discuss the robustness of our findings. In either case, we note sharp and persistent declines in the probabilities of health emergencies after the incarceration event.

that incarceration improves the mental health of inmates after release.

Table 2: The Effects of Incarceration on Health Emergency.

A. Probability of Any Visit		
	Any Health Emergency Visit	Mental Health Emergency Visit
	(1)	(2)
Months 1–12	-0.032***	-0.017***
	(0.001)	(0.001)
Dependent Mean	0.08	0.03
Months 13–60	-0.056***	-0.032***
	(0.002)	(0.002)
Dependent Mean	0.08	0.03
B. Number of Visits		
	Any Health Emergency Visit	Mental Health Emergency Visit
	(1)	(2)
Months 1–12	-0.043***	-0.017***
	(0.005)	(0.003)
Dependent Mean	0.12	0.05
Months 13–60	-0.081***	-0.034***
	(0.011)	(0.005)
Dependent Mean	0.13	0.05

Notes: The sample of nonconfession criminal cases processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. Emergency visits are health-care visits to an emergency room (ER). Mental Health emergency visits are health-care visits to an ER for a mental health reason. The dependent mean is the mean of the outcome in the sample included in the regression. *p<0.1, **p<0.05, ***p<0.01.

Heterogeneity. Leveraging the richness of our data, we next explore heterogeneity in the effects of incarceration on mental health along three important dimensions. First, we consider inmates' past mental health history and investigate heterogeneity in the impacts across inmates who previously had and did not have a mental health disorder. Second, we consider heterogeneity in the prison conditions that the inmates faced, distinguishing between inmates assigned to prisons with mild conditions, i.e., open prisons or prisons with certified mental health or rehabilitation programs, or to prisons with harsh conditions, i.e., closed prisons without such certified prison programs. Finally, we consider heterogeneity in whether defendants faced a prison sentence for a violent or a nonviolent crime.[37]

Columns (1)–(2) in Table 3 show the effects of incarceration by inmates' past mental health history, considering inmates who had and did not have any previous mental health disorders. If prison reduces the likelihood of mental health disorders among the former, then this could mean that

[37] We also consider heterogeneity by prison spell length. We divide the sample of incarcerated defendants in 2009–2014 into two groups, those below and above the median length at 6 months, and report the TWFE estimates in Figure A8 (Appendix A). We do not measure any significant difference in the effect of prison on mental health between offenders sentenced to short and long sentences, suggesting that in our context, the extensive margin effect of prison matters more than time spent in prison.

prison safeguards against the onset of new mental health disorders among those without preexisting mental health conditions. Alternatively, if prison only affects the latter group, then this may reflect that prison reduces the intensity of mental health disorders or rehabilitates some among the inmates with previous mental health disorders. Because we do not want to condition on the outcome in the TWFE estimation, we do not directly use information on past mental health visits. Instead, we leverage the very rich sociodemographic data to predict the probability of having any mental health visit within 3 years prior to the crime. We then define those with (no) previous disorder as defendants with predicted probability above (below) the sample median.[38] Focusing on the first 12 months post-court decision, we find that inmates both with and without past mental health disorders are impacted similarly with regard to their probability of a mental health visit (Panel A) and the number of mental health visits (Panel B). However, in the 13–60-month period after the court decision, the impacts, especially on the number of visits, are larger for those with no previous disorders.

Next, we consider heterogeneity in the effects of incarceration by the prison conditions facing inmates.[39] Focusing on Panel A of Table 3, columns (3)–(4), we find that inmates facing both mild and harsh prison conditions have lower probabilities of mental health visits with similar sized impacts, both in the first 12 months and in the 13–60-month period after the court decision. However, when we consider the number of mental health visits in Panel B in columns (3)–(4), we find much stronger reductions for inmates facing mild prison conditions. Notably, these inmates experience larger reductions despite having a lower dependent mean on average. These findings suggest that exposure to milder prison conditions seems to matter more at the intensive than the extensive margin of mental health problems.

Finally, in Table 3 columns (5)–(6), we consider heterogeneity in the effects of incarceration by the type of crime for which defendants faced a prison sentence. Comparing defendants who committed violent and nonviolent crimes, we find little evidence for heterogeneity in the effects of incarceration on the probability of mental health visits (Panel A). However, we find that the point estimate on the number of mental health visits (Panel B) during the 13–60 -month period post-court decision is larger for inmates who committed a violent crime. The corresponding figures showing the time profile of the mental health effects of incarceration for these different subgroups can be found in Appendix A (Figures A5 to A7).

[38]The prediction model uses a flexible function of the following covariates: gender, age, foreign-born, marital status, number of children, education level, employment status, benefit recipient, wage, municipality, a variable indicating if a child died in the last 5 years, and the age of the child at death. The prediction model is described further in Appendix B.

[39]For this analysis, only 85% of the sample of sentenced defendants is included, as the information on prison identifiers is missing for the other inmates, which is required to classify the type of prison facility inmates served in.

Table 3: Heterogeneity by Past Mental Health History, Prison Conditions and Type of Crime.

A. Probability of Mental Health Visit						
	Past Mental Health History		Prison Conditions		Type of Crime	
	No Disorder	Had Disorder	Mild	Harsh	Violent	
	(1)	(2)	(3)	(4)	(5)	(6)
Months 1–12	-0.037***	-0.033***	-0.036***	-0.034***	-0.033***	-0.036***
	(0.003)	(0.004)	(0.003)	(0.005)	(0.004)	(0.003)
Dependent Mean	0.17	0.33	0.25	0.29	0.19	0.28
Months 13–60	-0.084***	-0.055***	-0.067***	-0.063***	-0.086***	-0.060***
	(0.007)	(0.007)	(0.006)	(0.010)	(0.008)	(0.006)
Dependent Mean	0.18	0.33	0.25	0.29	0.18	0.28
Number of Observations	8,760	9,436	10,965	5,254	6,055	12,897
B. Number of Mental Health Visits						
	Past Mental Health History		Prison Conditions		Type of Crime	
	No Disorder	Had Disorder	Mild	Harsh	Violent	NonViolent
	(1)	(2)	(3)	(4)	(5)	(6)
Months 1–12	-0.076***	-0.093***	-0.103***	-0.040***	-0.085***	-0.082***
	(0.011)	(0.015)	(0.012)	(0.020)	(0.013)	(0.012)
Dependent Mean	0.38	0.84	0.59	0.72	0.42	0.69
Months 13–60	-0.169***	-0.111***	-0.153***	-0.055	-0.191***	-0.105***
	(0.022)	(0.033)	(0.026)	(0.046)	(0.030)	(0.025)
Dependent Mean	0.40	0.85	0.60	0.75	0.42	0.72
Number of Observations	8,760	9,436	10,965	5,254	6,055	12,897
Controls:						
Case x Individual FEs	✓	✓	✓	✓	✓	✓
Period FEs	✓	✓	✓	✓	✓	✓

Notes: The sample of nonconfession criminal cases processed in 2009–2014. The estimation includes controls for case and period (month × year) FEs. Standard errors clustered at the case level. 95% confidence intervals. Past mental health history is predicted using a sample of individuals in the Norwegian population register aged 10 years or more in 2009 and alive in 2010. No (had) disorder is defined as below (above) the median of the predicted probability of having had a mental health visit in the 3 years preceding the crime. Prison conditions are defined for 85% of the sample of defendants sentenced to prison with nonconfession criminal cases processed in 2009–2014 that have an available prison ID. Mild conditions refer to open or closed prisons with a certified mental health or rehabilitation program, whereas harsh conditions refer to closed prisons without these types of programs. The dependent mean is the mean of the outcome in the sample included in the regression. *p<0.1, **p<0.05, ***p<0.01.

Relation to the literature. Contrary to correlational studies often highlighting that inmates are at a higher risk of death or are more likely to have health issues, our results point to the positive causal impact of prison on mental health. The two causal studies that are closest to ours, however, consistently find that incarceration decreases mortality risk. Using a modified DiD framework, Norris et al. (2020) find that incarcerated defendants face lower mortality rateshile in prison than do nonincarcerated defendants, and they can rule out the positive effect on mortality risk post-release. This protective effect of prison is stronger for deaths caused by homicides, overdoses, or suicide. Focusing on the intensive margin of prison sentence, Hjalmarsson and Lindquist (2020) exploit reforms in Sweden that provided a quasi-experimental variation in the time spent in prison. They show that more time spent in prison causes a decrease in mortality rates when focusing on specific populations or causes of deaths. Interestingly, they find that the decrease in mortality risk is partly driven by a decrease in the chance of suicide of about 80% in the 3 years post-release. This reduction is particularly strong for violent offenders, like what we find, and for offenders with a history of mental health, whereas we find the opposite.

Although both studies use mortality as an outcome and cannot be quantitatively compared with ours, their findings of positive incarceration effects on defendant health coincide with ours. In particular, the causes of deaths for which they assign the strongest decrease are related to mental health (suicide and overdose), although they also find other margins of health improvement.

4.3 Robustness

We now assess the robustness of our main findings on how prison affects inmates' mental health.

Preceding and following events. As discussed in Section 2.1, an incarceration event is always preceded by the event of crime and the trial process that follows criminal investigation. If the latter events also affect incarcerated defendants' mental health, then we can expect such effects to appear as pre-event changes in the mental health outcomes prior to the court decision. While our graphical evidence in Figure 1b for mental health visits shows little indication of such pre-event effects, to encompass such impacts we now alternate the reference points used in the event study. Our baseline uses the first time-to-event dummy (i.e., the 36th month before the court decision) and the last time-to-event dummy before the event (i.e., the month before the court decision) as reference points.

First, we re-estimate the event study specification by setting the second reference point as the time-to-event dummy for 18 months before the court decision rather than 1 month before. More than three of four defendants in our sample had committed the crime they were facing trial for during the 18-month period prior to the court decision. To distinguish the onset of the court trial further, we add a vertical line at 4 months before the court decision, as three of four defendants had

the start of their trial within the 4 months prior to the court decision. The event study estimates on mental health visits using the alternative reference points at -36 and -18 months are provided in the Appendix Figure A9b. These estimates confirm our baseline estimates (repeated in Figure A9a) that prison significantly lowers inmates' likelihood of having mental health-related visits, with reductions persisting beyond the first 12 months after the court decision. If anything, incarcerated defendants have slightly higher rates of mental health-related visits in the 18 months prior to the court decision, which could be related to the onset of crime or the trial process.

Second, we re-estimate the event study specification dropping all periods between the month of the crime and the month before the court decision, and instead using the month before the crime as the second reference point.[40] The results from this exercise are presented in the Appendix Figure A9c. Again, we find that the event of the case decision is followed by a substantial reduction in the likelihood of mental health-related visits, and these reductions persist over time.

Finally, given that prison entry does not necessarily immediately follow the court decision,[41] we re-estimate the TWFE specification using prison entry as the event.[42] Results are reported in the Appendix Figure A9d. We observe a slight decrease in the probability of mental health visits before incarceration, followed by a sharp reduction immediately after. This immediate reduction likely captures the incapacitation effect of prison. Consistently, as inmates are gradually released, we observe an increase up to half a year after prison entry. The longer term impacts remain strong and negative.

Repeat offenders. Another potential issue with the event study estimates relates to the presence of repeat offenders. If some defendants offend repeatedly and are reincarcerated within the observed period, then their future self will be used as a control for their first offence. To the extent that the treatment effects of incarceration are not constant over time, or when the effects of repeated incarcerations are not additive, the presence of repeat offenders in our sample can make it more difficult to interpret the event study estimates. To address these concerns, we re-estimate the event study specification by restricting the sample to the first observed offence within the 2009–2014 period. Imposing this restriction reduces the number of cases sentenced to prison over that period from 20,769 to 17,230. The results from this exercise are presented in the Appendix Figure A9e. The results remain virtually unchanged. In fact, the decrease in the probability of mental health visits is even more pronounced and precisely estimated than in the baseline.

[40] For this exercise, we consider only 12 months in the pre-event period, to keep the sample as balanced as possible.

[41] We report statistics on the time period between the case decision and actual incarceration in Tables A6 and A7. The median is 171 and 138 days, respectively.

[42] We therefore exclude from this analysis the 12% of the sample who do not have a prison entry date reported (for instance, either because they emigrated, or served their sentence under electronic monitoring).

Electronic monitoring. On September 2008, Norway gradually introduced electronic monitoring as an alternative way of prisoners serving short prison sentences in some regions, until a national implementation in May 2014. This implies that some of the defendants included in our sample are not going to serve their sentence in prison, which would pollute our treatment definition.[43] We reproduce the main event study graph excluding prison sentences served via electronic monitoring in Appendix A. Again, the results remain virtually unchanged (Figure A9f).

Sensitivity of the IV estimates. In Table 1, column (3), we provided IV estimates of the effects of incarceration on defendants' mental health using a random judge design and the assigned judge's stringency as an instrument. While the IV estimates were more imprecise than the TWFE estimates, both approaches suggested reductions in mental health outcomes. Following Bhuller et al. (2020), we also made attempts to assess the sensitivity of our IV estimates. While these baseline IV estimates were constructed for cases assigned to judges who had handled at least 50 cases (to ensure sufficient number of cases to measure precisely judge stringency IV), we also estimated the IV models for cases assigned to judges handling at least 75 or 100 cases, respectively. We also assessed the sensitivity of our IV estimates to calculate the judge stringency IV based on only non-confession cases, while in our baseline, we used all randomly assigned cases (both confession and nonconfession cases), as in Bhuller et al. (2020). Furthermore, we also estimated a reverse sample IV, where we randomly split our sample in half and used one half to calculate the average incarceration rate of each judge, and then used these measures of judge stringency as an IV for incarceration in the other half of the sample. The results from these various sensitivity analyses are provided in the Appendix Table A9. While our results based on the IV approach do not qualitatively change, their magnitude and precision vary across specifications. For the number of mental health visits, the coefficients vary from -0.4 to -0.7, and we lose precision in column (3), where the number of observations is also smaller. However, the point estimates still confirm our main finding that prison improves inmates' mental health.

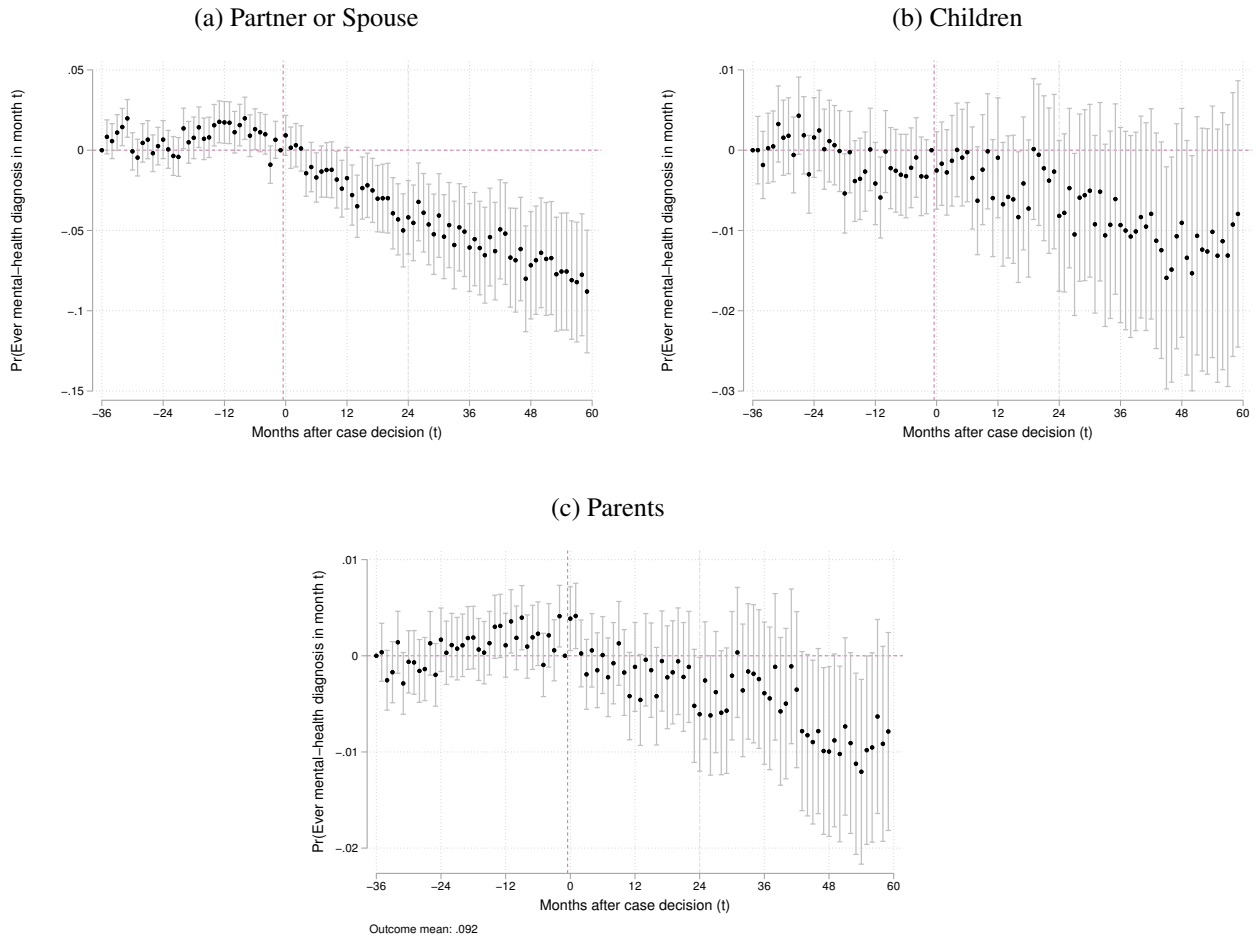
5 Spillover Effects on Family Health and Well-being

We now consider the spillover effects of defendant incarceration on their preexisting family members' mental health. These spillovers could come from the more direct effect of removing the defendant from the family or as a spillover from the changes in the defendants' mental health because of prison. We start by estimating the effects of defendant incarceration on the mental health outcomes of partners (including the marital spouse or previously cohabitating partner), children,

[43] We count about 18% of the sample of offenders sentenced to prison in 2009–2014 that are serving their sentence partly or fully under elect.

and parents using the event study design.[44] The resulting estimates are illustrated in Figure 3. Consistent with the large and persistent negative effects in Section 4 on the likelihood defendants have mental health problems post incarceration, we also find similar impacts on defendants' partner's mental health visits in Figure 3a. Notably, the impact profile is quite flat before the defendant's incarceration and declines sharply after the event. Focusing next on the defendants' children in Figure 3b, we again notice the tendency for negative point estimates post-incarceration, however, the confidence intervals are too wide to draw firm conclusions. For the defendants' parents in Figure 3c, there is clearer evidence that at least in the longer term incarcerated defendants' parents have a lower likelihood of mental health visits.

Figure 3: The Effects of Incarceration on Family Peers' Mental Health.



Notes: The sample of partners, children and parents of defendants sentenced to prison with nonconfession criminal cases processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph plots the coefficients from the distance dummies.

[44] Regarding children, we only include those aged 8 years or older at the time of the case decision. We end up with a sample of 24,378 children spells, 7,500 partner spells, and 67,357 parent spells with the defendant's case decided between 2009 and 2014. As the TWFE is estimated on incarcerated defendants, accounting for about half of the sample, the number of observations reported in Table 4 is about half of the aforementioned number of family member spells.

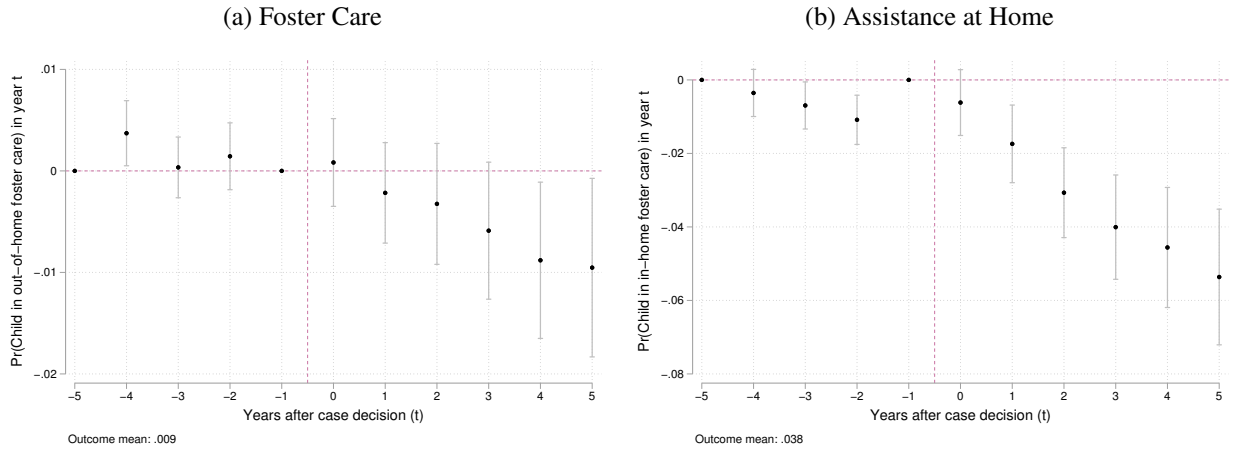
Table 4: The Effects of Incarceration on Family Peers' Mental Health.

A. Probability of Mental Health Visit			
	Partner or Spouse	Children	Parents
	(1)	(2)	(3)
Months 1–12	-0.027***	0.001	-0.002*
	(0.005)	(0.002)	(0.001)
Dependent Mean	0.18	0.08	0.10
Months 13–60	-0.073***	-0.002	-0.007***
	(0.010)	(0.004)	(0.003)
Dependent Mean	0.17	0.08	0.10
B. Number of Mental Health Visits			
	Partner or Spouse	Children	Parents
	(1)	(2)	(3)
Months 1–12	-0.065***	-0.003	-0.003
	(0.015)	(0.005)	(0.003)
Dependent Mean	0.38	0.16	0.18
Months 13–60	-0.163***	-0.008	-0.016**
	(0.030)	(0.011)	(0.006)
Dependent Mean	0.37	0.17	0.18
Number of Observations	3,595	12,370	29,939
Controls:			
Case x Individual FEs	✓	✓	✓
Period FEs	✓	✓	✓

Notes: The sample of family members of defendants with nonconfession criminal cases processed in 2009–2014. Column (1) reports the TWFE estimates on the sample of partners, and includes controls for case and period (month × year) FEs. Column (2) reports the TWFE estimates on the sample of children aged 8 years or older at the time of the case decision, and includes controls for case ×child ID and period (month × year) FEs. Column (3) reports the TWFE estimates on the sample of parents, and includes controls for case ×parent ID and period (month × year) FEs. Standard errors clustered at he case level. 95% confidence intervals. The dependent mean is the mean of the outcome in the sample included in the regression. *p<0.1, **p<0.05, ***p<0.01.

Table 4 reports the corresponding estimates from the TWFE specification, which summarizes the event study estimates for the 1–12 months and the 13–60 months post-court decision. Column (1) confirms the event study results, indicating that incarcerated defendants' partners have a lower likelihood of a mental health visit (Panel A) and fewer mental health visits (Panel B), and the improvements in their mental health persists after the 12-month period post-court decision, when the defendant is also likely to be out of prison. Unlike defendants, their family members by construction do not experience incapacitation and thus, the reductions in their mental health visits are likely to reflect fewer mental health problems already from the initial period when the defendants faced the court decision. The similarity across the impact profiles for defendants and their partners, however, could reflect that both experience gradual improvements in their mental health. Focusing on the defendants' parents in Column (3), we again find noticeable declines in mental health visits, especially in the post 12-month period when defendants are more likely out of prison. To investigate further the channels driving the positive effect on spouses' mental health, we look at the probability for the incarcerated defendant of staying with the same spouse as the one

Figure 4: The Effects of Incarceration on the Incidence of Child Protection Service Events.



Notes: The sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph plots the coefficients from the distance dummies.

defined the year before the case decision.[45] At 5 years after the case decision, only about 40% of the spouses remain together, suggesting that the "removal of a bad influence" channel could be at play.[46] Comparing single and partnered inmates, we also find that inmates with a partner the year before the case decision exhibit stronger declines in the probability of mental health-related visits (Figure A11). This is in-line with the hypothesis that the marked improvement in the offender's mental health spills over to the mental health of family members.

To assess further the impacts on family well-being and child outcomes, we utilize additional data on yearly child protection services (CPS) incident reports. Specifically, these data enable us to measure two types of CPS-related events at the annual level for families with incarcerated defendants. First, we observe all events of foster care provided to a child at high risk of neglect or abuse. We consider whether at least one child in the defendant's family was taken out of the family residence by the CPS and provided with alternative shelter. Second, we observe events of in-home assistance provided by CPS caseworkers to families that experience social problems and where a child faces some risk of neglect or abuse. As earlier, we exploit the timing of defendants' incarceration in an event study design to study how the prevalence of foster care and in-home CPS assistance change following the incarceration event. The results are illustrated in Figure 4. Consistent with our previous findings on improvements in family mental health, we reveal significant reductions in the likelihood of in-home assistance post-event in Figure 4b. Similarly, we also note

[45] Our sample of spouses are defined as the spouses of defendants the year before the case decision.

[46] Supporting this hypothesis, we plot in Figures A10 of Appendix A the TWFE estimates on spouses separately for those with and without the defendant 5 years after the case decision. The figures show that the negative effects on the probability and number of a mental health visits are concentrated among spouses who did not stay with the defendant. While we cannot interpret this result causally, given the endogeneity of the decision of staying with the defendant, this may suggest that removing a dysfunctional spouse could partly explain the positive impact of incarceration on the mental health of the spouse.

a decline in the likelihood of foster care, although the effect estimates are only significant at 5 years post-incarceration.

Taken together, the evidence that incarcerated defendants' family members experience fewer mental health problems and that there are far fewer child protection-related incidents in these families suggests that incarceration can have important positive spillovers on family health and well-being.

6 Conclusion

In this paper, we examined the impacts of incarceration on inmates' health in general, and their mental health in particular. We went beyond the positive association between incarceration and the prevalence of mental health disorders by relying on two different methodologies. The TWFE approach exploited the variation in the date of incarceration decision while controlling for time and case FEs. To support this methodology, we used an alternative approach where we instrumented the incarceration of defendants using the assigned judge's stringency, taking advantage of the random assignment of cases to judges. Both methods consistently showed that prison causally lowered the prevalence of mental health disorders. Our findings demonstrate that this reduction persists post-release, and that it is driven by a decrease in both addiction- and mood disorder-related visits.

We make a further contribution by providing the first causal evidence on the impact of prison on the health of inmates' family members, finding that incarceration has positive spillovers on the mental health of spouses, parents, and children. The decrease in child protection-related incidents for children of incarcerated defendants further supports the argument that the well-being of the family is positively impacted. Overall, our findings suggest that time spent in prison with a focus on rehabilitation can have large positive effects that go beyond any direct effects on the prisoner.

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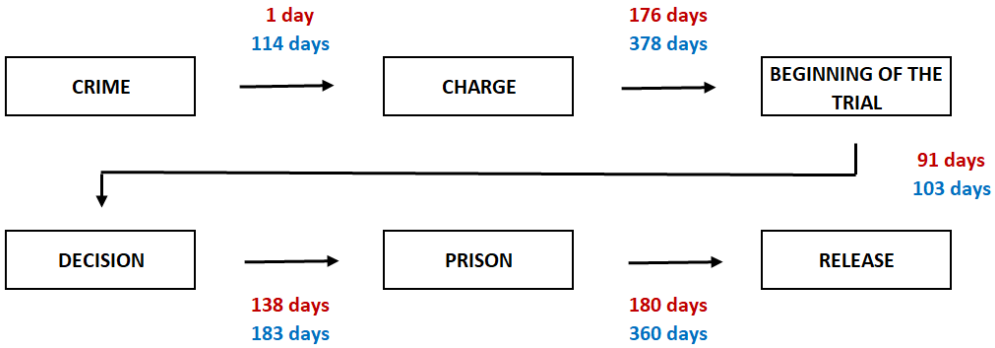
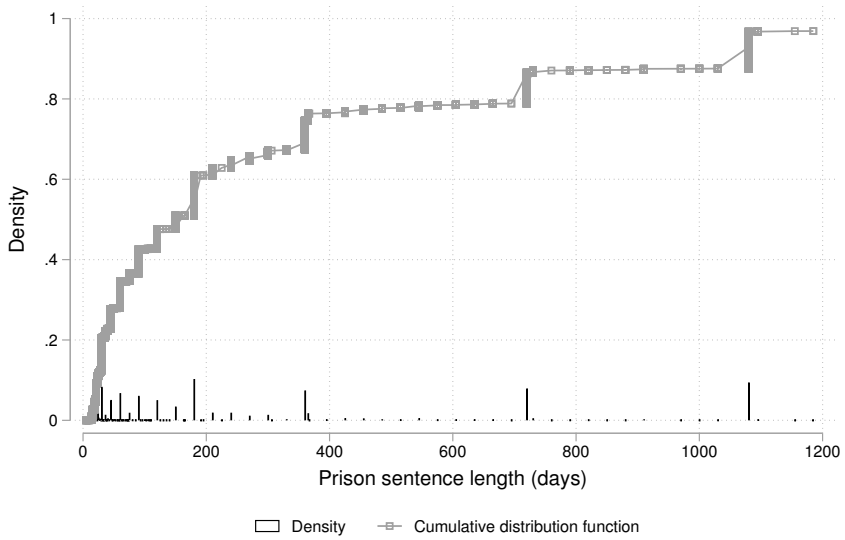
A Online Appendix – Additional Figures and Tables

Figure A1: Timeline from Crime to Prison Release.



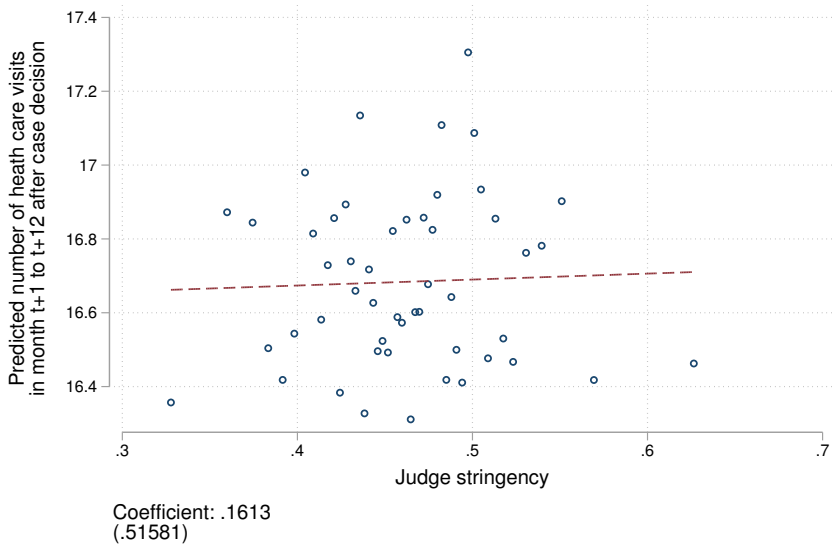
Notes: This figure plots the median (top figure in red) and average (bottom figure in blue) time between each step of the timeline for the sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014.

Figure A2: Cumulative Distribution and Density of Prison Spell Length.



Notes: The sample of nonconfession criminal cases sentenced to prison and processed in 2005–2014. The graph plots the density and cumulative distribution function of prison sentence length.

Figure A3: Correlation between Predicted Health-care Visits and Judge Stringency.

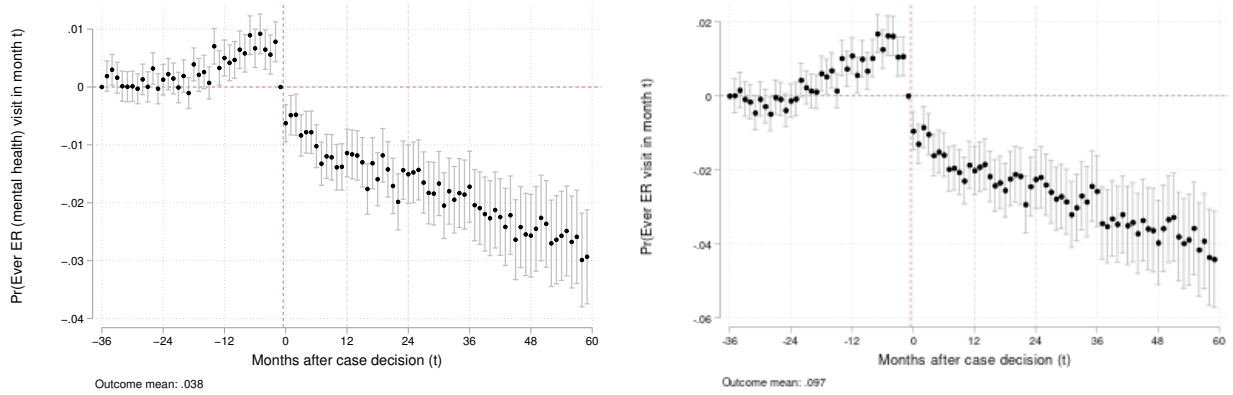


Notes: Sample of all nonconfession criminal cases decided in 2006–2014. The number of health-care visits has been predicted using the same set of sociodemographic and past and current crime variables as those in Table A11.

Figure A4: The Effects of Incarceration on Health Emergencies.

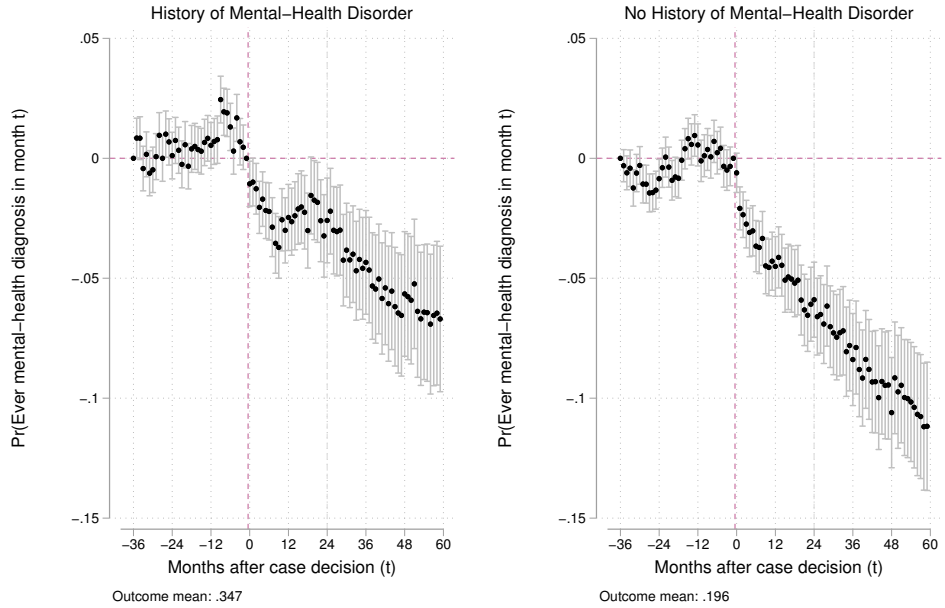
(a) Mental Health Emergency Visit

(b) Any Health Emergency Visit



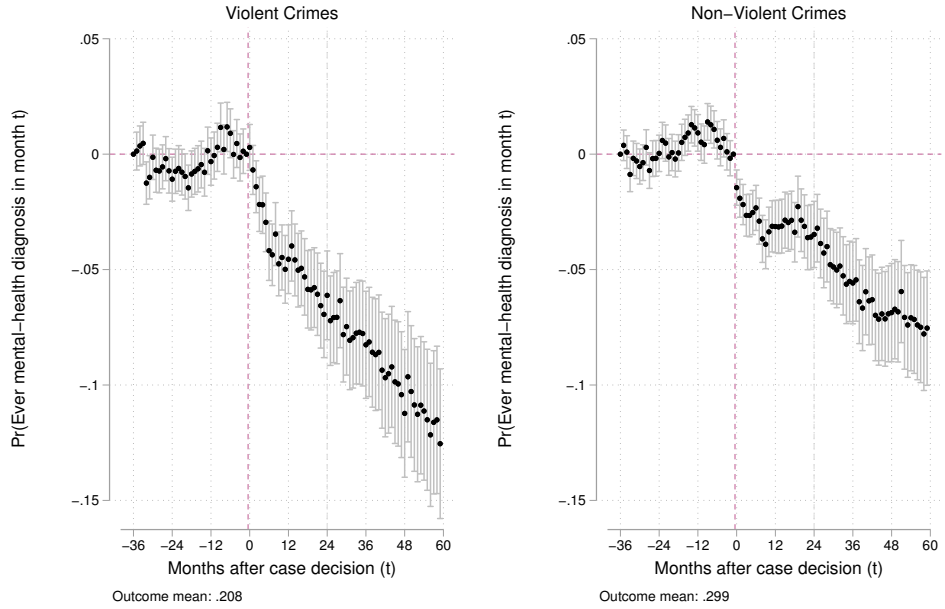
Notes: The sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph plots the coefficients from the distance dummies.

Figure A5: Heterogeneity: The Effects of Incarceration on Mental Health Visits by Mental Health History.



Notes: The sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph plots the coefficients from the distance dummies.

Figure A6: Heterogeneity: The Effects of Incarceration on Mental Health Visits by Type of Crime.

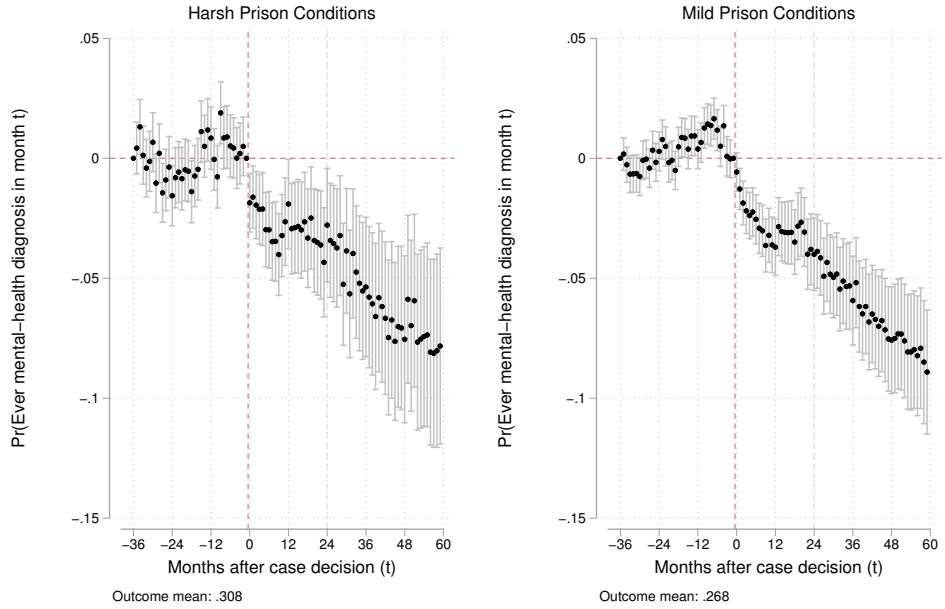


Notes: The sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph plots the coefficients from the distance dummies.

Figure A8: Heterogeneity: The Effects of Incarceration on Mental Health Visits by Sentence Length.

Notes: The sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph plots the coefficients from the distance dummies.

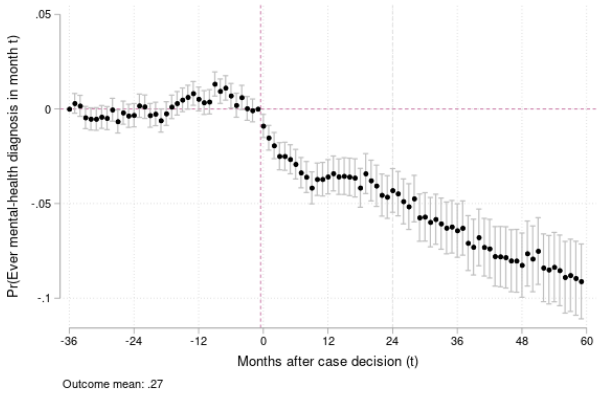
Figure A7: Heterogeneity: The Effects of Incarceration on Mental Health Visits by Prison Conditions.



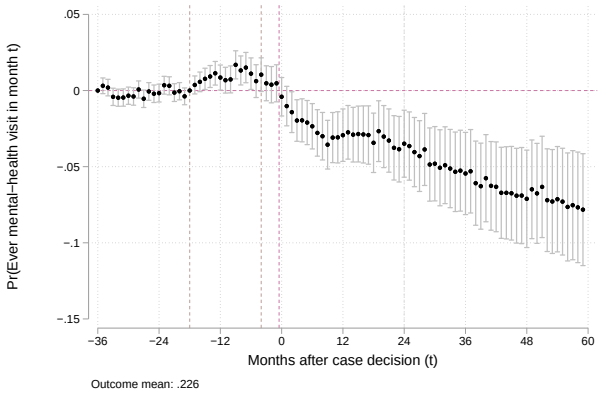
Notes: The sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph plots the coefficients from the distance dummies.

Figure A9: Robustness: The Effects of Incarceration on Mental Health Visits.

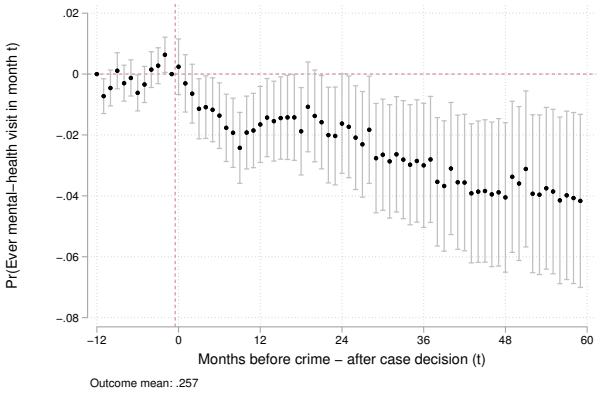
(a) Baseline



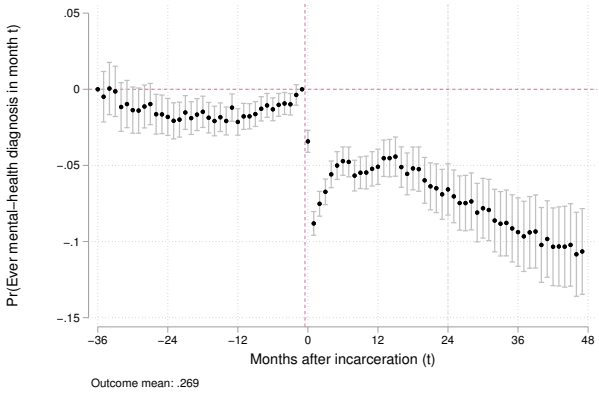
(b) Alternative Reference Points



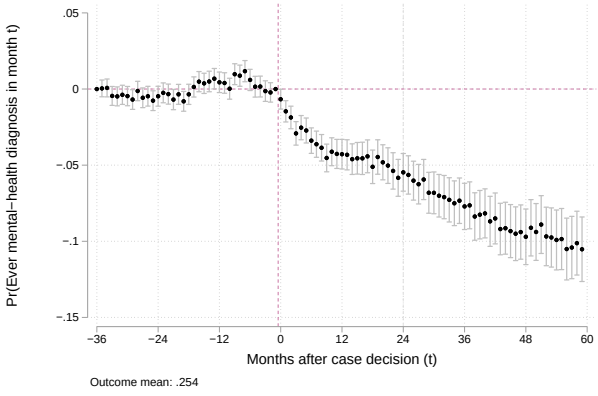
(c) Drop Months Between Crime and Prison



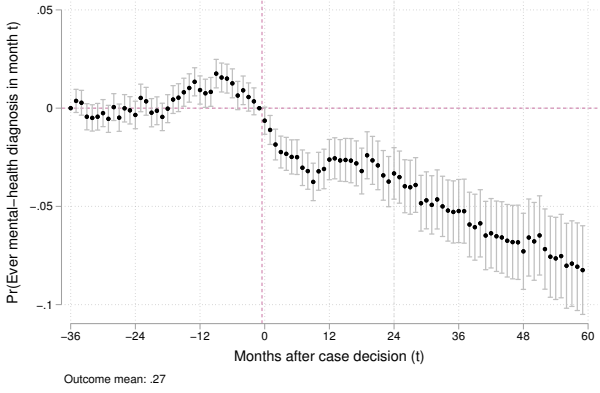
(d) Incarceration as the Event



(e) Excluding Repeat Offenders



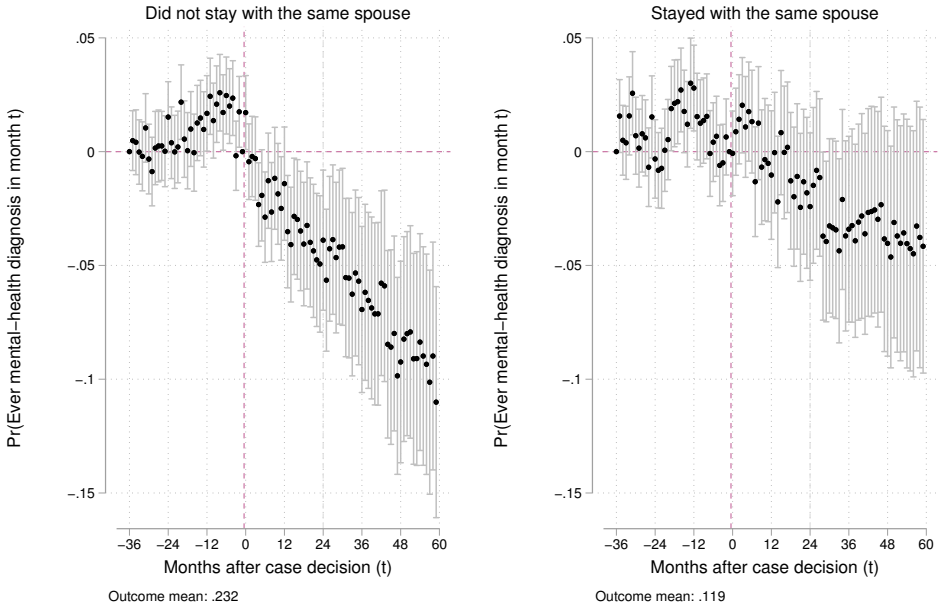
(f) Excluding Offenders on Electronic Monitoring



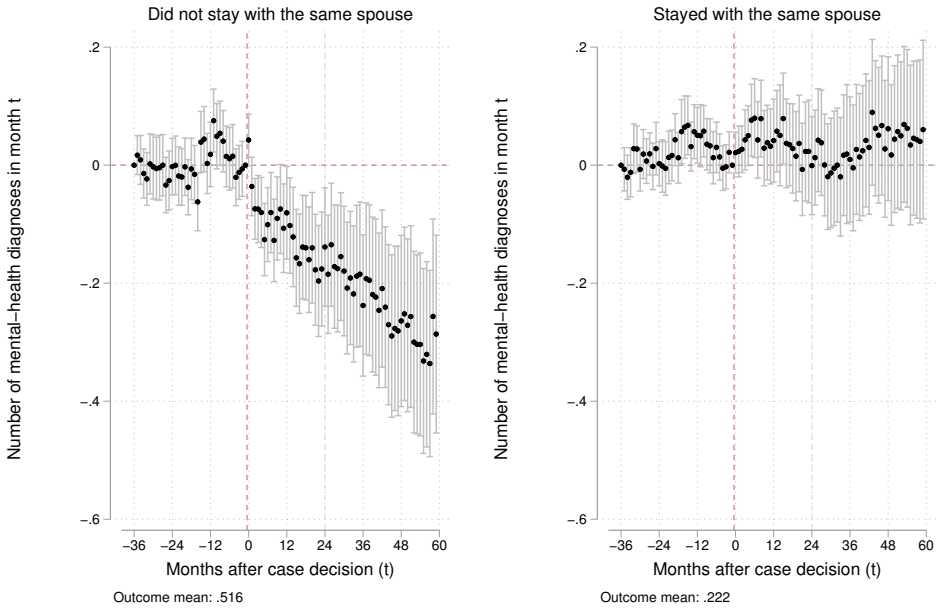
Notes: Figures (a), (b) and (c) are based on the sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014. Figure (d) is based on the sample of first occurrences of nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graphs plot the coefficients from the distance dummies.

Figure A10: The Effects of Incarceration on Mental Health Visits by Spouse Status 5 Years after the Decision

(a) Probability of Mental Health Visits



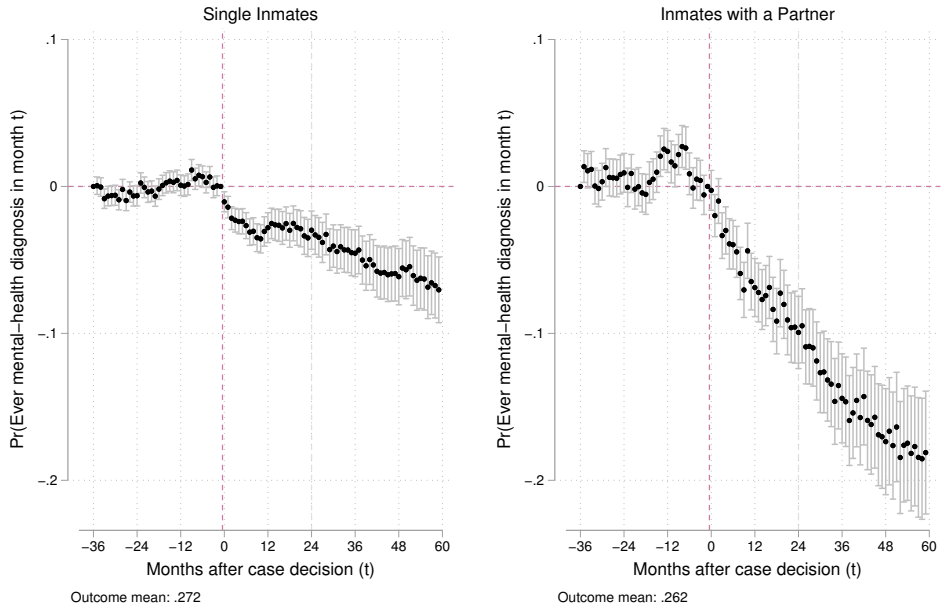
(b) Number of Mental Health Visits



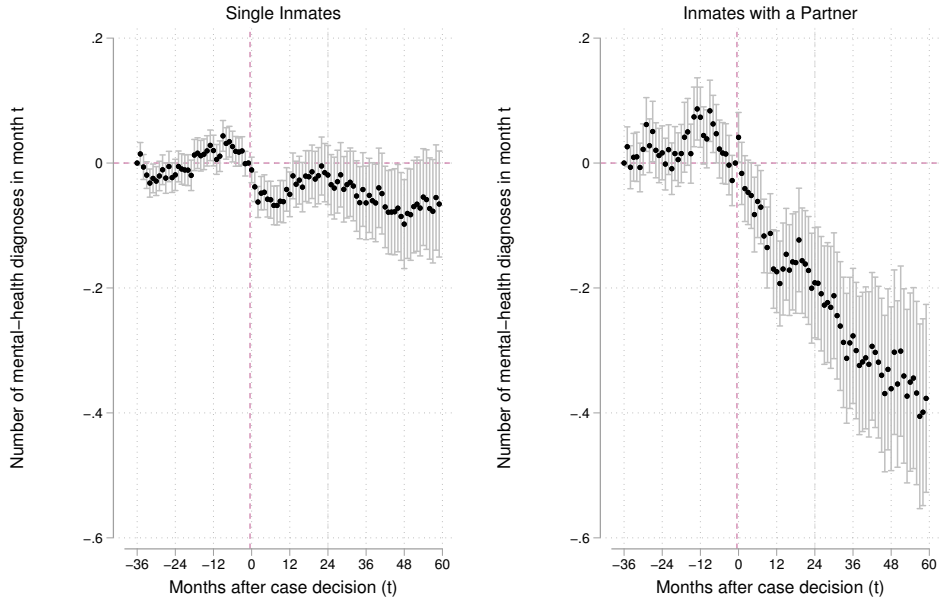
Notes: The sample of spouses as defined in the year before case decision for nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph separately plots the coefficients from the distance dummies for spouses not with the defendant at 5 years after the case decision (LHS) and for spouses still with the defendant at 5 years after the case decision (RHS).

Figure A11: The Effects of Incarceration on Mental Health Visits by Spouse Status 1 Year before the Decision.

(a) Probability of Mental Health Visits



(b) Number of Mental Health Visits



Notes: The sample of nonconfession criminal cases sentenced to prison and processed in 2009–2014. The estimation includes controls for case and month × year FEs. Standard errors clustered at the case level. 95% confidence intervals. The graph plots the coefficients from the distance dummies separately for single inmates (LHS) and inmates with a spouse (RHS) the year before the decision.

Table A1: Most Common Mental Health Diagnoses.

	Number	Frequency	Cumulative frequency
Drug abuse	46212	22.25	22.25
Depressive disorder	15429	7.43	29.67
Anxiety disorder	10667	5.13	34.81
Hyperkinetic disorder	8496	4.09	38.9
Mental and behavioral disorders due to use of opioids : dependence syndrome	13428	6.46	45.36
Medication abuse	5992	2.88	48.25
Chronic alcohol abuse	5846	2.81	51.06
Acute stress reaction	5577	2.68	53.74
Sleep disturbance	5568	2.68	56.42
Mental and behavioral disorders due to use of opioids : unspecified mental and behavioral disorder	4165	2	58.43
Feeling anxious/nervous/tense	4056	1.95	60.38
Psychological disorders, other	4038	1.94	62.33
Psychological symptom/complt other	3849	1.85	64.18
Disturbance of activity and attention	3472	1.67	65.85
Mental and behavioral disorders due to use of alcohol : dependence syndrome	3157	1.52	67.37
Affective psychosis	2823	1.36	68.73
Mental and behavioral disorders due to multiple drug use and use of other psychoactive substances : harmful use	2790	1.34	70.07
Mental and behavioral disorders due to use of cannabinoids : dependence syndrome	2384	1.15	71.22
Schizophrenia	2237	1.08	72.3
Number of Observations		207,739	

Notes: This table reports the most common diagnoses defined as mental health-related for 2010 in the sample of nonconfession criminal cases processed in 2005–2014 with at least one mental health diagnosis in 2010.

Table A2: Most Common Addiction Diagnoses.

	Number	Frequency	Cumulative frequency
Drug abuse	46212	45.37	45.37
Mental and behavioural disorders due to use of opioids : dependence syndrome	13428	13.18	58.55
Medication abuse	5992	5.88	64.43
Chronic alcohol abuse	5846	5.74	70.17
Mental and behavioral disorders due to multiple drug use and use of other psychoactive substances : dependence syndrome	4786	4.7	74.87
Mental and behavioral disorders due to use of alcohol : dependence syndrome	3157	3.1	77.97
Mental and behavioural disorders due to use of cannabinoids : dependence syndrome	3019	2.96	80.93
Mental and behavioral disorders due to multiple drug use and use of other psychoactive substances : harmful use	2790	2.74	83.67
Mental and behavioral disorders due to use of alcohol : harmful use	2007	1.97	85.64
Mental and behavioral disorders due to use of other stimulants, including caffeine : dependence syndrome	1716	1.68	87.32
Acute alcohol abuse	1071	1.05	88.37
Mental and behavioral disorders due to use of cannabinoids : harmful use	874	0.86	89.23
Mental and behavioral disorders due to use of other stimulants, including caffeine : harmful use	628	0.62	89.85
Mental and behavioral disorders due to multiple drug use and use of other psychoactive substances : unspecified mental and behavioral disorder	589	0.58	90.43
Mental and behavioral disorders due to use of alcohol : dependence syndrome	567	0.56	90.98
Number of Observations		101,867	

Notes: This table reports the most common diagnoses defined as addiction related for 2010 in the sample of nonconfession criminal cases processed in 2005–2014 with at least one addiction diagnosis in 2010.

Table A3: Most Common Depression or Mood Disorder-Related Diagnoses.

	Number	Frequency	Cumulative frequency
Depressive disorder	15429	14.57	14.57
Anxiety disorder/anxiety state	10667	10.08	24.65
Hyperkinetic disorder	8496	8.02	32.67
Acute stress reaction	5577	5.27	37.94
Sleep disturbance	5568	5.26	43.2
Feeling anxious/nervous/tense	4056	3.83	47.03
Psychological disorders, other	4038	3.81	50.85
Psychological symptom/complt other	3849	3.64	54.48
Disturbance of activity and attention	3472	3.28	57.76
Affective psychosis	2823	2.67	60.43
Schizophrenia	2237	2.11	62.54
Feeling depressed	2121	2	64.54
Personality disorder	2022	1.91	66.45
Mental disorder, not otherwise specified	1921	1.81	68.27
Phobia/compulsive disorder	1869	1.77	70.03
Number of Observations		105,872	

Notes: This table reports the most common diagnoses defined as depression or mood disorder-related for 2010 in the sample of nonconfession criminal cases processed in 2005–2014 with at least one depression or mood disorder diagnosis in 2010.

Table A4: Most Common Physical Health Diagnoses.

	Number	Frequency	Cumulative frequency
General disease NOS	27392	9.36	9.36
General psychiatric examination, not elsewhere classified	16255	5.55	14.91
No disease	11223	3.83	18.75
Back symptom/complaint	7349	2.51	21.26
Limited function/disability NOS	6661	2.28	23.54
Low back symptom/complaint	5461	1.87	25.4
Back syndrome w/o radiating pain	5302	1.81	27.21
Back syndrome with radiating pain	5060	1.73	28.94
Neck symptom/complain	4037	1.38	30.32
Observation for suspected mental and behavioral disorders	3566	1.22	31.54
Shoulder symptom/complaint	3422	1.17	32.71
General symptom/complaint other	3213	1.1	33.81
Shoulder syndrome	3164	1.08	34.89
Upper respiratory infection acute	3142	1.07	35.96
Knee symptom/complaint	3074	1.05	37.01
Abdominal pain/cramps general	2715	0.93	37.94
Muscle pain	2557	0.87	38.81
Neck syndrome	2470	0.84	39.66
Injury musculoskeletal NOS	2409	0.82	40.48
Hypertension uncomplicated	2354	0.8	41.29
Asthma	2349	0.8	42.09
Number of Observations		292,659	

Notes: This table reports the most common diagnoses defined as physical health-related for 2010 in the sample of nonconfession criminal cases processed in 2005–2014 with at least one physical health diagnosis in 2010.

Table A5: General Population vs. Sample of Defendants in 2010.

	General Population	Sample	(2) - (1)	(2) - (1) With Controls	(2) - (1) Standard-ized With Controls
Health-care Visits	8.656	14.829	6.173***	9.622***	0.724***
			(0.071)	(0.068)	(0.005)
Physical Health Diagnoses	6.817	7.754	0.937***	3.852***	0.343***
			(0.06)	(0.057)	(0.005)
Mental Health Diagnoses	0.926	5.687	4.761***	4.911***	1.088***
			(0.024)	(0.024)	(0.005)
Number of Observations	4779380	36017	4815397	4814890	4814890

Notes: This table reports summary statistics in 2010 for the general population and the sample of nonconfession criminal cases processed in 2005–2014 with at least one health-care visit in 2010.

Table A6: Summary Statistics on the Sample of Defendants

	mean	sd	p10	p50	p90
Age at the time of case decision	33.274	11.666	19.967	31.23	49.515
Female	0.112	0.315			
Foreign-born	0.142	0.349			
Married in year t-1	0.106	0.307			
Number of children in year t-1	0.792	1.25	0	0	3
High school by year t-1	0.173	0.378			
Some college education in year t-1	0.049	0.216			
Violent crime	0.274	0.446			
Property crime	0.128	0.334			
Economic crime	0.106	0.308			
Drug-related crime	0.133	0.34			
Drunk driving	0.075	0.263			
Traffic violation (speeding, no license)	0.07	0.254			
Missing data on sex, age, foreign-born status or education	0.032	0.175			
Court decision outcome: prison is the strictest sentence	0.53	0.499			
Number of days between crime and case decision date	595.28	857.494	124	322	1303
Number of days between case decision and prison entry date	279.17	332	0	171	710
Days of prison sentence if given prison	337.897	456.981	24	150	1080
Employed in year t-1	0.345	0.475			
Ever employed in years t-2 to t-5	0.463	0.499			
Ever charged in year t-1	0.467	0.499			
Ever charged in years t-2 to t-5	0.642	0.479			
Ever incarcerated in year t-1	0.137	0.344			
Ever incarcerated in years t-2 to t-5	0.288	0.453			
Ever health-care visit in months t-1 to t-12	0.902	0.297			
Number of health-care visits in months t-1 to t-12	15.705	21.455	1	8	39
Ever physical health diagnosis in months t-1 to t-12	0.843	0.364			
Number of physical health diagnoses in months t-1 to t-12	7.348	12.075	0	4	18
Ever mental health-related diagnosis in months t-1 to t-12	0.535	0.499			
Number of mental health-related diagnoses in months t-1 to t-12	6.852	13.874	0	1	21
Observations			55,464		

Notes: The sample of nonconfession criminal cases processed in 2006–2014 with nonmissing demographics, type of crime, past work, crime, and health history variables.

Table A8: Health Variable Distribution in the Sample of Defendants.

	Mean	Standard Deviation	Percentile 10	Percentile 50	Percentile 90	Mean Difference: Non-incarcerated – incarcerated defendants
Ever health-care visit in month t	0.43	0.495				-0.010***
						(0.002)
Number of health-care visits in month t	1.229	2.272	0	0	4	-0.057***
						(0.010)
Ever visit for physical-health visit in month t	0.286	0.452				0.007***
						(0.002)
Number of visits for physical-health visit in month t	0.582	1.391	0	0	2	0.012*
						(0.006)
Ever visit for mental health visit in month t	0.208	0.406				-0.020***
						(0.002)
Number of visits for mental health visit in month t	0.508	1.435	0	0	2	-0.050***
						(0.006)
Ever visit for substance abuse in month t	0.091	0.287				-0.023***
						(0.001)
Number of visits for substance abuse in month t	0.235	1.09	0	0	0	-0.054***
						(0.005)
Ever visit for drug abuse in month t	0.075	0.264				-0.020***
						(0.001)
Number of visits for drug abuse in month t	0.2	1.026	0	0	0	-0.049***
						(0.004)
Ever visit for alcohol abuse in month t	0.013	0.115				-0.003***
						(0.000)
Number of visits for alcohol abuse in month t	0.026	0.302	0	0	0	-0.002
						(0.001)
Ever visit for opioid abuse in month t	0.017	0.13				-0.004***
						(0.001)
Number of visits for opioid abuse in month t	0.036	0.356	0	0	0	-0.007***
						(0.001)
Ever visit for severe mood disorder in month t	0.036	0.186				0.001
						(0.001)
Number of visits for severe mood disorder in month t	0.067	0.462	0	0	0	-0.002
						(0.002)
Ever visit for light mood disorder in month t	0.051	0.22				0.001
						(0.001)
Number of visits for light mood disorder in month t	0.09	0.488	0	0	0	0.007***
						(0.002)

Notes: This table reports summary statistics for the sample of non confession criminal cases processed in 2006–2014 measured in 36–30 months before the case decision.

Table A7: Summary Statistics for the Sample of Incarcerated Defendants

	mean	sd	p10	p50	p90
Age at the time of case decision	34.091	11.193	21.101	32.107	49.69
Female	0.076	0.265			
Foreign-born	0.151	0.358			
Married in year t-1	0.095	0.293			
Number of children in year t-1	0.796	1.262	0	0	3
High school by year t-1	0.168	0.374			
Some college education in year t-1	0.043	0.203			
Violent crime	0.315	0.465			
Property crime	0.126	0.331			
Economic crime	0.078	0.269			
Drug-related crime	0.131	0.338			
Drunk driving	0.083	0.276			
Traffic violation (speeding, no license)	0.051	0.219			
Missing data on sex, age, foreign-born status or education	0.038	0.191			
Number of days between crime and case decision date	652.701	1019.427	120	316	1546
Number of days between case decision and prison entry date	183.014	208.583	0	138	405
Days of prison sentence if given prison	359.636	463.737	25	180	1080
Employed in year t-1	0.331	0.47			
Ever employed in years t-2 to t-5	0.457	0.498			
Ever Charged in year t-1	0.529	0.499			
Ever Charged in years t-2 to t-5	0.707	0.455			
Ever incarcerated in year t-1	0.187	0.39			
Ever incarcerated in years t-2 to t-5	0.383	0.486			
Ever health-care visit in months t-1 to t-12	0.909	0.288	1	1	1
Number of health-care visits in months t-1 to t-12	16.521	22.745	1	9	41
Ever physical health diagnosis in months t-1 to t-12	0.847	0.36	0	1	1
Number of physical health diagnoses in months t-1 to t-12	7.496	12.92	0	4	18
Ever mental health-related diagnosis in months t-1 to t-12	0.564	0.496	0	1	1
Number of mental health-related diagnoses in months t-1 to t-12	7.387	14.763	0	1	22
Observations		18,219			

Notes: The sample of nonconfession criminal cases processed in 2009–2014 with nonmissing demographics, type of crime, past work, crime and health history variables that were sentenced to prison.

Table A9: Robustness: IV Estimates of the Effects of Incarceration on Mental Health Visits.

	Baseline IV	Number of Cases Handled by Judge		Definition of Judge Stringency IV	
Definition of Judge Stringency IV:	Random	Random	Random	Nonconfession	Reverse Sample
No. of Cases Handled by Judge:	$\geq$ 50 cases	$\geq$ 75 cases	$\geq$ 100 cases	$\geq$ 50 cases	$\geq$ 50 cases
	(1)	(2)	(3)	(4)	(5)
A. First-stage Estimates					
Incarcerated	0.355***	0.367***	0.376***	0.275***	0.380***
	(0.051)	(0.052)	(0.053)	(0.041)	(0.042)
Dependent Mean	0.52	0.52	0.53	0.52	0.53
B. IV Estimates: Probability of Mental Health Visit					
Months 1–60	-0.115	-0.085	-0.047	-0.080	-0.120*
	(0.083)	(0.081)	(0.076)	(0.077)	(0.062)
Dependent Mean	0.25	0.25	0.26	0.25	0.25
C. IV Estimates: Number of Mental Health Visits					
Months 1–60	-0.726***	-0.577*	-0.379	-0.580*	-0.625**
	(0.341)	(0.327)	(0.304)	(0.324)	(0.259)
Dependent Mean	0.65	0.65	0.65	0.65	0.65
Number of Observations	35,082	34,202	32,746	35,082	35,082
Controls:					
Demographics	✓	✓	✓	✓	✓
Type of Crime	✓	✓	✓	✓	✓
Past Work & Crime History	✓	✓	✓	✓	✓
Court $\times$Year FEs	✓	✓	✓	✓	✓

Notes: Sample of nonconfession criminal cases processed in 2009–2014. All estimations include court $\times$case entry year FEs and demographics (age, sex, foreign-born status, number of children, marital status, level of education), type of crime, past work and crime history (indicator for being employed in year t-1 to t-5 before the year of crime, indicator for being ever charged in year t-1 to t-5 before the year of crime, indicator for being ever incarcerated in year t-1 to t-5 before the year of case decision) controls. Standard errors two-way clustered at the judge and defendant level in the IV estimation. 95% confidence intervals. The first column reproduces the baseline IV estimation presented in Table 1. Columns (2) and (3) vary the definition of the sample and exclude judges that handled fewer than 75 and 100 randomly assigned confession or nonconfession cases between 2005 and 2014, respectively. Column (4) excludes confession cases for the computation of the judge stringency score. *p<0.1, **p<0.05, ***p<0.01.

Table A10: First-stage Estimates: The Effect of Judge Stringency on Incarceration Probability.

	(1)	(2)	(3)	(4)	(5)	(6)
Estimation sample:	Time of decision	Month 12 after decision	Month 24 after decision	Month 36 after decision	Month 48 after decision	Month 60 after decision
Dependent variable:	Pr(Incarcerated)					
A. Court $\times$Year of Court Case Registration Interacted Fixed Effects						
Judge Stringency	0.3812***	0.3786***	0.3760***	0.3711***	0.3689***	0.3662***
	(0.0546)	(0.0550)	(0.0552)	(0.0554)	(0.0552)	(0.0558)
F-stat (Instrument)	48.65	47.35	46.39	44.82	44.58	43.04
B. Add Controls for Demographics and Type of Crime						
Judge Stringency	0.3683***	0.3649***	0.3623***	0.3591***	0.3577***	0.3566***
	(0.0536)	(0.0540)	(0.0542)	(0.0545)	(0.0542)	(0.0547)
F-stat (Instrument)	47.17	45.74	44.64	43.39	43.63	42.53
C. Add Controls for Demographics, Type of Crime, Past Work and Criminal History						
Judge Stringency	0.3606***	0.3583***	0.3589***	0.3569***	0.3569***	0.3548***
	(0.0493)	(0.0497)	(0.0499)	(0.0502)	(0.0502)	(0.0508)
F-stat (Instrument)	53.45	51.88	51.64	50.65	50.46	48.82
Dependent mean	0.5301	0.5292	0.5278	0.5261	0.5251	0.5239
Number of cases	59556	59059	58118	57193	56341	55459

Notes: The sample of non-confession criminal cases processed 2006-2014. The estimation includes controls for case $\times$ case decision year FEs. F-statistic is a joint test of the null hypothesis for all variables. The omitted category for education is "Less than high school, year t-1" and the omitted category for type of crime is "Other crimes". Standard errors two-way clustered at the judge and defendant level. *p<0.1, **p<0.05, ***p<0.01.

Table A11: Tests of Randomization.

	Incarcerated (1)		Judge Stringency (2)	
Age at the time of case decision	0.0035***	(0.0003)	0.0000	(0.0000)
Female	-0.0589***	(0.0054)	-0.0014***	(0.0005)
Foreign-born	0.0054	(0.0044)	0.0003	(0.0004)
Married, year t-1	-0.0204**	(0.0089)	-0.0012	(0.0009)
Number of children, year t-1	-0.0016	(0.0023)	0.0004	(0.0002)
High school degree, year t-1	-0.0013	(0.0062)	0.0013**	(0.0007)
Some college, year t-1	-0.0440***	(0.0093)	-0.0007	(0.0012)
Violent crime	0.0945***	(0.0066)	-0.0005	(0.0008)
Property crime	-0.0431***	(0.0088)	-0.0003	(0.0009)
Economic crime	-0.0683***	(0.0091)	0.0007	(0.0010)
Drug-related crime	-0.0649***	(0.0079)	-0.0012	(0.0010)
Drunk driving	0.0713***	(0.0095)	-0.0011	(0.0009)
Other Traffic	-0.0574***	(0.0107)	-0.0012	(0.0011)
Missing X s	-0.2961***	(0.0995)	0.0053	(0.0114)
Employed, year t-1	0.0180***	(0.0062)	-0.0006	(0.0007)
Ever employed, years t-2 to t-5	0.0163***	(0.0062)	-0.0011*	(0.0006)
Ever Charged, year t-1	0.0529***	(0.0053)	-0.0004	(0.0006)
Ever Charged, years t-2 to t-5	0.0589***	(0.0061)	0.0001	(0.0007)
Ever incarcerated, year t-1	0.1472***	(0.0078)	-0.0001	(0.0009)
Ever incarcerated, years t-2 to t-5	0.1658***	(0.0069)	0.0009	(0.0007)
Number of health-care visits, month t-1	-0.0074**	(0.0033)	0.0001	(0.0004)
Number of mental health diagnoses, month t-1	0.0057*	(0.0034)	-0.0002	(0.0004)
Number of physical health diagnoses, month t-1	0.0043	(0.0036)	0.0001	(0.0004)
Missing health information	0.0947***	(0.0343)	0.0002	(0.0041)
Constant	0.2591***	(0.0113)	0.4619***	(0.0027)
F-statistic for joint test	152.980		1.274	
p-value	(0.000)		(0.173)	
Dependent variable mean	0.5301		0.4617	
Dependent variable sd	0.4991		0.0725	
Number of cases	59,556		59,556	

Notes: The sample of nonconfession criminal cases processed in 2006–2014. All estimations include controls for court × case decision year FEs. F-statistic is the joint test of the null hypothesis for all variables. The omitted category for education is "Less than high school, year t-1" and the omitted category for type of crime is "Other crimes". Standard errors two-way clustered at the judge and defendant level. *p<0.1, **p<0.05, ***p<0.01.

B Online Appendix – Details on the Prediction Model

Mental health score is computed by predicting the probability of at least one mental health-related visit in the 3–1 years before the crime. The prediction model is trained on the general population (excluding our sample) in the population register in 2009–2010. We then restrict the model to individuals aged 10 years or older in 2009 and alive by 2010. We retrieve their sociodemographic

and health information from 2004 to 2010 and define a dummy variable equal to one if they had at least one mental health visit within the past 3 years. We then use a logit model – given the dependent variable is binary – that includes the following variables: female indicator, the year, deciles of age, indicator for foreign-born, the marital status the year before, the marital status 2 years before, number of children 1 and 2 years before (one indicator per value), employment status 1 year before, deciles of transfers received 1 year before, a set of indicators if a child has died within the last 5 years and was aged between 0–10 years, 11–20 years, etc., fixed effects for the municipality of residence 1 year before, and deciles of wage 1 and 2 years before. The total number of observations is 7,813,589 (3,950,508 individuals) and the pseudo-R^2 is 7.4%.

We use an alternative model where we predict the probability of at least one mental health visit 3 years before the crime (to be as far as possible from the event) using our full sample of nonconfession crimes processed between 2006 and 2014. This alternative model may better predict mental health as it is based on a sample of offenders but at the expense of using the same sample to train and test the model. We again use a logit model, where we include the following variables: a female indicator, dummies for each age value, dummies for each age-at-crime value, indicator for foreign-born, indicator for married the year before the crime, dummies for number of children the year before the crime, dummies for each year of education value 1 year before the crime, number of hours worked and monthly wage 36 months before the case decision, indicator equal to one if ever suspected or charged in the last 3 years before the case decision, number of suspected crimes and charges in the last 3 years before the case decision, indicator equal to one if ever suspected in years t-2 to t-5 before the year of the crime. In that case, the number of observations is equal to 35,363 and the pseudo-R^2 is 12.3%. Table correlates both measures with each other, with the actual probability of having at least one mental health visit in 3 years before the case decision. The correlation lies between 0.3 and 0.53. We also reproduce Figure A5 with the second measure (based on our sample directly) and the results are very similar.

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