Treated Together: Spillovers Among Youths Admitted to Residential Treatment

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March 20, 2025

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Abstract

Individuals struggling with substance abuse and self-harm are often treated in group-based programs. However, concerns have been raised about the risk of adverse outcomes through peer-to-peer spillovers. This paper analyses the effects of peers placed in residential treatment facilities on each other's outcomes. I use novel data on the universe of youths (over 16,000) admitted to state-owned treatment facilities in Sweden between 2000 and 2020. To overcome the issue of nonrandom assignment of youths, I use an IV design and exploit the natural flow of youths to and from facilities within a given year. I find strong evidence of reinforcing peer effects in substance abuse and self-harm: exposing youths with a history of substance abuse (self-harm) to peers with a similar background greatly increases the risk of hospitalization due to substance abuse (self-harm) post-discharge. Social influence is a likely mediator. Moreover, increased exposure to peer substance abuse has a significant negative impact on youths' educational attainment, partly through the effect on own substance abuse.

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1 Introduction

Youth suicide rates and, especially, drug overdose rates have risen dramatically during recent decades in many Western countries. In the US, the rate of drug overdose among youths (ages 15-25) has more than quintupled since 2001 while the rate of suicide has increased by 46%, resulting in 8,000 unintentional overdoses and 7,000 suicides in 2020 (CDC, 2023). Major predictors of overdose and suicide are nonlethal substance abuse and self-harm (Hawton et al., 2003; Degenhardt and Hall, 2012).[1] People struggling with substance abuse and self-harm are often treated in group-based programs. However, the cost-effectiveness, efficacy, and safety of group programs have been questioned (Beetham et al., 2020; Wakeman et al., 2020). In particular, high and long exposure to individuals who engage in the same type of behavior may have detrimental effects on the recovery process (Taiminen et al., 1998; Richardson et al., 2012). But, due to the challenges with estimating peer effects, little is known about the presence and character of such effects.

In this paper, I exploit novel Swedish data on youths (under age 21) placed together in residential treatment facilities to estimate the effects of exposure to peers with a history of substance abuse and self-harm on the risk of hospitalization due to substance abuse and self-harm post-placement. To identify youths with a history of substance abuse and self-harm, I use register data on hospitalizations and narcotic crimes that occur strictly before placement and information on the reason for institutionalization (as stated on the Swedish child protection authority's application for placement). Hence, the focus of this paper is on behaviors that are serious enough to warrant hospitalization, prosecution, or institutionalization.[2]

To further deepen our understanding of the effects of exposing youths to substance-abusing and self-harming peers, I also estimate the effects on education attainment.

Estimating peer effects is empirically difficult (Manski, 1993). In most natural settings, individuals select into peer groups. If similar individuals tend to interact with one another, allowing for self-selection inflates estimated peer effects. In addition, the environments in which peer groups operate might vary across groups, thereby creating within-group correlation in unobservables. It is especially challenging to identify the endogenous social effect of peer behavior on the individual due to the simultaneity of individual and peer behavior.[3]

[1] There is a lack of consensus on the definitions of substance use, misuse, abuse, and dependence (Mahmoud et al., 2017). In Sweden, youths can be legally institutionalized if their use of addictive substances (alcohol, drugs, or other addictive substances) poses a significant risk to their health or development. I use the term substance abuse to denote such use. Substance use disorders are included in the term substance abuse but substance abuse is not limited to substance use disorders. I use the term self-harm to denote self-inflicted poisonings and injuries.

[2] Physicians only hospitalize patients with severe injuries or illnesses that cannot wait or be treated within the Swedish primary care system. Even if a youth accidentally harms themselves while being under the influence, my measure of substance abuse would not capture the incident since I only include hospitalizations in which substance abuse or self-harm is registered as the main cause of illness or harm (primarily overdoses, substance use disorder, and severe acts of self-harm).

[3] I only consider own and peer characteristics measured before social interaction commences (i.e. exogenous peer

With these challenges in mind, the setting considered in this paper lends itself well to the study of peer effects. Specifically, I use data on the universe of individuals admitted to residential youth facilities managed by the Swedish National Board of Institutional Care (NBIC). These youths are placed in the care of NBIC because they engage in substance abuse, criminal behavior, or some other destructive behavior that threatens their health or development. Assignment of youths to facilities is done by a central placement unit based on the availability of beds and observable characteristics. These facilities are miles apart, meaning that across-facility contact is limited. Within facilities, youths spend large amounts of time together (in the common rooms, fenced-in yard, on-site school, therapy sessions, etc.), partly because they are not free to leave the premises.

I am interested in the effect of exposure to peers with a particular background during a youth's NBIC placement on post-placement behavior. An empirical challenge is that total peer exposure is a function of placement length and future peer composition, which can depend on unobservable characteristics of the youth. To avoid this issue, I exploit variation in the share of peers with a particular history on the youth's *first* day at NBIC as an instrument for total peer exposure in an IV design.

Another key challenge is that the facilities youths are assigned to deviate in terms of, e.g., target group, treatment portfolio, and staff education. To avoid within-group correlation in unobservables, I apply the identification strategy used originally in Bayer et al. (2009) and replicated by Stevenson (2017) and Damm and Gorinas (2020), which relies on the natural variation in the peer group generated by the continuous entry and exit of individuals from the group. Specifically, I adopt a fixed effects (FEs) approach to exploit variation in peer composition within facility-by-year cells.

In my main specification, I define each first-day peer measure as the share of other youths with a pre-placement history of h (e.g., substance abuse) on the first day of the youth's first placement spell.[4] Total peer exposure is defined as the sum of daily peer measures over the entire first placement spell.

Guided by previous research showing reinforcing peer effects in crime and substance use (Kremer and Levy, 2008; Bayer et al., 2009), I estimate separate effects for youths with versus without a history of the behavior of interest. There are several reasons to expect that peer effects for youths with versus without a history of the behavior of interest differ in magnitude. For example, there is variation in youth's predisposition to different types of behaviors and susceptibility to peer influence in that behavior. Specific genes, underlying disorders, and personality traits can

effects). For identification of endogenous peer effects, see Lee (2007), Bramoullé et al. (2009), and Blume et al. (2015).

[4] A placement spell is defined as an uninterrupted placement at NBIC but can include periods of isolation and facility transfers.

be important risk factors for developing one particular behavior but not another (Brown, 2002; Laukkanen et al., 2009; Allen et al., 2012; Hilt and Hamm, 2014). At the same time, youths placed at NBIC are on average 16 years old at the time of first placement and have typically already been heavily exposed to peers who engage in a host of problematic behaviors via pre-placement networks. It is possible that youths who have not yet started to engage in behavior h before institutionalization are not predisposed to behavior h and not susceptible to peer influence in that regard.

The considered setting has three key features that enable me to use first-day peer composition by own history as instruments for total peer exposure by own history. First, there is considerable variation in first-day peer shares by own history within facility-by-year cells, and the instruments are highly predictive of the endogenous variables. Second, variation in first-day peer characteristics is as good as random after netting out facility-by-year FEs. I show that this assumption is empirically valid. Last, to the best of my knowledge, there is no channel other than total peer exposure through which first-day peer composition can impact future outcomes.

There are several reasons to expect that peer substance abuse and self-harm impact own behavior. These reasons can be grouped into five broad categories: (i) social influence, (ii) interrupted treatment, (iii) quality of care, (iv) spread of mental illness; and (v) learning and availability. First, if peers with a history of substance abuse and self-harm are more likely to engage in these activities at NBIC than other peers, such an increase in exposure to incidents involving substance abuse and self-harm during placement can impact own risk of substance abuse and self-harm through, for example, triggering of craving or emotional distress (Walton et al., 1995). In addition, youths who identify with peers who engage in these behaviors may imitate the behavior and join their peers, which can be a form of socialization and create a sense of closeness and community (Taiminen et al., 1998). The intensity and frequency of own behavior may increase to match peer behavior. Due to the addictive nature of both behaviors (Davis and Lewis, 2019), such an increase in frequency and intensity can impact the risk of experiencing adverse outcomes even after placement.

Second, peer composition may affect post-placement outcomes by hampering treatment provision. In particular, substance-abusing youths might coordinate to help each other escape and use substances outside the treatment facilities. Moreover, if a peer group is functioning poorly (e.g., frequent overdoses and self-harming incidents), some youths may need to be moved. Such a move naturally creates a discontinuity in treatment provision as the youth who moves must establish new relationships with treatment providers. In turn, the discontinuities in treatment can adversely affect the youth's recovery process.

Third, exposure to peers with a history of substance abuse and self-harm might adversely affect own outcomes because such peers are, possibly, especially resource-demanding and, thereby,

negatively affect the quality of care available. For example, a youth who self-harms frequently might require close supervision around the clock, which could affect how much time staff can allocate to other youths.

Fourth, increased exposure to substance-abusing and self-harming peers may also imply increased exposure to peers who suffer from depression and other mental disorders. Indeed, depression and other mental disorders are predictors of self-harm and substance abuse (Beautrais, 2000; Bostwick et al., 2016). In turn, it has been suggested that mental disorders such as depression are 'contagious', i.e. being exposed to depressed peers increases the risk of developing depression (e.g., Giulietti et al., 2022). In other words, a positive relationship between peer substance abuse (self-harm) and own substance abuse (self-harm) may reflect peer effects in other mental disorders.

Last, social learning and availability can be important channels (Jarvi et al., 2013; Neighbors et al., 2013; Martínez et al., 2023). For example, youths might learn from each other about more potent drug combinations and effective ways to self-harm with available material, thereby increasing the risk of hospitalization. Placement with a higher share of youths with a history of substance abuse may also expand the youth's network of dealers and increase the availability of addictive substances.

I find strong evidence of peer effects in substance abuse and self-harm among youths with a prior history of the *same* behavior. Specifically, a 1-standard deviation higher exposure to peers with a history of substance abuse increases the risk of hospitalization due to substance abuse within one year of discharge from the treatment facility by 183% relative to the mean for youths with a history of substance abuse.

Similarly, a 1-standard deviation higher exposure to peers with a history of self-harm increases the risk of being hospitalized for self-harm by 84% relative to the mean for youths with a history of self-harm.

Among youths with no history of substance abuse or self-harm, there is no evidence of significant peer effects. However, the outcomes I consider are severe. If there are introductory peer effects, it might take several years before the behavior has progressed to the point where I can observe an effect on hospitalization.

What are the drivers of these peer effects in substance abuse and self-harm? I present evidence suggesting that co-harming and social interaction is a key channel. In particular, there is evidence of adverse peer effects already during placement and considerable clustering in incidents. Among youths who are ever hospitalized for self-harm or substance abuse during placement at NBIC, 1 in 5 are hospitalized in the same month as their peer is hospitalized for the *same* reason.

While I cannot rule out alternative mechanisms, I find little evidence in support of the other four groups of mechanisms.

Given the large peer effects in substance abuse and self-harm, a natural follow-up question is how exposure to these peers affects education attainment. I show that a 1-standard deviation increase in exposure to peers with a history of substance abuse decreases the likelihood of attaining sufficient grades to be eligible for high school by age 21 by 250% relative to the mean among youths with a history of substance abuse.

There is ample correlational evidence that exposure to substance abuse and self-harm (via peers, family members, and the media) are important predictors of own substance abuse and self-harm (Hawton et al., 2012; Costello et al., 2021). In particular, studies in psychology and sociology document that segregation of youths who engage in problematic behaviors in special education, community, and treatment programs appears to exacerbate problematic behavior (Dishion and Tipsord, 2011).

The bulk of studies that can credibly identify the effects of peer substance use considers self-reported drinking, smoking, and occasional marijuana use among students (e.g., Duncan et al., 2005; Kremer and Levy, 2008; Card and Giuliano, 2013).[5] Only three papers include heavy drugs (Gaviria and Raphael, 2001; Lundborg, 2006; Eisenberg et al., 2014), again using surveys in which students are asked whether they have ever used different substances during specified periods. Most studies tend to find evidence of peer effects, but sometimes only in specific subsamples or substances.

To the best of my knowledge, there is no paper that is able to identify peer effects in substance *abuse*, i.e. use of addictive substances that significantly harms the individual's health or development (e.g., alcoholism). Even if there are peer effects in, for example, occasional binge drinking with friends, it is not evident that there are meaningful peer effects in alcoholism as the underlying mechanisms and importance of biological, environmental, and psychological risk factors are likely different (Tarter and Vanyukov, 2001). In addition, even if a peer effect in alcoholism exists among friends, it might not exist in treatment programs where staff can interrupt harmful peer interactions. At the same time, knowledge about peer-to-peer spillovers in substance abuse in treatment programs is particularly policy-relevant as it is important for treatment design. By using administrative data on severe substance abuse incidents, I shed light on how exposure to peers with a history of substance abuse affects own outcomes and add to the growing economic literature on the determinants of harmful substance use (e.g., Powell et al., 2018; Ruhm, 2019; Alpert et al., 2022).

Eisenberg et al. (2014) is the only other study on the causal effects of exposure to self-harming peers that I am aware of. Using survey data from college students, they do not find evidence of peer effects in suicidal ideation or non-suicidal self-injury. An important difference between Eisenberg et al. (2014) and this paper is the severity of the self-harm studied. I only consider self-

[5]For a review of the literature on peer effects, see Sacerdote (2011).

harm which results in hospitalization. In contrast, Eisenberg et al. (2014) classify, for example, having punched oneself as self-harm. The visibility of peer self-harm and the role of peer influence can be vastly different depending on the severity of the self-inflicted harm.

A related literature is the small line of work on causal peer effects in mental well-being. In line with the literature on peer effects in substance use, these studies are typically conducted in school environments using survey data (Aizer, 2009; Golberstein et al., 2016; Zhang, 2019; Giulietti et al., 2022; Kiessling and Norris, 2023).[6] The studies that focus on student-to-student spread of mental well-being tend to find no or modest increasing effects, while those that examine the effects of other peer features (such as ability ranking) find larger effects.

Peer effects in residential facilities — which is the setting of my study — may be very different from those in school environments. Prior correlational evidence suggests that social effects in mental health predominately exist in close relationships and relationships outside the school environment (Zalk et al., 2010; Fruehwirth et al., 2019). Moreover, limited contact opportunities with family, prior history of problematic behaviors, and experience of adverse childhood events might make youths in residential facilities more susceptible to peer influences (Dishion and Tipsord, 2011). By studying peer effects in self-harm in residential care using register data, I not only add to the peer effects literature but also to the economic literature on the determinants of self-harm and mental illness (e.g., Persson and Rossin-Slater, 2018; Adhvaryu et al., 2019; Baranov et al., 2020).

Peer effects in youth facilities are surprisingly understudied. Even though at least 6 million children are placed in residential facilities without parental care each year in the name of child welfare and justice (United Nations, 2020), only three papers can identify peer effects using credible designs in such settings (Bayer et al., 2009; Stevenson, 2017; Font and Mills, 2022).[7] The main focus of these three papers is crime-related outcomes. Bayer et al. (2009) use data from juvenile correctional facilities in Florida and find predominately reinforcing peer effects, meaning that exposing juveniles to peers with a criminal history within the same crime category increases recidivism. Stevenson (2017) uses similar data and finds evidence of social contagion of crime-oriented noncognitive factors.[8] Font and Mills (2022) use data on youths placed in foster care

[6]Two studies that use non-survey data are Getik and Meier (2022) and Bütikofer et al. (2020), where the former uses Swedish register data to examine how gender composition in school cohorts affects mental health and the latter uses Norwegian register data to estimate the mental health effects of school selectivity.

[7]This population fares disproportionately worse than children living in family-type homes (Li et al., 2019; Gutterswijk et al., 2020) and are at a high risk of future involvement in socially destructive behaviors, such as crime and substance abuse (Shook et al., 2011; Aizer and Doyle, 2015; Eren and Mocan, 2021).

[8]These findings are in line with a sizable literature in economics that documents the importance of social interactions in explaining criminal behavior (e.g., Case and Katz, 1991; Glaeser et al., 1996; Ludwig et al., 2001; Jacob and Lefgren, 2003; Kling et al., 2005; Deming, 2011; Billings et al., 2014; Damm and Dustmann, 2014; Corno, 2017; Billings et al., 2019; Billings and Schnepel, 2022). Especially relevant for this paper is the work on peer effects in prisons (Harris et al., 2018; Damm and Gorinas, 2020). Literatures in criminology, sociology, and psychology also

in Wisconsin. They do not find that exposure to peers with a higher risk of future imprisonment increases own risk of criminal behavior, running away, or early parenthood, but they find an increase in high school dropout rate. By considering novel outcomes (substance abuse and self-harm), I extend our knowledge about the peer effects in residential facilities.[9]

A related literature is that on the effects of placing juveniles in residential facilities (e.g., Hjalmarsson, 2009; Aizer and Doyle, 2015; Eren and Mocan, 2021). See Doyle and Aizer (2018) for a review of studies on the effects of child protection interventions. Of particular relevance is Helénsdotter (2024), who includes data on youths placed at NBIC in her analysis of the causal effects of court-ordered placement in out-of-home care. Helénsdotter (2024) shows that such placement greatly increases the risk of death and hospitalization due to self-harm. However, she finds little evidence of an increase in the risk of experiencing adverse events related to substance abuse.

2 Setting & Data

2.1 Institutional Care in Sweden

Each year, the National Board of Institutional Care (NBIC) houses youths aged below 21 in about 20 residential treatment facilities spread across Sweden.[10] Almost all youths (90%) are involuntarily placed at NBIC. The remaining 10% are either voluntarily placed or sentenced to serve time at NBIC for having committed a crime punishable by prison. In the two former cases, the local Social Welfare Committee (SWC; *socialnämnden*) decides whether the youth should be placed at NBIC, while it is the District Court in the latter case. According to the Swedish Criminal Code, a person under the age of 18 who commits a crime that would be sanctioned with imprisonment if the perpetrator had been 18 or older should be ordered to serve time at NBIC by the District Court instead of prison unless there are special circumstances. Figure 1 provides a representation of the possible routes to institutionalization.

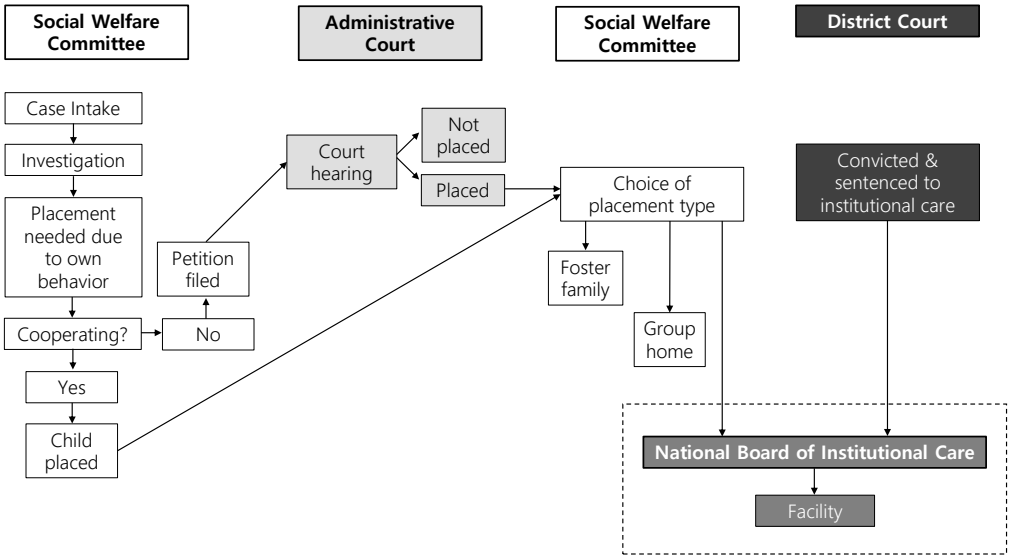
Regardless of the placement route, the SWC must submit an application to the central placement unit at NBIC. The placement unit assigns the youth to a facility while considering (in falling order): gender, availability of beds, special needs, security class, age, group composition, and

provide evidence of peer effects in crime (see Pratt et al., 2010).

[9] This paper is also related to the literature on the effects of exposure to peers who come from deficient or criminal homes, which finds adverse effects on a range of outcomes (e.g., Carrell and Hoekstra, 2010; Carrell et al., 2018; Billings and Hoekstra, 2019; Santavirta and Sarzosa, 2019). There are also papers on neighborhood effects that include measures of mental health, drinking, and smoking (see Chyn and Katz, 2021, for a review). In addition, the literature on social influences on crime at the extensive margin is relevant. For example, Hjalmarsson and Lindquist (2012) provide indirect evidence that role modeling might explain why children of criminally active fathers are more likely to have a record.

[10] During the sample period, some facilities have closed and new ones have opened. Hence, the total number of unique facilities during the sample period is higher.

Figure 1. *Pathways to Institutionalization in Sweden*



Note: This figure provides a representation of the different routes to placement at NBIC. Almost all youths at NBIC are placed by the SWC, either involuntarily via the court (90%) or voluntarily (5%). All of these youths engage in substance abuse, criminal behavior, or another destructive behavior that poses a significant risk to their health or development. The SWC decides whether the child should be placed at NBIC, but the central placement unit at NBIC allocates youths to facilities. Youths can also be sentenced to serve time at NBIC by a district court for committing a crime punishable by prison (5%).

home region. The placement unit is open around the clock and the assignment should be done immediately upon receiving the application. No applications can be denied. Almost all youths are placed in their assigned facility the same day or the day after their placement application is submitted. Around one-third of youths are transferred to a new facility at some point after entering their first facility. However, in my main specification, I only exploit variation in the peer composition on the first day of arrival to estimate peer effects.

At NBIC, youths live together while supervised by staff. All youths have separate bedrooms. The youths are institutionalized because they engage in substance abuse, criminal behavior, or some other destructive behavior (e.g., prostitution) that significantly threatens their health or development. While many of the youths at NBIC suffer from mental disorders and engage in self-harming behavior (e.g., skin cutting), having a mental disorder or engaging in self-harm is not legal grounds for placement at NBIC in itself.

The NBIC facilities are miles apart. Therefore, across-facility contact is essentially non-existent. Within facilities, youths spend large amounts of time together: in the common rooms, fenced-in yard, on-site school, therapy sessions, etc. In fact, youths are not free to leave the premises, and the facility is usually surrounded by a high fence.

Facilities vary in terms of target group, treatment portfolio, security class, and staff education.

All facilities accept youths struggling with substance abuse or other destructive behaviors, and almost all accept youths with criminal backgrounds. Some facilities exclusively accept youths with a certain sex or age, while some facilities are more equipped than others to handle youths with special needs. Therefore, it is essential for identification to only exploit variation in peer composition within facilities.

Unless the youth is sentenced to serve time at NBIC, the SWC must reassess whether the need for care persists every six months. If the SWC determines that the youth would benefit from being placed in a foster family or other form of placement, the SWC can transfer the youth from NBIC at any time. If the youth no longer exposes their health or development to a significant risk of harm through abuse of addictive substances, criminal activity, or some other destructive behavior, the SWC terminates care. At the latest, care is terminated when the youth turns 21.

Youths placed at NBIC for committing an offense punishable by prison serve a fixed sentence. The sentence length is determined by the District Court in advance and must be at least 14 days and at most 4 years. There is no possibility of early release.

2.2 Swedish Education System

Ten years of schooling (ages 6 to 16, grades 0-9) are compulsory in Sweden. After grade 9, Swedes can choose to attend high school (*gymnasiet*) if they are eligible. In Sweden, high school typically lasts for three years and there are both vocational and academic high school tracks. To be able to enroll in a vocational high school track, the student must have attained passing grades in at least eight subjects, including Swedish, English, and mathematics. After high school, students may pursue higher education or enter the workforce.

Students who are not eligible for high school after grade 9 can attend the so-called introduction program to attain passing grades in the required subjects. Hence, a person can become eligible for high school after the year they turn 16.

2.3 Cross-Country Comparison

The United Nations (2020) estimates that at least 6 million children and youths are placed in residential facilities without parental care each year in the name of child welfare and justice. In Sweden, there is in practice no informal sector as all residential child and youth facilities must be registered with The Health and Social Care Inspectorate. Nevertheless, the estimated placement rate in Sweden (2-3 children per 1,000) is lower than the rates in most Western countries. For example, in Canada, Germany, and the United Kingdom, the placement rate is estimated to be 5-10 children per 1,000.

The institutional features and legal framework governing the provision of care to youths with

behavioral problems are almost identical in Sweden and other Scandinavian countries. While the system employed in the US is very different, the systems used in other parts of Europe are similar to the Scandinavian system. In particular, favoring treatment in residential facilities akin to NBIC over prison when a youth abuses drugs, engages in prostitution or commits crimes is common throughout Europe. In the US, on the other hand, the imprisonment rate is over 10 times as high as in Western Europe (United Nations, 2020). For overviews of the systems employed in several Western countries, see Whittaker et al. (2022).

2.4 Data Description

The primary data source is the administrative records kept by NBIC on the universe of youths admitted to residential care during 2000-2020 in Sweden. The full sample contains 27,683 youth-by-spell observations and 16,461 unique youths. The records include placement reasons (as specified on the placement application submitted by the SWC) as well as information on facility assignments and dates related to admission, discharge, moves within NBIC, and episodes of isolation and absconding.

Statistics Sweden linked the administrative records on youths placed at NBIC with register data using the youths' personal identity numbers. These personal identity numbers are unique and given to all Swedish residents, including foreign-born. I have accurate personal identity numbers for 93% of the youths. The reason for missing an accurate personal identity number is almost always recent immigration to Sweden. Statistics Sweden matched the youths to their parents and added data on, e.g., gender, birth date, immigration/emigration dates, foreign background, labor income, marital status, and education of both youths and parents.

The main explanatory variables are measured *before* placement. History of substance abuse takes the value 1 if the youth (i) is placed at an NBIC facility because they expose their health or development to a significant risk of harm through substance abuse, (ii) is hospitalized from substance abuse, or (iii) commits a narcotic crime at any point during the 24 months before placement. I use the date of the crime, not the date of conviction or reporting. History of self-harm takes the value 1 if the youth is hospitalized for self-harm at least one time during the 24 months before placement. The main outcomes are hospitalization due to substance abuse and self-harm by month 12 *after* the placement ends (i.e., the youth is discharged from NBIC).

Information on all hospitalizations at Swedish hospitals (private and public) comes from the National In-Patient Register (1998-2022) kept by the National Board of Health and Welfare. Via the National Board of Health and Welfare, I also obtain data on all deaths (date and cause) from the National Cause of Death Register (1998-2022), court petitions for involuntary adult addiction treatment from the Register of Compulsory Care Under the Act on Care of Substance Abusers (2000-2022), and out-of-home placements from the Register on Service Provision to Children and

Young Persons (2000-2022). Last, I obtain data on all legal proceedings (date of crime, section of the law, and sanction) from the National Council for Crime Prevention (1998-2022).

2.5 Measuring Peer Exposure

To measure the peer composition on each day, I start with the full sample of youths (N=27,683). I define the peer group at the facility level: peers on day d are the other youths living in the same facility on day d as the youth i. However, I exclude youths in isolation or on the run on day d.[11] Peer exposure on a given day ($Peer\ exposure_{i,f,h,d}$) is defined as the share of peers in facility f with pre-placement history h (e.g., substance abuse):

$$Peer\ exposure_{i,f,d,h} = \frac{1}{N_{f,d} - 1} \sum_{j \neq i} History_{j,f,d,h}, \tag{1}$$

where $History_{j,f,h,d}$ is an indicator taking the value 1 if peer j in facility f on day d has a pre-placement history of h and $N_{f,d}$ is the number of available peers in facility f on the day d. Since a youth can have a history of multiple behaviors, the shares do not sum to one.

First-day peer exposure is defined as the peer exposure on the youth's first day of arrival ($d = 0$). Total peer exposure is defined as the sum of daily peer exposure over all days youth i was present in an NBIC facility during their first placement spell. Days in isolation and on the run are excluded. The start date of a placement spell is the day of arrival at NBIC while the end date is the day the youth's placement at NBIC ends.

2.6 Sample Creation and Descriptive Statistics

In the analysis, I limit the sample (N=27,683) to the first placement spell per youth (N=16,461). Since I only observe youths admitted from January 1, 2000, I cannot observe the full peer group at the start of 2000. While the median placement length is only three months, over 10% of the sample are placed for longer than 1 year (see Figure A1). As only 2.5% are placed longer than 2 years, I drop the first two years and restrict the sample to youths admitted during 2002-2020 (N=14,648). I then drop 7 youths who were still at NBIC by the end of 2021 (which is when my data from NBIC ends). I also drop youths without any peers on their first day (5 observations) and youths in facility-by-year cells with less than 10 youths after imposing the previous restrictions (535 observations). The final sample consists of 14,101 unique youths assigned to one of 36 facilities (referred to as the '2002-2020 Sample').

When studying outcomes based on register data obtained from another source than NBIC, I

[11] One-third of youths run away or get put in isolation at least once during their first placement spell. Among those who run away or get put in isolation, the median number of days on the run or in isolation is 11.

further restrict the sample to youths who are observable by Statistics Sweden, i.e. youths with valid personal identity numbers (1,121 observations dropped). This sample (N=12,980) is referred to as the 'Main Analysis Sample'.

To study the effect of peer substance abuse and self-harm on high school eligibility by the year the youth turns 21 years old, I restrict the 'Main Analysis Sample' to youths who (i) were not eligible for high school before their NBIC placement (N=2,109 dropped), (ii) turn 21 before 2023 (N=1,616 dropped), and (iii) start their placement the year they turn 21 (N=11 dropped). I also drop youths in facility-by-year cells with less than 2 observations after imposing the previous restrictions (8 observations). I refer to this sample (N=9,236) as the 'Education Sample'.

Table 1. *Descriptive Statistics*

	All First-Time Placements	2002-2020 Sample	Main Analysis Sample	Education Sample
A: Youth Characteristics				
Female	0.34	0.34	0.34	0.34
Foreign	0.29	0.30	0.24	0.24
Age	15.78	15.76	15.76	15.57
<15 y.o.	0.22	0.22	0.22	0.25
≥18 y.o.	0.13	0.13	0.13	0.10
Placement type:				
Involuntary	0.90	0.92	0.92	0.92
Sentenced	0.05	0.04	0.04	0.04
Voluntary	0.05	0.04	0.04	0.05
Required to attend school	0.43	0.43	0.43	0.49
Completed 9th grade	0.41	0.41	0.44	0.35
Missing personal identity number	0.07	0.08	0.00	0.00
History of:				
Substance abuse	0.58	0.58	0.59	0.54
Self-harm	0.06	0.06	0.06	0.06
Crime	0.76	0.76	0.76	0.77
Neurodevelopmental disorder	0.03	0.03	0.04	0.03
Depression	0.02	0.02	0.02	0.02
Other mental illness	0.07	0.07	0.07	0.07
Any birth parent:				
Dead	0.04	0.04	0.05	0.05
<18 y.o. at birth of child	0.02	0.02	0.02	0.02
Married, yr t-1	0.49	0.50	0.50	0.49
No labor income, yr t-1	0.50	0.50	0.50	0.52
Hosp. d.t. mental health, yr t-1	0.03	0.03	0.03	0.03
Hosp. d.t. substance use, yr t-1	0.03	0.03	0.03	0.03
Any crime, yr t-1	0.10	0.09	0.09	0.10
Missing any X, yr t-1	0.31	0.31	0.25	0.26

Table 1 displays descriptive statistics at the child and birth parent level (Panel A), placement spell level (Panel B), and peer level (Panel C) for all first-time placements, the '2002-2020 Sample', the 'Main Analysis Sample', and the 'Education Sample'. The descriptive statistics reported

Table 1. *Continued*

B: Placement Characteristics				
Days in institutional care during spell	151.62	146.34	148.55	151.60
Total days in institutional care	254.30	246.44	254.28	269.05
Number of spells	2.30	2.35	2.34	2.28
First facility is in new county	0.71	0.72	0.70	0.68
C: Peer Characteristics on First Day				
Peer substance abuse	0.63	0.63	0.63	0.59
Peer self-harm	0.07	0.07	0.07	0.06
Peer crime	0.82	0.83	0.82	0.83
Peer NDD	0.04	0.04	0.04	0.04
Peer depression	0.02	0.02	0.02	0.02
Peer other mental illness	0.08	0.08	0.08	0.08
Peer female	0.32	0.31	0.33	0.33
Peer foreign	0.27	0.27	0.27	0.25
Peer <15 y.o.	0.21	0.21	0.21	0.22
Peer missing personal id. no.	0.05	0.05	0.04	0.04
Peer size	19.44	19.81	19.64	19.45
Above median peer size	0.38	0.38	0.38	0.38
Unique facilities	47	36	36	36
Unique birth parents	26021	22179	22179	15723
Observations	16461	14101	12980	9236

Note: This table presents descriptive statistics on child, parent, placement, and first-day peer characteristics for all first-time placements at NBIC and each analysis sample as described in Section 2.6. Child and parent characteristics are measured at or by the start of the youth's first NBIC placement. Statistics are shown for observations with non-missing information.

in the first and second columns are very similar. In the last two columns, the share of youths with missing personal identity numbers is (naturally) zero, and the share of youths with missing background information on any birth parent is smaller. However, the share is still large. The reason for the high share of youths with missing information on at least one birth parent during the year before placement is that almost a quarter of the youths have a foreign background and, in this subgroup, it is common that at least one birth parent is unobservable at some point during the previous year.

3 Empirical Methodology

3.1 Instrumental Variable Model

The goal is to identify the effect of exposure to peers with a history of substance abuse or self-harm on youth outcomes. Consider an adapted version of Bayer et al. (2009)'s model:

$$\begin{aligned} Y_i =& \beta_0(Own\ history_i * Total\ peer\ exposure_i) \\ &+ \beta_1(No\ own\ history_i * Total\ peer\ exposure_i) \\ &+ \alpha(Own\ history_i) + \delta_{f,t} + \eta_{i,f,t} \end{aligned} \tag{2}$$

where Y_i is an outcome measured for youth i who was first admitted in year t to facility f, $Own\ history_i$ is an indicator taking the value 1 if the youth has a history of the category of interest, $No\,own\,history_i$ indicates the opposite, $Total\,peer\,exposure_i$ is youth i's total exposure to peers with a history of the category of interest during the placement spell, $\delta_{f,t}$ are facility-by-year FEs, and $\eta_{i,f,t}$ is an error term.

In line with Bayer et al. (2009) and Damm and Gorinas (2020), I interact total peer exposure with own history to distinguish between introductory and reinforcing peer effects, which is essential for understanding the mechanisms at play. In addition, since the baseline probabilities of experiencing a future hospitalization are vastly different for youths with versus without a history of the behavior of interest, it is useful to estimate separate effects to gauge the effect magnitude (see Table A1).

Estimates of β_0 and β_1 are likely plagued by omitted variable (OV) bias because unobservable factors of the youth may affect (i) the future peer composition at facility f, (ii) the number of days the youth spends in a particular facility, and (iii) the youth's total placement length. For 95% of the sample, placement at NBIC is terminated when the youth turns 21 or the SWC either determines that the youth no longer engages in destructive behavior or can be moved to an alternative placement form. Hence, a youth with severe prior substance abuse problems likely spends more time at NBIC than a youth with minor prior problems, even after controlling for any history of substance abuse. If the youth with severe problems is more likely to abuse substances post-placement than the youth with minor problems (regardless of peer exposure), I may wrongly attribute the difference in post-placement behavior to greater peer exposure. In addition, if a peer group is functioning poorly, staff may attempt to move one party to another facility.

To address this issue, the peer composition on the first day of youth i's arrival interacted with own history are used as instruments for total peer exposure by own history in a two-stage least squares (2SLS) procedure. The first-stage equations in the 2SLS model are:

$$\begin{aligned} Own\ history_i * Total\ peer\ exposure_i =& \pi_1(Own\ history_i * FD\ peer\ exposure_i) \\ &+ \pi_2(No\ own\ history_i * FD\ peer\ exposure_i) \\ &+ \pi_3(Own\ history_i) + \delta_{f,t} + \epsilon_{i,f,t} \end{aligned} \tag{3}$$

$$\begin{aligned} No\ own\ history_i * Total\ peer\ exposure_i =& \pi_1(Own\ history_i * FD\ peer\ exposure_i) \\ &+ \pi_2(No\ own\ history_i * FD\ peer\ exposure_i) \\ &+ \pi_3(Own\ history_i) + \delta_{f,t} + \epsilon_{i,f,t} \end{aligned} \tag{4}$$

where $FD\,peer\,history_i$ is the share of peers in facility f on the first day of youth i's arrival with a history of the behavior of interest and $\epsilon_{i,f,t}$ is an error term.

Facility-by-year FEs ($\delta_{f,t}$) are included to account for systematic differences in own and peer characteristics between facilities and over time. By including such FEs, I only exploit variation in first-day peer composition within facility-by-year cells.

Since the treatment (first-day peer composition) is assigned to all youths who enter the same facility on the same day, I cluster the standard errors at the facility-by-day level (see Abadie et al., 2023).

By using an IV design, the local average treatment effect (LATE) is estimated. The LATE is the effect of treatment on youths whose total exposure to peers with history h during their NBIC placement increases if the share of peers with history h on the first day they enter an NBIC facility is higher (known as compliers).

3.2 Instrument Relevance

First-day peer exposure by own history must be relevant instruments for total peer exposure by own history to identify β_0 and β_1. The shaded bars in Figure 2 illustrate the identifying variation after residualizing and mean-standardizing each first-day peer measure (using facility-by-year FEs). Among youths with a history of substance abuse (Panel A), youths at the 10th percentile are placed on their first day in a peer group consisting of 58% substance abusers, while youths at the 90th percentile are exposed a group with 77% substance abusers (mean: 0.680, std. dev.: 0.081). Among youths with a history of self-harm (Panel C), youths at the 10th percentile are exposed on their first day to peers where 9% have a history of self-harm compared to 11% for youths at the 90th percentile (mean: 0.098; std. dev. 0.023).

The plots in Figure 2 also include flexible regressions of total peer exposure on first-day peer exposure by own history. In each plot, the endogenous variable appears to monotonically increase in the instrument.

Figure 2. *Relationship Between First-Day Peer Exposure and Total Peer Exposure*



Note: This figure depicts the relationship between total and first-day peer exposure when both peer exposure variables are interacted with own history of substance abuse (plot A), no own history of substance abuse (plot B), own history of self-harm (plot C), and no own history of self-harm (plot D). The histogram in each plot depicts the distribution of own-history-specific first-day peer exposure (leaving out the top and bottom 5%). The solid lines show Kernel-weighted local polynomial regressions of total peer exposure*own history on first-day peer exposure*own history (or interacted with an indicator for no own history in plots B and D). The dashed lines show 90% confidence bands. The 'Main Analysis Sample' is used (see Section 2.6). The plotted values are mean-standardized residuals from regressions on facility-by-year FEs, an indicator for own history, and first-day peer exposure*no own history (or first-day peer exposure*own history in plots B and D).

To formally examine the relevance of own-history-specific first-day peer exposure, I regress total peer exposure by own history on first-day peer exposure interacted with own history. Table 2 presents these first-stage estimates. Irrespective of the relevant history category and whether peer controls are included, the estimates are positive, large, and highly significant with Sanderson-Windmeijer Multivariate F-statistics around 40-100. The point estimate of 36.8 in column 3, Panel A, implies that if the share of peers with a history of substance abuse on the first day of youth i's arrival is 1 percentage points higher, the total peer exposure measure rises by 62% relative to the mean among youths with a history of substance abuse.

Table 2. *First-Stage Estimates*

	Total Peer Exposure		Total Peer Exposure* Own History		Total Peer Exposure* No Own History	
	(1)	(2)	(3)	(4)	(5)	(6)
A: Exposure to Peers With History of Substance Abuse						
FD peer exposure	32.7168***	31.4032***				
	(5.4673)	(5.5786)				
Own history*FD peer exposure			36.8037***	35.2348***		
			(4.9545)	(5.1176)		
No own history*FD peer exposure					47.4399***	47.6500***
					(5.3899)	(5.4083)
Dep. mean if own hist.=1	59.75	59.75	59.75	59.75	0.00	0.00
Dep. mean if own hist.=0	53.35	53.35	0.00	0.00	53.35	53.35
Effective *F*-statistic	35.00	31.03				
Sanderson-Windmeijer *F*-statistic			49.11	44.05	43.39	40.69
B: Exposure to Peers With History of Self-Harm						
FD peer exposure	21.3853***	21.2153***				
	(2.1487)	(2.2043)				
Own history*FD peer exposure			59.5563***	59.8884***		
			(7.8712)	(7.8737)		
No own history*FD peer exposure					25.4934***	25.0707***
					(2.0031)	(2.0508)
Dep. mean if own hist.=1	9.37	9.37	9.37	9.37	0.00	0.00
Dep. mean if own hist.=0	5.95	5.95	0.00	0.00	5.95	5.95
Effective *F*-statistic	96.58	90.36				
Sanderson-Windmeijer *F*-statistic			98.59	96.97	108.09	99.65
Peer controls	No	Yes	No	Yes	No	Yes
Observations	12980	12980	12980	12980	12980	12980

Note: The dependent variable in columns 1-2 is the youth's total exposure to peers with history h (as indicated in the panel heading) during their first placement spell. Total exposure is regressed on the share of peers with history h on the youth's first day. Olea and Pflueger (2013)'s effective F-statistic is reported. The dependent variable in columns 3-4 (5-6) is the interaction of total peer exposure with an indicator taking the value 1 if the youth has (does not have) a history of the same behavior. Each dependent variable in columns 3-6 is regressed on peer exposure on the youth's first day interacted with the youth's own history of the behavior. All estimations include facility-by-year FEs. Sanderson and Windmeijer (2016)'s conditional F-statistics are reported. The 'Main Analysis Sample' is used. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Figure A2 displays the available variation in additional first-day peer measures (without interacting with own history) after accounting for facility-by-year FEs.

3.3 Conditional Random Assignment

The facility at which a youth is placed is not random. To circumvent the issue of non-random assignment, I rely on natural variation in peer composition within facility-by-year cells as youths are discharged and new ones are admitted.[12] This approach has been employed by Bayer et al.

[12]Figure A4 presents the number of admission events by facility and year.

(2009), followed by Stevenson (2017) and Damm and Gorinas (2020). It relies on the central assumption that the variation in peer characteristics is as good as random after netting out facility-by-year FEs.

To examine the validity of this assumption, I present results from employing randomization checks in Table 3 and Table A2 (see Bayer et al., 2009, and Guryan et al., 2009).

In Table 3, I use the diagnostic testing procedure proposed in Bayer et al. (2009). First, I predict each outcome (substance abuse and self-harm post-placement) based on the full set of youth characteristics listed in Table 1 as well as home county and facility-by-year FEs. I then regress predicted outcomes on the peer variables and corresponding own history variables with and without facility-by-year FEs. In line with the validity of the central assumption, the estimated coefficients are close to zero, lack individual significance, and are not jointly significant when facility-by-year FEs are included.

In Table A2, I present further evidence in support of conditional random assignment. Specifically, I regress the first-day share of peers with a history of substance abuse (self-harm) on own history of the corresponding behavior with and without facility-by-year FEs. In all regressions, I control for the leave-out mean of the relevant history category within the population at risk of being the youth's peers (i.e., the leave-out mean within the facility-by-year cell). The leave-out mean within the randomization cell is included to account for the mechanical negative correlation between individual and peer characteristics.

In line with facility specialization, there is a strong correlation between own and peer pre-placement history when no facility-by-year FEs are included (columns 1, 3, and 5 in Table A2). Hence, estimations of peer effects that do not take into account such specialization would likely yield biased estimates. Fortunately, when facility-by-year FEs are included, the correlations between own and first-day peer history are small and lack statistical significance. These results provide strong empirical evidence that youths are as-if-randomly assigned to peer groups within facility-by-year cells.

While the outlined strategy allows for a causal analysis of peer effects, the estimated effect might reflect the influence of other peer characteristics than the peer characteristic of interest. For example, if own depression increases the risk of engaging in self-harm, and peer depression affects own depression, the estimated effect of peer self-harm on own self-harm is likely subject to omitted variable bias. To alleviate such concerns, I follow Altonji et al. (2005) and examine the stability of my estimates to the inclusion of additional peer characteristics. In the peer effects literature, concerns about omitted variable bias have been addressed in a similar fashion by Golsteyn et al. (2020).

Table 3. *Test of Conditional Random Assignment of First-Day Peer Composition*

	Predicted Substance Abuse Post-Exit		Predicted Self-Harm Post-Exit	
	(1)	(2)	(3)	(4)
Peer substance abuse	0.0509***	0.0013	0.0065***	-0.0004
	(0.0036)	(0.0031)	(0.0021)	(0.0011)
Peer self-harm	-0.0155	0.0003	0.0405***	0.0001
	(0.0098)	(0.0060)	(0.0064)	(0.0019)
Peer crime	-0.0338***	0.0016	-0.0160***	-0.0006
	(0.0058)	(0.0036)	(0.0039)	(0.0012)
Peer NDD	-0.0003	-0.0037	0.0003	0.0007
	(0.0110)	(0.0076)	(0.0071)	(0.0025)
Peer depression	0.0272	0.0037	-0.0058	0.0038
	(0.0168)	(0.0097)	(0.0108)	(0.0030)
Peer other mental illness	0.0365***	0.0059	-0.0073	-0.0012
	(0.0083)	(0.0054)	(0.0056)	(0.0018)
Peer female	0.0061*	-0.0024	-0.0103***	0.0001
	(0.0032)	(0.0052)	(0.0021)	(0.0019)
Peer foreign	-0.0599***	-0.0015	-0.0158***	0.0004
	(0.0043)	(0.0037)	(0.0024)	(0.0012)
Peer <15 y.o.	-0.0063**	-0.0019	0.0027	-0.0023*
	(0.0027)	(0.0033)	(0.0019)	(0.0012)
Peer missing personal id. no.	0.0097	-0.0059	0.0244***	-0.0027
	(0.0086)	(0.0082)	(0.0049)	(0.0027)
Facility*year FEs	No	Yes	No	Yes
F-statistic	74.428	0.399	14.481	0.664
p-value	0.000	0.948	0.000	0.759
Observations	12980	12980	12980	12980

Note: Test of exogenous peer variation using the 'Main Analysis Sample'. Outcomes are predicted using the youth characteristics in Table 1, home county FEs, and facility-by-year FEs. In each regression, the predicted outcome is regressed on the listed peer measures and the corresponding own characteristics with and without facility-by-year FEs (as indicated in the table). Reported *F*-statistic (*p*-value) of joint significance is for the displayed variables. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

3.4 Exclusion Restriction

Conditional random assignment is sufficient to estimate the reduced-form effect of first-day peer exposure on youth outcomes. However, to estimate the effects of total peer exposure during the youth's time at NBIC by own history, the instruments must satisfy the exclusion restriction. In this context, the assumption implies that own-history-specific first-day peer exposure must exclusively affect youth outcomes through own-history-specific total peer exposure, either by affecting the daily peer composition or the total time spent at NBIC. To the best of my knowledge, there is no channel other than total peer exposure through which first-day peer exposure can impact youth outcomes.

3.5 Monotonicity

In the presence of heterogeneous effects, a monotonicity condition is needed. Monotonicity implies that, for every youth, total peer exposure weakly increases with first-day peer exposure. Monotonicity is not met if, for example, there are youths who would have a medium level of total exposure to substance-abusing peers if the first-day peer exposure is of medium level but who would have a low level of exposure if the first-day peer exposure is high. Such a problem can arise if NBIC responds to a youth being placed in a facility with a high (but not a medium) share by relocating the youth to a low-exposure facility or relocating the substance-abusing peers.

If the monotonicity assumption holds, the first-stage estimates are nonnegative for all subsamples of youths. To probe whether the monotonicity condition holds, I slice the sample along observable dimensions and estimate the first stage in each subsample (see Table A3). In line with the monotonicity condition, each estimate is positive, large, and significant.

4 Peer Effects in Substance Abuse and Self-Harm

4.1 Baseline Results

Table 4 presents the estimated effects of peer substance abuse and self-harm, respectively, on the risk of youth i being hospitalized from substance abuse or self-harm during the 12 months after placement exit. Separate effects are estimated for youths with versus without a history of each behavior. The sample size is slightly smaller compared to Table 1 due to emigration and death.[13]

Simple OLS regression of total peer exposure by own history yields estimates close to zero. However, these estimates are likely biased because youth characteristics influence the length of placement and future peer composition. Addressing this issue by using first-day peer exposure by own history as instruments for total peer exposure by own history reveals large, reinforcing peer effects in both substance abuse and self-harm.

Relative to the average risk of experiencing a substance abuse-related hospitalization among youths with a history of substance abuse, the point estimate of 0.24 percentage points in column 1 implies that a 1-standard deviation increase in total peer exposure (75.0) increases the risk of a future hospitalization for substance abuse by 183%. This effect is significant at the 1% level. I also report the p-value of a joint Anderson-Rubin (AR) test as well as identification-robust AR confidence sets for each regressor. Reassuringly, the joint AR-test returns a p-value below 1%. The

[13] To test for selective sample attrition, I regress dummies for missing in Statistics Sweden's register data, missing in the 'Main Analysis Sample', and missing in the 'Education Sample', respectively, on my main first-day peer measures. The results in Table A4 suggest that selective attrition is negligible. Estimated effects of all peer measures interacted with own history of the corresponding peer measure on the main outcomes (substance abuse and self-harm post-placement) are available in Table A5. In Table A6, I provide estimated peer effects in crime, depression, and any mental disorder (excluding substance abuse and self-harm).

Table 4. *Peer Effects in Substance Abuse and Self-Harm*

	Substance Abuse		Self-Harm	
	(1)	(2)	(3)	(4)
Ordinary Least Squares				
Own history*Total peer exposure	0.0001*	0.0001	0.0012*	0.0007
	(0.0001)	(0.0001)	(0.0007)	(0.0007)
No own history*Total peer exposure	-0.0000	-0.0000	0.0002*	-0.0003**
	(0.0000)	(0.0000)	(0.0001)	(0.0001)
Reduced-Form Regression				
Own history*FD peer exposure	0.0963***	0.0861***	0.3258**	0.3076**
	(0.0270)	(0.0272)	(0.1428)	(0.1408)
No own history*FD peer exposure	-0.0049	0.0009	-0.0080	-0.0023
	(0.0230)	(0.0238)	(0.0306)	(0.0319)
Instrumental Variable Model				
Own history*Total peer exposure	0.0024***	0.0022***	0.0059**	0.0057*
	(0.0007)	(0.0007)	(0.0030)	(0.0030)
No own history*Total peer exposure	0.0013	0.0013	0.0008	0.0010
	(0.0008)	(0.0009)	(0.0015)	(0.0016)
Dep. mean if own hist.=1	0.0971	0.0971	0.1421	0.1421
Dep. mean if own hist.=0	0.0240	0.0240	0.0269	0.0269
%Δ from 1 s.d. Δ if own hist.=1	182.97	167.78	83.62	80.63
%Δ from 1 s.d. Δ if own hist.=0	402.39	421.34	38.28	45.43
Test of equality (p-value)	0.0129	0.0561	0.0265	0.0372
Joint AR p-value	0.0000	0.0001	0.0660	0.0886
AR confidence set β_0 (90%)	[.0011,.0039]	[.0008,.0037]	[.0001,.0127]	[-.0001,.0125]
AR confidence set β_1 (90%)	[-.0004,.0032]	[-.0003,.0033]	[-.0022,.0043]	[-.0021,.0046]
Youth & peer controls	No	Yes	No	Yes
Observations	12866	12866	12866	12866

Note: The dependent variable is an indicator equal to one if the youth is hospitalized due to substance abuse or self-harm (respectively) during the 12 months after exit from the first placement spell at NBIC. In *Ordinary Least Squares*, each dependent variable is regressed on total peer exposure interacted with the youth's own history of the behavior indicated in the top row. In *Instrumental Variable Model*, Own history*FD peer exposure and No own history*FD peer exposure are used as instruments for Own history*Total peer exposure and No own history*Total peer exposure. All estimations control for own history and facility-by-year FEs. Whether controls for youth and first-day peer characteristics (as listed in Table 1) are included is indicated at the bottom of the table. The 'Main Analysis Sample' is used. %Δ from 1 s.d. Δ if own hist.=1 gives the change in the likelihood of hospitalization when total peer exposure increases by 1 standard deviation relative to the mean risk among youths with a history of substance abuse or self-harm. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

AR confidence sets are obtained using the projection method. Even though the project method is known to suffer from poor power (see Andrews et al., 2019), the AR confidence set in column 1 still implies a significant reinforcing peer effect in substance abuse (90% level).

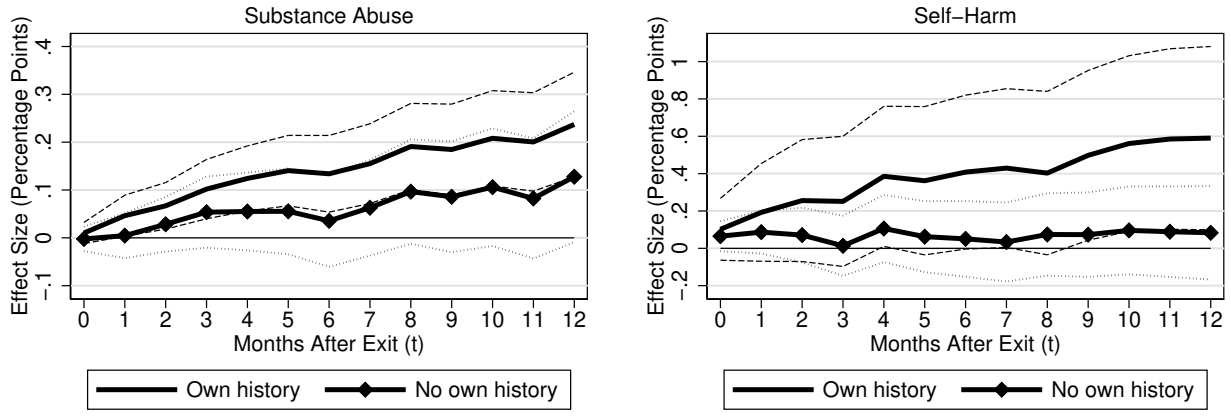
For youths without a history of substance abuse, the estimated peer effect is positive but not statistically significant. Tests of equality reveal a significant difference in the IV estimated coefficients at the 5-10% level.

A similar pattern is observed for self-harm (columns 3-4, Table 4): a large reinforcing peer effect is found (significant at the 5-10% level), while the estimated introductory peer effect is small and lacks statistical significance. The difference in IV-estimated effects is significant at the 5% level. The point estimate of 0.59 percentage points in Column 3 implies that a 1-standard deviation increase in exposure to peer self-harm during placement (20.1) increases the risk of future self-harm by 83.6% relative to the mean among youths with a history of self-harm.

The estimated reinforcing peer effects are unaffected by the inclusion of the full set of youth and first-day peer controls (see Table 1). This suggests that omitted variable bias potentially is of limited concern (Altonji et al., 2005) and supports that it is the peer characteristic of interest, rather than some other peer characteristic such as gender composition, that is driving the estimated effects.

Figure 3 presents IV estimates of the effect of peer exposure on the cumulative risk of hospitalization from substance abuse and self-harm by month t after the end of the NBIC placement (with 90% confidence intervals). Separate lines are shown for youths with and without a history of the relevant behavior. Among youths with a history of substance abuse, the estimated effect is positive for the full 12-month window and appears to be slightly increasing in size over time. The point estimates are statistically significant from the first month onward. For youths with no history of substance abuse, the point estimates are positive but lack statistical significance.

Figure 3. *IV Estimated Peer Effects in Substance Abuse and Self-Harm*



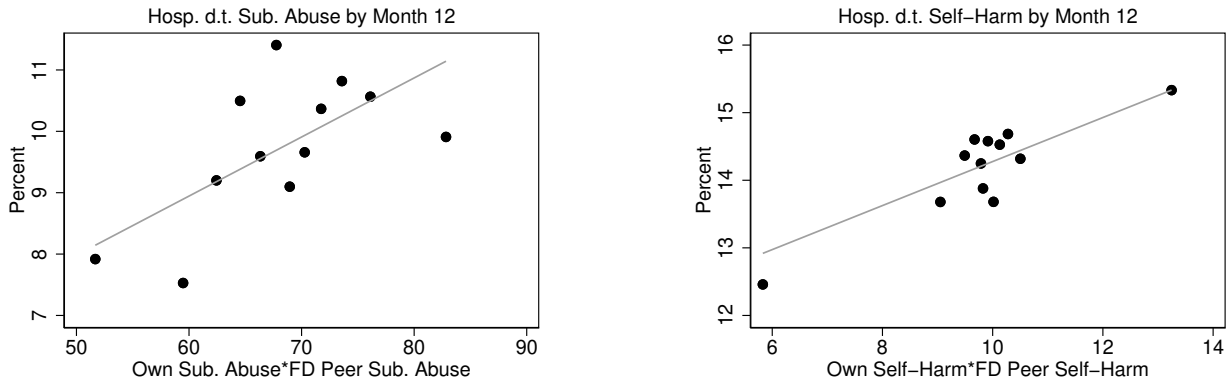
Note: Black lines show IV estimates of the effect of total peer exposure on the cumulative probability of the youth being hospitalized from substance abuse and self-harm (respectively) by month t post-exit. The relevant history category is stated in the subfigure heading. Dashed lines show 90% confidence bands. Effect estimates are presented in percentage points (i.e., scaled by 100). All specifications condition on being alive and in Sweden during months 0-t.

For self-harm, the effect is positive and increases over the months following placement exit among youths with a prior history of self-harm. The effect is statistically significant from month 9 onward. Among youths with no such prior history, the point estimates are close to zero during

the year post-placement.

In Table 4, I use classical 2SLS and impose linear models in the first and second stages. As shown in Figure 2, each endogenous variable increases appropriately linearly with the relevant instrument. Since the IV estimator is the ratio of the reduced form to the first stage, probing the reduced-form relationships is also useful. As seen in Figure 4, the risk of hospitalization is approximately linear in first-day peer exposure among youths with a history of the same behavior. Figure A5 provides the corresponding figure for youths with no history of substance abuse and self-harm. Figure A5 also illustrates the relationship between first-day peer exposure and future hospitalization risk when the number of peers (rather than the share) with a certain history is used.

Figure 4. *Reduced-Form Relationship Between First-Day Peer Exposure and Hospitalization*



Note: Black dots represent the risk of hospitalization (in percent) due to substance abuse and self-harm post-placement over the share of first-day peers with a history of the corresponding behavior interacted with own history. All values are residualized and mean-standardized using facility-by-year FEs, no own history interacted with peer exposure, and own history.

Tables A7-A8 demonstrate that the main results are robust to changes in specification, sample selection, and instrument construction. The results are also robust to dropping each facility.

4.1.1 Are there no introductory peer effects?

I cannot rule out the presence of introductory peer effects. The outcome used as a proxy for future substance abuse and self-harm (hospitalization) is extreme. In Sweden, only individuals with severe injuries or illnesses that cannot be treated within the outpatient healthcare system are hospitalized. If there are introductory peer effects, it might take several years before the behavior has progressed to the point where I can observe an effect on hospitalizations.

In addition, a third of youths are readmitted to NBIC within one year of ending their first placement. Table A9 presents evidence that exposure to peers with a history of substance abuse increases the likelihood of being readmitted to NBIC within one year and lowers the possibility

of being placed in a foster family.[14] Compared to a foster home, both the level of control and healthcare knowledge is higher in an NBIC facility. By stopping incidents and (when needed) providing healthcare, NBIC staff may prevent some hospitalizations. Hence, I may fail to identify youths who engage in behavior that would result in hospitalization had the youth not been placed at NBIC.

4.2 Heterogeneity

Table A10 presents separate effects by youth characteristics (sex, foreign background, and age), while Table A11 presents separate effects by facility characteristics (peer group size, occupancy, and whether the youth had to move to a facility in a new county). A reinforcing peer effect is estimated in all subgroups, but the estimates are at times imprecise due to the sample size. Few statistically significant differences are detected.

Prior studies document that peer effects tend to be stronger in groups with similar characteristics (e.g., Billings and Schnepel, 2022). To inspect whether peer effects increase with connectivity in the current context, I calculate two new sets of instruments: (i) the first-day share of peers with history h and the same sex as the youth and (ii) the first-day share of peers with history h and the opposite sex as the youth. In Table A12, I use these variables as instruments for the total exposure to peers with history h and the same (or opposite) sex as the youth. The results suggest that the reinforcing peer effects in substance abuse and self-harm are entirely driven by exposure to peers of the same sex. In fact, the point-estimated effects of opposite-sex peer history are negative, but only the effect of exposure to opposite-sex self-harm is statistically significant.

5 Mechanisms for Peer Effects in Substance Abuse & Self-Harm

The main analysis reveals large reinforcing peer effects in substance abuse and self-harm. In this section, I explore the five groups of mechanisms through which peer exposure can impact the risk of future hospitalization outlined in Section 1.

I begin by decomposing the estimated peer effects in substance abuse by constructing substance-specific outcome variables. As seen in Table A13, the effect of exposure to peer substance abuse is positive in all columns when the youth has a history of substance abuse. Hence, the reinforcing peer effect in substance abuse does not appear to be driven by a particular substance. However, the estimate lacks statistical significance when the outcome is an indicator taking the value one if the youth is hospitalized for a cannabis-related illness or injury within one year of leaving NBIC.

[14] Figure A3 shows the share of youths in any form of out-of-home care in the months after exiting their first NBIC placement.

5.1 Social Influence

Does social influence drive the estimated effects of peer exposure? To explore this channel, I examine the presence of peer effects during placement. Figure A6 presents OLS estimated effects of first-day peer exposure on the risk of being hospitalized due to substance abuse and self-harm during the months after admission but before placement termination. I inspect the reduced-form impact of first-day peer exposure rather than the effect of total peer exposure because the outcome is measured during placement.

In line with the main results, the point estimates for peer substance abuse and self-harm are positive among youths with a prior history of the corresponding behavior by month 3 after arriving at NBIC. I use three months as the cutoff due to sample considerations. Specifically, the median placement length is three months. Indeed, the confidence intervals are wide and the estimated effects are only statistically significant at some time points.

Moreover, there appears to be considerable clustering of severe substance abuse and self-harm incidents: more than 1 in 5 youths who are hospitalized for self-harm while placed at NBIC are hospitalized (at least once) in the same month as their peer is hospitalized for the same reason. An equivalent share is observed among youths who are hospitalized for substance abuse while placed at NBIC.

If peer behavior affects own behavior through direct exposure to substance abuse and self-harm incidents, we should expect an effect of exposure to peers with a history of substance abuse (but not self-harm) on the length of time the youth spends at NBIC because the placement length depends on whether the youth threatens their health or development through substance abuse, criminal activity, or other destructive behavior (excluding self-harm). In Table A14, I regress the number of days spent at NBIC on first-day peer exposure by own history. As expected, exposure to peers with a history of substance abuse significantly increases (1% level) the time youths with a history of substance abuse spend at NBIC. Exposure to peers with a history of self-harm, on the other hand, does not significantly increase placement duration.

All in all, these results speak in favor of peers influencing youth substance abuse and self-harm through direct exposure to peer behavior.

5.2 Interrupted Treatment

A youth's treatment can be disrupted if the youth runs away from NBIC or must switch to a new facility. Even though the security of NBIC facilities is supposed to be high, it is common to escape: almost 1 in 5 manage to escape at least once during their first placement spell. In support of the interrupted-treatment channel, there is suggestive evidence that exposure to peers with a history of substance abuse increases the number of days on the run if the youth has a history

of substance abuse (Table A14, Column 7).[15] However, the reinforcing peer effect in substance abuse is still large and statistically significant in the subsample of youths who never run away during their first placement spell (Table A15, Column 5).

Moreover, as shown in columns 2-3 of Table A14, I find no statistically significant effects of peer composition on the likelihood of switching facilities or the number of facility switches during the placement spell.

5.3 Quality of Care

Substance-abusing and self-harming peers may affect the quality of care available to other youths by being particularly resource-demanding. To investigate the quality-channel, I consider other groups of youths who likely require high-intensity care: youths with neurodevelopmental disorders, youths who have committed violent crimes, and youths who have committed such serious crimes that they are sentenced to serve time at NBIC (e.g., murder). In Table A16, I regress my main outcomes (hospitalization due to substance abuse and self-harm by month 12) on the first-day peer measures interacted with own history of substance abuse and self-harm, respectively. There is little evidence that exposure to peers with such backgrounds increases the risk of hospitalization due to substance abuse and self-harm.

While I cannot offer conclusive evidence, these results suggest that the main results (reinforcing peer effects in substance abuse and self-harm) are not driven by exposure to resource-demanding peers.

5.4 Spread of Mental Illness

As shown in Table A5, there is no statistically significant effect of peer depression on the likelihood of hospitalization due to substance abuse or self-harm in the year following placement. Likewise, regressing an indicator for hospitalization due to depression on peer depression interacted with own history of depression does not yield significant estimates (Table A6). Hence, my results do not support the existence of depression contagion. Neither can I find any evidence that exposure to peers with a history of any other mental disorder (excluding substance abuse and self-harm) adversely affects own mental health (Table A6, Column 3).

[15] Treatment can also be affected by being placed in isolation, which implies that the youth is kept separate from the other youths and only has contact with staff members. However, it is not evident that exposure to substance abusing or self-harming peers would influence time spent in isolation. Isolation is supposed to be used if staff members believe that the youth will benefit from receiving care alone. Isolation is sometimes (inaccurately) used as a punishment. As shown in Table A14, no statistically significant effects are found on the likelihood of being placed in isolation or the number of days spent in isolation.

5.5 Learning and Availability

If social learning is an important driver, we should expect larger effects for youths with relatively low experience of the behavior. The lack of introductory peer effects (i.e. peer effects for youths with no history of the behavior) in the full sample speaks against social learning being a major driver of peer influence.

If experience is correlated with age, we should expect larger peer effects in young subsamples. However, I find no evidence that the harmful effects of peers are significantly larger among youths aged below 15 (Table A10, columns 7-9).

Moreover, increased availability might be an especially relevant mechanism if the youth moves to a new county because their capacity to smuggle addictive substances into NBIC is likely lower if the facility is far from their network of dealers and friends. However, as shown in Table A11, there is no statistically significant difference in the reinforcing peer effect in substance abuse by whether the youth must move to a new county.

6 Effect of Peer Substance Abuse & Self-Harm on Education

Given the large, reinforcing peer effects in substance abuse and self-harm, a natural follow-up question is whether exposure to peer substance abuse and self-harm impacts classical economic outcomes. Since the sample is comprised of youths, I focus on educational attainment. Specifically, since the sample is highly disadvantaged I use the lowest step in the educational ladder in Sweden as an outcome: whether the youth attains sufficient grades to be eligible for high school by age 21 (see Section 2 for details on the Swedish education system).

As seen in Table 5, simple OLS regression gives negative point estimates for exposure to peers with a history of substance abuse regardless of own history. When first-day peer exposure is used as an instrument for total peer exposure, the point estimates become much larger in absolute size. In particular, the point estimate in the first column (0.0028) implies that a one standard deviation increase in total exposure to peer substance abuse (76.2) reduces the chance of being eligible for high school by age 21 by 21.5 percentage points for youths with a history of substance abuse.

Interestingly, a significant effect is also found for youths with no history of substance abuse and the IV estimates are not statistically different. While the estimated introductory peer effect in substance abuse is positive (see Table 4), it is not statistically significant. This discrepancy indicates that exposure to substance-abusing peers does not affect educational attainment exclusively through the peers' effect on youths' own substance abuse. This is unsurprising since prior studies have found evidence of peer effects in education (see Sacerdote, 2011). In particular, if peers with a history of substance abuse tend to perform particularly poorly in school, there may be a direct effect of being exposed to low-achieving peers on youths' own educational performance.

Table 5. *Effect of Peer Substance Abuse and Self-Harm on Eligibility for High School*

	Substance Abuse		Self-Harm	
	(1)	(2)	(3)	(4)
Ordinary Least Squares				
Own history*Total peer exposure	-0.0003***	-0.0001*	0.0004	-0.0001
	(0.0001)	(0.0001)	(0.0009)	(0.0009)
No own history*Total peer exposure	-0.0004***	-0.0003***	-0.0004	-0.0007**
	(0.0001)	(0.0001)	(0.0003)	(0.0003)
Reduced-Form Regression				
Own history*FD peer exposure	-0.1332***	-0.1393***	-0.0246	0.0209
	(0.0487)	(0.0494)	(0.1689)	(0.1644)
No own history*FD peer exposure	-0.0586	-0.0719	0.0264	0.0752
	(0.0505)	(0.0516)	(0.0728)	(0.0748)
Instrumental Variable Model				
Own history*Total peer exposure	-0.0028**	-0.0030***	0.0002	0.0019
	(0.0011)	(0.0012)	(0.0033)	(0.0034)
No own history*Total peer exposure	-0.0024*	-0.0028**	0.0011	0.0034
	(0.0013)	(0.0014)	(0.0034)	(0.0035)
Dep. mean if own hist.=1	0.1218	0.1218	0.1813	0.1813
Dep. mean if own hist.=0	0.1882	0.1882	0.1506	0.1506
%Δ from 1 s.d. Δ if own hist.=1	-176.30	-188.27	2.15	24.00
%Δ from 1 s.d. Δ if own hist.=0	-99.53	-115.34	9.25	28.92
Test of equality (p-value)	0.6343	0.8173	0.6992	0.5245
Joint AR p-value	0.0194	0.0164	0.9112	0.5995
AR confidence set β_0 (90%)	[-.0053,-.0007]	[-.006,-.0007]	[-.0075,.0078]	[-.0047,.0097]
AR confidence set β_1 (90%)	[-.0055,.0002]	[-.0065,0]	[-.0056,.0077]	[-.0035,.0103]
Youth & peer controls	No	Yes	No	Yes
Observations	9028	9028	9028	9028

Note: The dependent variable is an indicator taking the value 1 if the youth attains sufficient grades to be eligible for high school by age 21. The 'Education Sample' is used. All regressions control for own history and facility-by-year FEs. The bottom of the table indicates whether controls for youth and peer characteristics are included. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

To explore whether the effect on own substance abuse is an important channel for the effect on educational attainment, I use first-day peer exposure by own history as instruments for own substance abuse, where own substance abuse is measured as an indicator taking the value 1 if the youth is hospitalized due to substance abuse by month 12 after leaving NBIC. The IV results in Table A17 imply that, among compliers, youths who are hospitalized by month 12 are 84 percentage points less likely to be eligible for high school by age 21. Compliers are in this context youths whose hospitalization status depends on the first-day share of substance-abusing peers. Since the first-stage relationship between first-day peer composition and hospitalization is weak (effective F-statistic around 8-9), weak-instrument robust methods should be used for inference (Andrews et al., 2019). The AR test, which is robust to weak identification, yields a p-value below 5%.

7 Optimal Allocation of Youths

Given that the harmful peer effects are significantly larger if the youth has a history of the same behavior, the question arises whether it is optimal to separate youths with similar behavioral backgrounds. However, all youths placed in NBIC facilities have behavioral problems. After substance abusers, the main group is youths with a criminal background. A concern frequently raised in the public debate is that youths admitted to NBIC facilities are victimized by criminal peers. In Table 6, I examine the (reduced-form) impact of the first-day share of peers with a criminal background on the risk of being hospitalized for assault within 12 months of entering an NBIC facility. Indeed, being placed in a facility on a day with a higher share of criminal peers significantly increases the risk of being hospitalized (5-10% level).

Table 6. *Effect of Criminal Peers on Risk of Assault*

	(1)	(2)
FD peer crime	0.0139**	0.0134*
	(0.0067)	(0.0070)
Dependent mean	0.0037	0.0037
%Δ from 1 s.d. Δ	63.33	60.80
Youth & peer controls	No	Yes
Observations	12889	12889

Note: The dependent variable is an indicator taking the value 1 if the youth is hospitalized for injuries sustained through assault within 12 months of entering NBIC. FD peer crime is the share of peers on the youth's first day with a criminal background. The 'Main Analysis Sample' is used. All regressions include facility-by-year FEs. The bottom of the table indicates whether the full set of youth and peer controls are included. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

This exercise illustrates the existence of other adverse spillovers across youths beyond reinforcing peer effects in substance abuse and self-harm. Hence, spreading youths with substance abuse and self-harm across facilities, and thereby increasing the share of youths with other behavioral backgrounds, might not be optimal.

8 Conclusion

This paper examines how exposure to peers with a history of substance abuse and self-harm in residential treatment facilities affects youth outcomes. To identify causal effects, I exploit novel data and plausibly exogenous variation in first-day peer exposure within facility-by-year cells in an IV framework.

I find strong evidence of reinforcing peer effects in substance abuse and self-harm. Increased exposure to peers with a pre-placement history of substance abuse (self-harm) greatly increases

the risk of hospitalization due to substance abuse (self-harm) in the year after discharge, but only if the youth has a history of the same behavior. The strong effects persist even after controlling for a rich set of alternative peer characteristics (crime, neurodevelopmental disorder, depression, other mental disorder, gender, age, and foreign background).

Interestingly, I do not find significant introductory peer effects in substance abuse and self-harm. Compared to the reinforcing peer effects, the estimated effects on youths without a history of substance abuse and self-harm are significantly smaller.

The empirical evidence suggests that the adverse effects of exposure to peer substance abuse and self-harm are generated by peers reinforcing each others' addictive and self-harming behaviors through social influence.

Moving beyond the peer-to-peer spread of substance abuse and self-harm, I also show that increased exposure to peer substance abuse sharply decreases the likelihood of attaining sufficient grades to be eligible for high school.

The findings of this paper do not imply that we should spread substance-abusing and self-harming youths across facilities. All else equal, such a change would mechanically increase these youths' exposure to peers who struggle with other types of problematic behaviors, where the largest group following substance abuse is criminal behavior. Exposure to such peers can also adversely affect youth outcomes. As an example, I show that increased exposure to criminal peers increases the likelihood of being hospitalized for injuries sustained through assault.

Given that previous literature shows that court-ordered placement of youths in NBIC facilities (and other forms of out-of-home care) has large adverse health effects, reducing the extent to which youths are placed in NBIC facilities might generate better outcomes.

This paper is limited to youths placed in residential facilities. The social spillovers of substance abuse and self-harm might be very different for other populations (e.g., adults), in other settings (e.g., schools), and for other types of relationships (e.g., parent-child interactions). Moreover, 95% of the youths in the studied sample are placed involuntarily. A study conducted using youths who are voluntarily admitted for treatment in residential facilities might yield different results. Future studies on spillovers in substance abuse and self-harm using other samples are needed.

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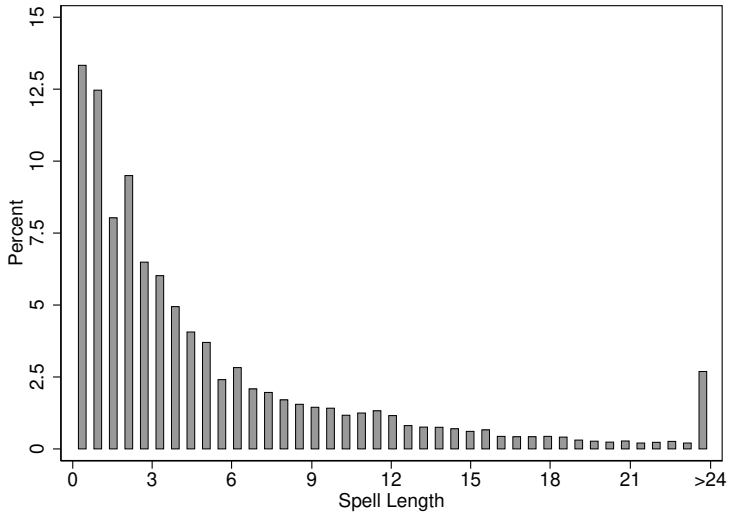
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Appendix

Figure A1. *Length of Placement Spell*



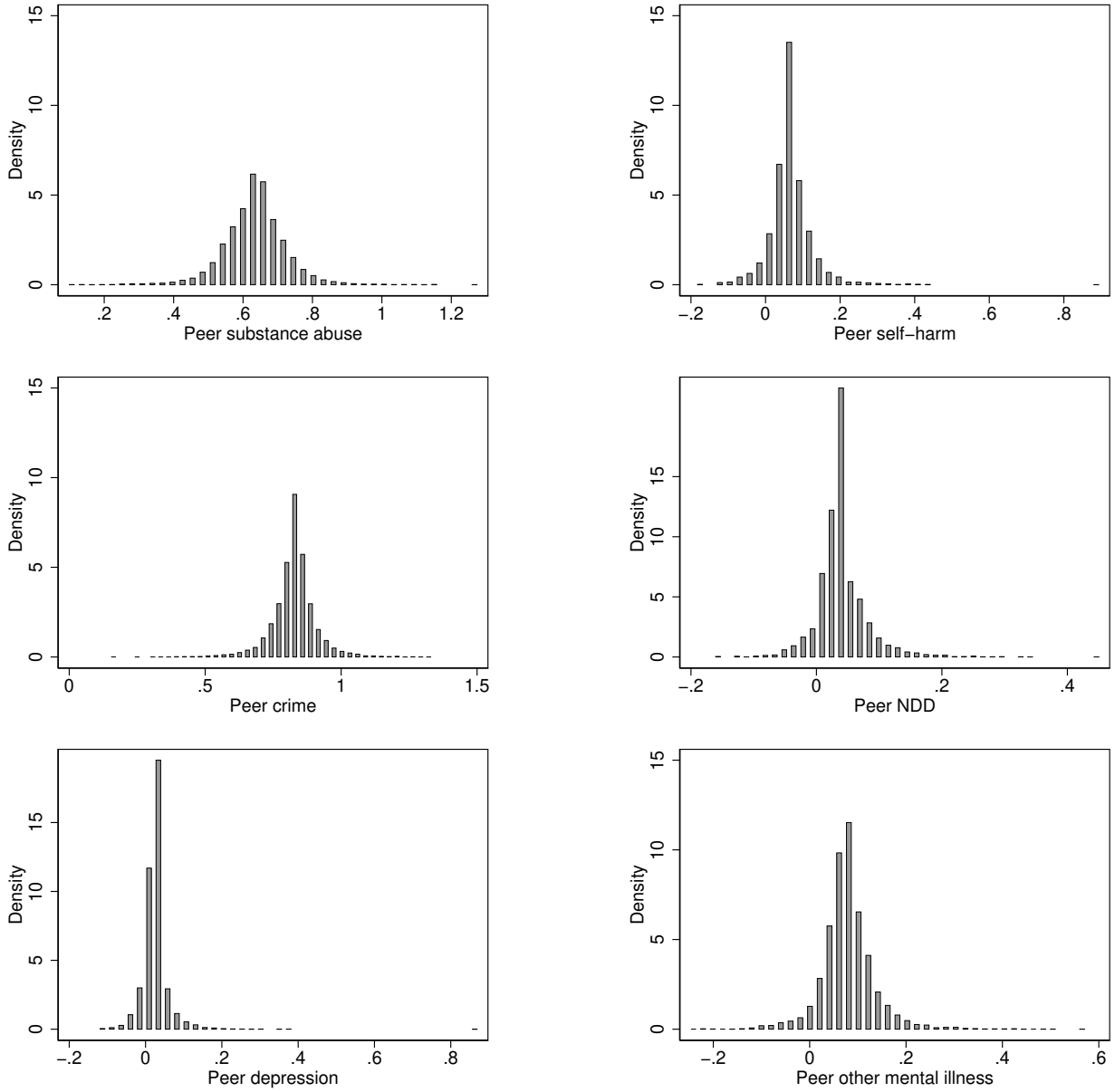
Note: This figure presents the distribution of placement spell lengths. I use the full sample of first-time placements but restricted to placements that start before 2020 since I only have information about exit dates until the end of 2021 (N=15,562).

Table A1. *Own History as Predictor of Hospitalization*

	Substance Abuse		Self-Harm	
	(1)	(2)	(3)	(4)
Own substance abuse	0.0632***	0.0447***		0.0055
	(0.0041)	(0.0042)		(0.0036)
Own self-harm		0.0448***	0.1029***	0.0724***
		(0.0129)	(0.0121)	(0.0118)
Youth controls	No	Yes	No	Yes
Adjusted R-squared	0.0387	0.0604	0.0325	0.0528
Dependent mean	0.0673	0.0673	0.0341	0.0341
Observations	12866	12866	12866	12866

Note: The dependent variable is an indicator taking the value 1 if the youth is hospitalized due to substance abuse (columns 1-2) or self-harm (columns 3-4) by month 12 after exit from the first placement spell at NBIC. Each dependent variable is regressed on an indicator taking the value 1 if the youth has a pre-placement history of the behavior indicated at the top of the table. The 'Main Analysis Sample' is used. All specifications are estimated using OLS and include facility-by-year FEs. The full set of youth characteristics listed in Table 1 are included as controls in columns 2 and 4. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Figure A2. *Variation in Residualized First-Day Peer Composition*



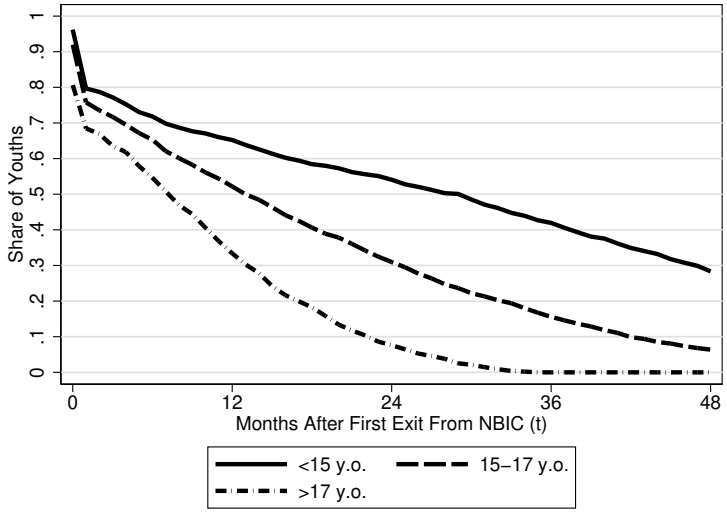
Note: This figure displays the variation in the share of peers with a pre-placement history of substance abuse, self-harm, crime, neurodevelopmental disorder, depression, and other mental illness, respectively, on the first day of youth i's arrival after accounting for facility-by-year FEs. The relevant peer variable is indicated on the x-axis. The '2002-2020 Sample' is used.

Table A2. *Additional Test of Conditional Random Assignment of First-Day Peer Composition*

	2002-2020 Sample		Main Analysis Sample		Education Sample	
	(1)	(2)	(3)	(4)	(5)	(6)
A: Peer Substance Abuse						
Own substance abuse	0.0221***	-0.0018	0.0237***	-0.0014	0.0197***	-0.0023
	(0.0025)	(0.0039)	(0.0027)	(0.0042)	(0.0032)	(0.0054)
Dependent mean	0.6337	0.6337	0.6301	0.6301	0.5932	0.5932
B: Peer Self-Harm						
Own self-harm	0.0157***	0.0006	0.0154***	0.0010	0.0167***	0.0051
	(0.0031)	(0.0052)	(0.0031)	(0.0053)	(0.0038)	(0.0070)
Facility*year FEs	No	Yes	No	Yes	No	Yes
Dependent mean	0.0657	0.0657	0.0674	0.0674	0.0647	0.0647
Observations	14101	14101	12980	12980	9236	9236

Note: The dependent variable is the share of peers with a history of substance abuse (Panel A) or self-harm (Panel B) on the first day of the youth's placement. All models are estimated with OLS and control for the facility-by-year leave-out mean. Columns 2, 4, and 6 also include facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Figure A3. *Share of Youths in Out-of-Home Care After First Exit*



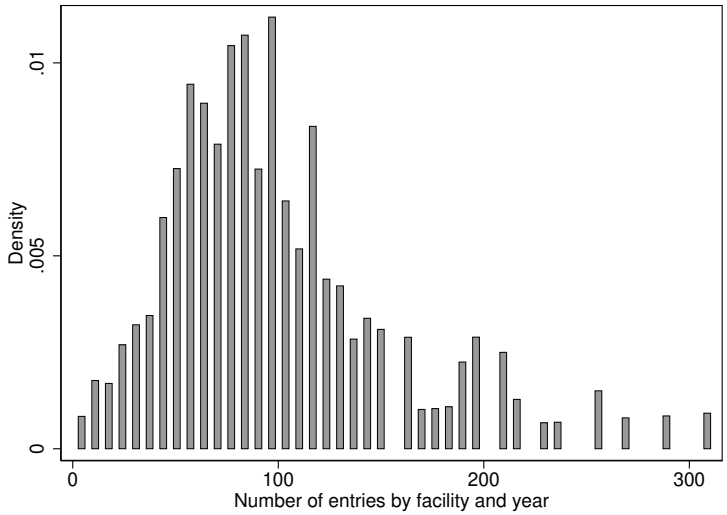
Note: This figure shows the share of youths (by age at admission) who are in any form of out-of-home care (including foster family, group home, and institution) for at least one day during month t after exiting NBIC at month 0. The 'Main Analysis Sample' is restricted to youths who exited care before 2013 since the non-NBIC placement data is known to suffer from underreporting from 2014 onward.

Table A3. *First-Stage Estimates of First-Day Peer Exposure on Total Peer Exposure in Subsamples*

	Gender		Background		Age	
	(1) Girl	(2) Boy	(3) Foreign	(4) Native	(5) <15	(6) ≥15
*A: Own History*Total Peer Exposure (Substance Abuse)*						
Own history*FD peer exposure	29.5964***	41.3554***	31.4638**	36.2008***	40.9807***	31.7440***
	(7.3993)	(6.9639)	(12.4603)	(6.9308)	(9.0616)	(6.1277)
Dep. mean if own hist.=1	56.63	61.33	65.15	58.45	53.97	60.65
Sanderson-Windmeijer *F*-statistic	21.58	21.77	11.34	20.43	23.92	16.50
*B: No Own History*Total Peer Exposure (Substance Abuse)*						
No own history*FD peer exposure	45.0434***	51.4860***	47.6580***	53.1410***	55.2601***	45.3539***
	(8.0146)	(7.4782)	(11.6572)	(9.1245)	(9.2339)	(6.8362)
Dep. mean if own hist.=0	49.53	55.48	54.92	54.51	50.29	55.04
Sanderson-Windmeijer *F*-statistic	25.64	19.24	10.61	17.98	34.97	14.97
*C: Own History*Total Peer Exposure (Self-Harm)*						
Own history*FD peer exposure	56.2953***	38.8407***	65.6709***	66.2733***	43.1802***	63.6462***
	(9.2478)	(7.5657)	(18.0825)	(12.5253)	(14.1498)	(8.8008)
Dep. mean if own hist.=1	12.03	4.46	6.46	10.80	10.28	9.17
Sanderson-Windmeijer *F*-statistic	45.31	66.25	11.63	45.12	16.04	73.77
*D: No Own History*Total Peer Exposure (Self-Harm)*						
No own history*FD peer exposure	24.0549***	25.3697***	28.3443***	22.3290***	26.6256***	24.4780***
	(2.8413)	(2.1092)	(7.3283)	(2.7511)	(4.2509)	(2.3081)
Dep. mean if own hist.=0	9.97	4.01	5.23	6.59	6.63	5.75
Sanderson-Windmeijer *F*-statistic	45.16	127.64	10.41	45.23	30.23	75.00
Observations	4466	8500	3052	6093	2858	10061

Note: First-stage estimates in subsamples of the 'Main Analysis Sample'. The subsample used when re-estimating the first stage is indicated in the column heading. All estimations include facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. Sanderson-Windmeijer *F*-statistic is for the displayed variable. * $p < .1$. ** $p < .05$. *** $p < .01$.

Figure A4. *Number of Admissions by Facility and Year*



Note: This histogram shows the number of admissions by facility and year, including admissions of youths who have been placed at NBIC before. The number of unique facility admissions is 51,079.

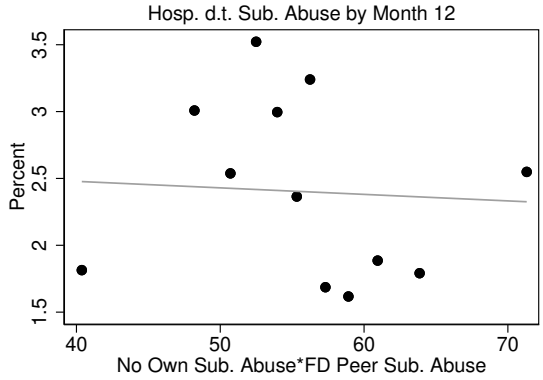
Table A4. *Test of Selective Attrition*

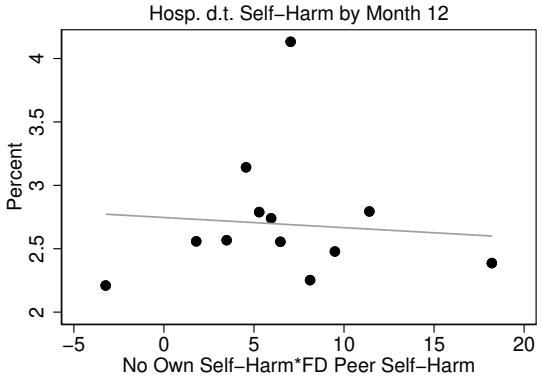
	(1) Missing in Statistics Sweden's Register Data	(2) Missing in Main Analysis Sample	(3) Missing in Education Sample
FD peer substance abuse	0.0042	0.0038	0.0165
	(0.0212)	(0.0082)	(0.0176)
FD peer self-harm	0.0089	0.0045	0.0080
	(0.0277)	(0.0181)	(0.0271)
Dependent mean	0.0780	0.0088	0.0225
Observations	14621	12980	9236

Note: I use the '2002-2020 Sample' and regress indicators for youth missing in (i) Statistics Sweden's register data, (ii) the 'Main Analysis Sample', and (iii) the 'Education Sample' on first-day peer substance abuse and self-harm. All regressions include facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

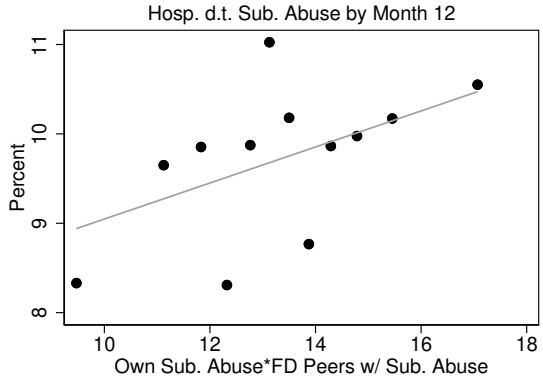
Figure A5. *Relationship Between First-Day Peer Exposure and Post-Exit Outcomes*

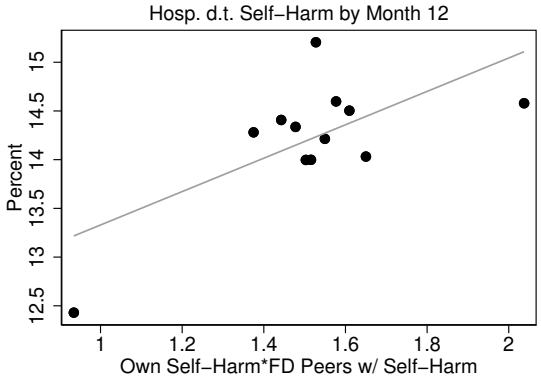
*Panel A. No Own Hist. of h*First-Day Share of Peers With Hist. of h*



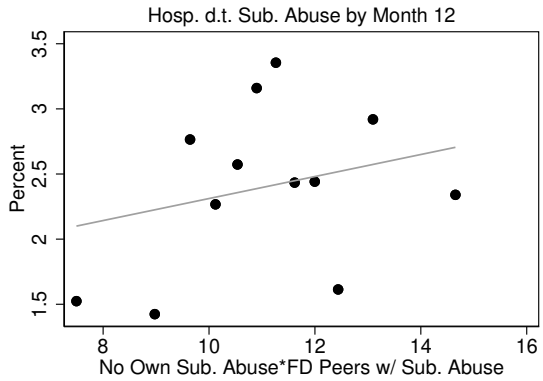


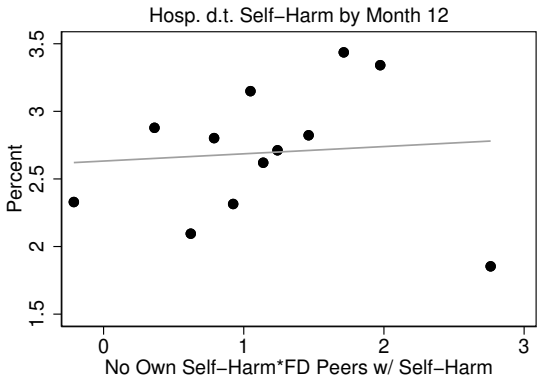
*Panel B. Own Hist. of h*First-Day Number of Peers With Hist. of h*





*Panel C. No Own Hist. of h*First-Day Number of Peers With Hist. of h*





Note: Black dots represent the risk of hospitalization due to substance abuse and self-harm post-placement over the share of first-day peers with a history of the corresponding behavior interacted with no own history (Panel A), number of first-day peers with a history of the corresponding behavior interacted with own history (Panel B), and number of first-day peers with a history of the corresponding behavior interacted with no own history (Panel C). All values are residualized and mean-standardized using facility-by-year FEs, (no) own history interacted with peer exposure, and (no) own history.

Table A5. *Effect of All First-Day Peer Characteristics by Own History on Hospitalization*

	Substance Abuse (1)	Self-Harm (2)
Substance abuse*Peer substance abuse	0.0957***	0.0155
	(0.0273)	(0.0216)
Not substance abuse*Peer substance abuse	-0.0114	0.0122
	(0.0238)	(0.0216)
Self-harm*Peer self-harm	0.1533	0.2785**
	(0.1402)	(0.1402)
Not self-harm*Peer self-harm	0.0265	-0.0007
	(0.0480)	(0.0321)
Crime*Peer crime	-0.0383	-0.0243
	(0.0332)	(0.0236)
Not crime*Peer crime	0.0685	-0.0144
	(0.0420)	(0.0310)
NDD*Peer NDD	-0.0691	0.4194
	(0.2674)	(0.2679)
Not NDD*Peer NDD	-0.0176	-0.0032
	(0.0627)	(0.0443)
Depression*Peer depression	0.1545	-0.1135
	(0.4643)	(0.3982)
Not depression*Peer depression	-0.0784	-0.0352
	(0.0733)	(0.0574)
Other mental illness*Peer other mental illness	0.0122	0.0518
	(0.1177)	(0.1113)
Not other mental illness*Peer other mental illness	-0.0139	-0.0574*
	(0.0450)	(0.0325)
Female*Peer female	0.0537	-0.0288
	(0.0418)	(0.0354)
Not female*Peer female	0.0404	-0.0752**
	(0.0389)	(0.0331)
Foreign*Peer foreign	-0.0542**	0.0253
	(0.0272)	(0.0240)
Not foreign*Peer foreign	-0.0002	0.0306
	(0.0261)	(0.0227)
<15 y.o.*Peer <15 y.o.	-0.0018	0.0032
	(0.0274)	(0.0261)
Not <15 y.o.*Peer <15 y.o.	0.0341	-0.0168
	(0.0272)	(0.0258)
Peer missing personal id. no.	0.0960*	-0.0561
	(0.0565)	(0.0438)
Dep. mean if own hist.=1	0.0971	0.1421
Dep. mean if own hist.=0	0.0240	0.0269
Observations	12866	12866

Note: The dependent variable in column 1 (2) is an indicator for hospitalization by month 12 due to substance abuse (self-harm). Each dependent variable is regressed on each first-day peer composition variable interacted with the youth's own history of the corresponding behavior. Both specifications are estimated using OLS and control for the full set of own history variables and facility-by-year FEs. The dependent mean is conditional on the youth's own history of substance abuse (column 1) and self-harm (column 2). The 'Main Analysis Sample' is used. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A6. *Peer Effects in Criminality, Depression, and Other Mental Disorders*

	(1) Crime	(2) Depression	(3) Any Mental Disorder Excl. Sub. Abuse & Self-Harm
Own history*FD peer exposure	-0.0061	0.1113	-0.0845
	(0.0656)	(0.2405)	(0.0748)
No own history*FD peer exposure	-0.0549	-0.0045	-0.0608**
	(0.0707)	(0.0218)	(0.0254)
Dep. mean if own hist.=1	0.4678	0.0600	0.1425
Dep. mean if own hist.=0	0.2040	0.0054	0.0204
Test of equality (*p*-value)	0.4737	0.6308	0.7385
Observations	9965	12866	12866

Note: The dependent variable in column 1 is an indicator equal to one if the individual commits a crime for which guilt is established or is readmitted due to their criminal behavior by month 12 after exit from the first placement spell at NBIC. In column 1, the 'Main Analysis Sample' is restricted to youths who were at least 15 when they were first admitted to NBIC. The dependent variable in column 2 (3) is an indicator equal to one if the individual is hospitalized due to depression (any mental disorder excluding substance abuse and self-harm) by month 12 after exit. Each dependent variable is regressed on first-day peer exposure interacted with the youth's history of the behavior indicated in the top row. All specifications are estimated using OLS and control for own history and facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A7. *Robustness Checks of Effect of Peers on Hospitalization I*

	Substance Abuse		Self-Harm	
	Coeff	Std err	Coeff	Std err
A: Baseline				
Own history*Total peer exposure	0.0024***	0.0007	0.0059**	0.0030
No own history*Total peer exposure	0.0013	0.0008	0.0008	0.0015
Observations	12866		12866	
B: With Youth, Peer, and Crime Rate Controls				
Own history*Total peer exposure	0.0022***	0.0007	0.0056*	0.0030
No own history*Total peer exposure	0.0013	0.0009	0.0010	0.0016
Observations	12674		12674	
C: With Control for Leave-out Mean History Within Facility-by-Year Cell				
Own history*Total peer exposure	0.0024***	0.0007	0.0062*	0.0032
No own history*Total peer exposure	0.0013	0.0008	0.0008	0.0015
Observations	12866		12866	
D: Clustering at Facility-by-Year Level				
Own history*Total peer exposure	0.0024***	0.0007	0.0059**	0.0027
No own history*Total peer exposure	0.0013	0.0009	0.0008	0.0012
Observations	12866		12866	
E: Facility-by-Year FEs Replaced by Facility-by-Quarter FEs				
Own history*Total peer exposure	0.0031***	0.0011	0.0110**	0.0050
No own history*Total peer exposure	0.0023	0.0015	0.0048	0.0042
Observations	12812		12812	
F: Facility-by-Year FEs Replaced by Facility FEs & Year FEs				
Own history*Total peer exposure	0.0015***	0.0004	0.0062**	0.0024
No own history*Total peer exposure	0.0001	0.0004	0.0006	0.0006
Observations	12866		12866	

Note: Panel A is the baseline. Panel B-C includes controls for the full sets of youth and peer characteristics (see Table 1) and crime rate in the youth's home municipality the month before intake. Panel C controls for the leave-out mean history within the facility-by-year cell. Panel D clusters the standard errors at the facility-by-year level. Finally, in Panels E-F, the facility-by-year FEs included in the baseline are replaced by facility-by-quarter FEs and facility and year FEs. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A8. *Robustness Checks of Effect of Peers on Hospitalization II*

	Substance Abuse		Self-Harm	
	Coeff	Std err	Coeff	Std err
A: Placements >14 Days				
Own history*Total peer exposure	0.0021***	0.0007	0.0065**	0.0027
No own history*Total peer exposure	0.0006	0.0008	0.0005	0.0014
Observations	11525		11525	
B: No Placements with Imputed Exit Dates				
Own history*Total peer exposure	0.0024***	0.0007	0.0060**	0.0030
No own history*Total peer exposure	0.0013	0.0008	0.0008	0.0015
Observations	12845		12845	
C: Placements Starting in 2003 or Later				
Own history*Total peer exposure	0.0020***	0.0006	0.0059*	0.0034
No own history*Total peer exposure	0.0010	0.0008	0.0005	0.0015
Observations	12117		12117	
D: Placements Starting Before 2019				
Own history*Total peer exposure	0.0025***	0.0007	0.0082**	0.0032
No own history*Total peer exposure	0.0014	0.0009	0.0017	0.0016
Observations	11465		11465	
E: No Siblings Placed at Same Facility at the Same Time				
Own history*Total peer exposure	0.0024***	0.0007	0.0059**	0.0030
No own history*Total peer exposure	0.0013	0.0008	0.0008	0.0015
Observations	12838		12838	
F: Share of Peers with History h on Day After Entry as Instrument				
Own history*Total peer exposure	0.0021***	0.0007	0.0063**	0.0028
No own history*Total peer exposure	0.0009	0.0008	0.0014	0.0015
Observations	12864		12864	
G: Average Share of Peers with History h During First 0-2 Days After Entry as Instrument				
Own history*Total peer exposure	0.0020***	0.0006	0.0065**	0.0027
No own history*Total peer exposure	0.0006	0.0008	0.0015	0.0014
Observations	12491		12491	
H: Binary Endogenous Variable (>50th percentile)				
Own history*High total peer exp.	0.2331***	0.0639	0.1789**	0.0804
No own history*High total peer exp.	0.0889	0.0747	0.0016	0.0169
Observations	12866		12866	

Note: The following subsamples of the 'Main Analysis Sample' are used: placements longer than 14 days (Panel A), placements without imputed exit dates (Panel B), placements starting in 2003 or later (Panel C), placements starting before 2019 (Panel D), and placements of youths with no full or half siblings placed at the same facility at the same time (Panel E). In Panels F-G, the instrument is replaced with: the share of peers with history h on the day after entry (Panel F) and the average share of peers with history h during the first 0-2 days after entry (Panel G). In Panel H, I replace the endogenous variable with a binary version that takes the value 1 if the youth has a total peer exposure measure above the median. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A9. *Effect of Exposure to Peer Substance Abuse and Self-Harm on Future Living Situation*

				Out-of-Home Care (Excl. NBIC)		
	(1) Readmission to NBIC	(2) Prison	(3) Adult Addic. Treatment	(4) Foster Care	(5) Group Home	(6) Other OOH Care Facility
A: Substance Abuse						
Own history*Total peer exposure	0.0026**	0.0010	0.0014	-0.0034**	0.0016	0.0021
	(0.0012)	(0.0036)	(0.0015)	(0.0017)	(0.0018)	(0.0015)
No own history*Total peer exposure	0.0030*	0.0040	0.0011	-0.0024	0.0010	0.0015
	(0.0016)	(0.0040)	(0.0017)	(0.0021)	(0.0023)	(0.0019)
Dep. mean if own hist.=1	0.3455	0.1090	0.0111	0.2402	0.5582	0.2528
Dep. mean if own hist.=0	0.2743	0.1115	0.0000	0.2586	0.4852	0.1982
B: Self-Harm						
Own history*Total peer exposure	-0.0048	0.0025	0.0010	0.0081*	0.0003	-0.0063
	(0.0040)	(0.0030)	(0.0017)	(0.0044)	(0.0045)	(0.0039)
No own history*Total peer exposure	-0.0029	0.0018	0.0017	0.0093**	0.0036	-0.0091**
	(0.0034)	(0.0033)	(0.0020)	(0.0044)	(0.0046)	(0.0040)
Dep. mean if own hist.=1	0.3187	0.0372	0.0207	0.2484	0.6057	0.2375
Dep. mean if own hist.=0	0.3161	0.1163	0.0077	0.2491	0.5180	0.2260
Test of equality (p-value)	0.5074	0.6862	0.5027	0.7009	0.3198	0.3688
Observations	12564	2787	2789	7586	7586	7586

Note: This table presents IV estimates of the effect of exposure to peers with a history of substance abuse (Panel A) and self-harm (Panel B) on the risk of being placed in various institutions. All dependent variables are measured as indicators taking the value 1 if the youth ever enters a placement of the form indicated at the top of the table during the 12 months post-placement. The 'Main Analysis Sample' is subject to restrictions depending on the outcome. Youths who die during the 12 months post-placement are excluded in all columns. Columns 2-3 exclude youths aged below 18 at the time of placement exit because being sentenced to prison and admission to adult addiction treatment are rare outcomes for youths aged below 18. Columns 4-6 exclude youths who exited their first NBIC placement in 2013 or later because the register on non-NBIC placements suffers from underreporting from 2014 onward. All estimations control for own history and facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A10. *Heterogeneity of Peer Effects in Substance Abuse and Self-Harm I*

	Gender			Background			Age at Placement		
	(1) Girl	(2) Boy	(3) Δ	(4) Foreign	(5) Native	(6) Δ	(7) <15 yrs	(8) ≥15 yrs	(9) Δ
A: Substance Abuse									
Own history*Total peer exposure	0.0040***	0.0015**	0.0025**	0.0029**	0.0024***	0.0006	0.0024**	0.0019***	0.0005
	(0.0013)	(0.0007)	(0.0013)	(0.0014)	(0.0006)	(0.0012)	(0.0012)	(0.0006)	(0.0011)
No own history*Total peer exposure	0.0019*	0.0007	0.0012	0.0017	0.0011	0.0005	0.0014	0.0010	0.0004
	(0.0011)	(0.0009)	(0.0010)	(0.0013)	(0.0008)	(0.0008)	(0.0009)	(0.0008)	(0.0007)
Dep. mean if own hist.=1	0.1265	0.0822		0.0565	0.1073		0.0531	0.1041	
Dep. mean if own hist.=0	0.0400	0.0151		0.0191	0.0260		0.0300	0.0207	
Observations	12866	12866	12866	12866	12866	12866	12866	12866	12866
B: Self-Harm									
Own history*Total peer exposure	0.0039	0.0067	-0.0028	0.0069	0.0057*	0.0013	0.0099	0.0051*	0.0048
	(0.0036)	(0.0078)	(0.0084)	(0.0069)	(0.0030)	(0.0067)	(0.0101)	(0.0028)	(0.0101)
No own history*Total peer exposure	0.0004	0.0016	-0.0012	0.0024	0.0003	0.0020*	0.0016	0.0004	0.0012
	(0.0018)	(0.0015)	(0.0017)	(0.0016)	(0.0016)	(0.0012)	(0.0018)	(0.0015)	(0.0011)
Dep. mean if own hist.=1	0.1865	0.0603		0.1240	0.1456		0.1088	0.1496	
Dep. mean if own hist.=0	0.0494	0.0161		0.0223	0.0284		0.0367	0.0241	
Observations	12866	12866	12866	12866	12866	12866	12866	12866	12866

Note: This table presents IV estimates of peer effects in substance abuse and self-harm by youth characteristics. The dependent variable (indicated in the panel heading) is an indicator that takes the value 1 if the youth is hospitalized due to substance abuse or self-harm (respectively) by month 12 following the youth's exit from their first placement at NBIC. The 'Main Analysis Sample' is restricted to the subsample indicated in the top row. All estimations include facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A11. *Heterogeneity of Peer Effects in Substance Abuse and Self-Harm II*

	Peer Count			High Share Occupied Beds			Across-County Move		
	(1) ≤20 peers	(2) >20 peers	(3) Δ	(4) Yes	(5) No	(6) Δ	(7) Yes	(8) No	(9) Δ
A: Substance Abuse									
Own history*Total peer exposure	0.0028***	0.0019***	0.0008	0.0019***	0.0026***	-0.0007	0.0025***	0.0021**	0.0004
	(0.0008)	(0.0007)	(0.0008)	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0008)	(0.0007)
No own history*Total peer exposure	0.0012	0.0015	-0.0003	0.0021	0.0010	0.0011	0.0012	0.0013	-0.0001
	(0.0008)	(0.0012)	(0.0010)	(0.0014)	(0.0007)	(0.0009)	(0.0008)	(0.0010)	(0.0007)
Dep. mean if own hist.=1	0.1106	0.0816		0.0926	0.0999		0.0996	0.0910	
Dep. mean if own hist.=0	0.0294	0.0179		0.0262	0.0227		0.0248	0.0224	
Observations	12866	12866	12866	12866	12866	12866	12866	12866	12866
B: Self-Harm									
Own history*Total peer exposure	0.0065*	0.0025	0.0040	0.0064	0.0058*	0.0006	0.0049	0.0076*	-0.0028
	(0.0035)	(0.0041)	(0.0049)	(0.0055)	(0.0030)	(0.0054)	(0.0036)	(0.0042)	(0.0049)
No own history*Total peer exposure	0.0007	0.0008	-0.0001	0.0014	0.0006	0.0008	0.0010	0.0007	0.0003
	(0.0016)	(0.0018)	(0.0015)	(0.0016)	(0.0015)	(0.0008)	(0.0016)	(0.0015)	(0.0010)
Dep. mean if own hist.=1	0.1593	0.1144		0.1293	0.1496		0.1308	0.1680	
Dep. mean if own hist.=0	0.0315	0.0218		0.0258	0.0277		0.0278	0.0249	
Observations	12866	12866	12866	12866	12866	12866	12866	12866	12866

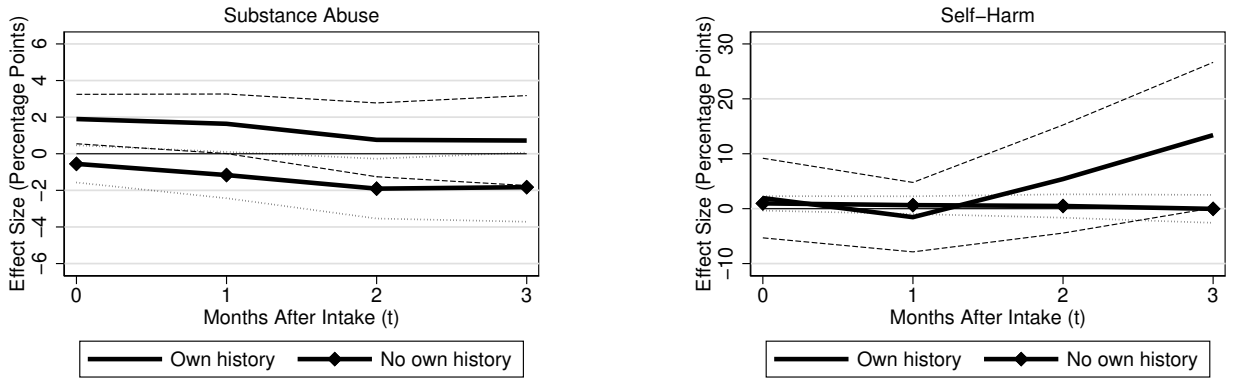
Note: This table presents IV estimates of peer effects in substance abuse and self-harm by facility characteristics. The dependent variable (indicated in the panel heading) is an indicator that takes the value 1 if the youth is hospitalized due to substance abuse or self-harm (respectively) by month 12 following the youth's exit from their first placement at NBIC. The 'Main Analysis Sample' is restricted to the subsample indicated in the top row. All estimations include facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A12. *Gender-Specific Peer Effects*

	(1) Substance Abuse	(2) Self-Harm
Exposure to Peers of Same Sex with History h		
Own history*Total peer exposure (same sex)	0.0013***	0.0066**
	(0.0003)	(0.0028)
No own history*Total peer exposure (same sex)	0.0005	0.0013
	(0.0004)	(0.0015)
Test of equality (*p*-value)	0.0002	0.0166
Exposure to Peers of Opposite Sex with History h		
Own history*Total peer exposure (opp. sex)	-0.0009	-0.0145**
	(0.0006)	(0.0065)
No own history*Total peer exposure (opp. sex)	-0.0004	-0.0020
	(0.0005)	(0.0013)
Dep. mean if own hist.=1	0.0971	0.1421
Dep. mean if own hist.=0	0.0240	0.0269
Test of equality (*p*-value)	0.2040	0.0464
Observations	12866	12866

Note: This table presents IV estimates of peer effects in substance abuse and self-harm. The dependent variable is an indicator equal to one if the youth is hospitalized due to substance abuse or self-harm (respectively) during the 12 months after exit from the first placement spell at NBIC. Own history*FD peer exposure (same sex) and No own history*FD peer exposure (same sex) are used as instruments for Own history*Total peer exposure (same sex) and No own history*Total peer exposure (same sex). FD peer exposure (same sex) is defined as the share of peers with history h and the same sex as the youth on the youth's day of entry, while FD peer exposure (opp. sex) is the share of peers with history h and the opposite sex on the youth's day of entry. The 'Main Analysis Sample' is used. All estimations control for own history, sex, and facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Figure A6. *Peer Effects in Substance Abuse and Self-Harm During Placement*



Note: Black lines show OLS estimates of the effect of first-day peer exposure on the cumulative probability of being hospitalized due to substance abuse (left subfigure) and self-harm (right subfigure) by month t post-intake. Dashed (dotted) lines show 90% confidence bands for youths with (without) a history of the behavior. All specifications condition on the NBIC placement ending after month t.

Table A13. *Decomposed Effect of Peers on Substance Abuse*

	(1) Any Substance Abuse	(2) Alcohol	(3) Narcotics	(4) Cannabis	(5) Other Substances
History of Substance Abuse					
Own history*Total peer exposure	0.0024***	0.0007**	0.0004**	0.0002	0.0020***
	(0.0007)	(0.0003)	(0.0002)	(0.0003)	(0.0005)
No own history*Total peer exposure	0.0013	0.0006	0.0003	0.0003	0.0010
	(0.0008)	(0.0004)	(0.0002)	(0.0004)	(0.0006)
Dep. mean if own hist.=1	0.0971	0.0197	0.0076	0.0158	0.0614
Dep. mean if own hist.=0	0.0240	0.0107	0.0010	0.0042	0.0084
Test of equality (*p*-value)	0.0129	0.7260	0.4387	0.4229	0.0015
Observations	12866	12866	12866	12866	12866

Note: This table presents IV estimates of the effect of total exposure to peers with a history of substance abuse on the risk of being hospitalized due to an illness or injury related to alcohol, narcotics, cannabis, or other substances. The baseline effect is provided in column 1. The 'Main Analysis Sample' is used. All estimations control for own history and facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A14. *Effect of First-Day Peer Composition on Placement Outcomes*

	Total	Facility Switch		Isolation		Runaway	
	(1) Days	(2) Ever	(3) Count	(4) Ever	(5) Days	(6) Ever	(7) Days
A: History of Substance Abuse							
Own history*FD peer exposure	50.4994***	0.0347	0.0409	0.0652	1.6081	0.0595	3.3720*
	(19.4827)	(0.0453)	(0.0952)	(0.0415)	(3.4492)	(0.0394)	(1.9496)
No own history*FD peer exposure	-12.7260	0.0206	0.0389	-0.0121	-6.9158	-0.0238	-0.6590
	(20.1493)	(0.0456)	(0.0941)	(0.0407)	(5.9107)	(0.0374)	(1.8939)
Dep. mean if own hist.=1	144.5594	0.3214	1.5373	0.2413	5.8754	0.1973	4.6114
Dep. mean if own hist.=0	148.8206	0.2580	1.4146	0.1913	9.0759	0.1622	3.6560
B: History of Self-Harm							
Own history*FD peer exposure	77.9875	0.1068	0.2318	0.0795	3.5856	0.0599	8.5773
	(78.1743)	(0.1721)	(0.3535)	(0.1709)	(16.4234)	(0.1468)	(6.0620)
No own history*FD peer exposure	-30.5336	0.0687	0.0764	0.0610	-4.4770	-0.0442	-0.1621
	(24.4668)	(0.0696)	(0.1494)	(0.0639)	(5.2803)	(0.0573)	(2.4629)
Dep. mean if own hist.=1	144.56	0.32	1.54	0.24	5.88	0.20	4.61
Dep. mean if own hist.=0	146.06	0.30	1.49	0.22	7.01	0.18	4.27
Observations	14101	14101	14101	12619	12619	14101	14101

Note: Each dependent variable listed in the top row is first regressed on first-day peer substance abuse interacted with own history of substance abuse (Panel A) and then first-day peer self-harm interacted with own history of self-harm (Panel B). The '2002-2020 Sample' is used. The sample is smaller in columns 4-5 because the registration of isolation episodes did not start until 2004. All estimations control for own history and facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A15. *Heterogeneity by Presence of Runaway and Isolation Episodes*

	Ever Isolation			Ever Runaway			Ever Isolation or Runaway		
	(1) Yes	(2) No	(3) Δ	(4) Yes	(5) No	(6) Δ	(7) Yes	(8) No	(9) Δ
A: Substance Abuse									
Own history*Total peer exposure	0.0042***	0.0015**	0.0026*	0.0037***	0.0022***	0.0015	0.0043***	0.0012*	0.0033**
	(0.0012)	(0.0007)	(0.0015)	(0.0013)	(0.0008)	(0.0011)	(0.0012)	(0.0007)	(0.0014)
No own history*Total peer exposure	0.0032*	0.0007	0.0017	0.0013*	0.0015	-0.0002	0.0028**	0.0008	0.0013
	(0.0019)	(0.0008)	(0.0022)	(0.0008)	(0.0010)	(0.0007)	(0.0014)	(0.0009)	(0.0011)
Dep. mean if own hist.=1	0.1230	0.0924		0.1317	0.0891		0.1207	0.0889	
Dep. mean if own hist.=0	0.0398	0.0206		0.0370	0.0215		0.0384	0.0189	
Observations	12866	11418	11418	12866	12866	12866	12866	11418	11418
B: Self-Harm									
Own history*Total peer exposure	0.0043	0.0066	-0.0034	0.0061*	0.0060	0.0001	0.0050*	0.0068	-0.0021
	(0.0029)	(0.0043)	(0.0053)	(0.0034)	(0.0040)	(0.0049)	(0.0027)	(0.0053)	(0.0058)
No own history*Total peer exposure	0.0012	-0.0000	0.0006	0.0014	0.0006	0.0008	0.0013	-0.0002	0.0010
	(0.0015)	(0.0016)	(0.0012)	(0.0011)	(0.0016)	(0.0010)	(0.0013)	(0.0017)	(0.0010)
Dep. mean if own hist.=1	0.1717	0.1308		0.1647	0.1361		0.1556	0.1339	
Dep. mean if own hist.=0	0.0395	0.0240		0.0333	0.0256		0.0359	0.0234	
Observations	12866	11418	11418	12866	12866	12866	12866	11418	11418

Note: This table presents IV estimates of peer effects in substance abuse and self-harm by the presence of runaway and isolation episodes. The dependent variable is an indicator that takes the value 1 if the youth is hospitalized due to substance abuse (Panel A) or self-harm (Panel B) by month 12 following the youth's exit from their first placement at NBIC. The 'Main Analysis Sample' is restricted to the subsample indicated in the top row. Periods of isolation were not registered before 2004. Hence, youths who were admitted to NBIC before 2004 are dropped from the samples in columns 1-3 and 7-9. All estimations control for own history and facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A16. *Effect of Resource-Demanding Peers on Hospitalization*

	(1) Substance Abuse	(2) Self-Harm
A: Peer History of Neurodevelopmental Disorder		
Own hist. of Y*FD peer NDD	-0.0370	0.0333
	(0.0752)	(0.1923)
No own hist. of Y*FD peer NDD	-0.0742	-0.0345
	(0.0667)	(0.0436)
B: Peer History of Violent Crime		
Own hist. of Y*FD peer violent crime	-0.0181	-0.1247**
	(0.0292)	(0.0554)
No own hist. of Y*FD peer violent crime	-0.0199	0.0270
	(0.0280)	(0.0192)
C: Peer History of Being Sentenced to Serve Time at NBIC		
Own hist. of Y*FD peer sentenced to serve	-0.0032	0.0514
	(0.0662)	(0.0885)
No own hist. of Y*FD peer sentenced to serve	-0.0299	0.1285***
	(0.0637)	(0.0472)
Dep. mean if own hist.=1	0.0971	0.1421
Dep. mean if own hist.=0	0.0240	0.0269
Observations	12866	12866

Note: The dependent variable is an indicator taking the value 1 if the youth is hospitalized due to substance abuse (column 1) and self-harm (column 2) by month 12 following placement exit. Each dependent variable is regressed on the first-day share of peers with the history indicated in the panel heading interacted with own history of substance abuse (column 1) and self-harm (column 2). The 'Main Analysis Sample' is used. All estimations control for own history of Y and facility-by-year FEs. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.

Table A17. *Effect of Own Substance Abuse on Eligibility for High School*

	(1)	(2)
Ordinary Least Squares		
Hosp. d.t. sub. abuse by month 12	-0.0124	0.0057
	(0.0154)	(0.0153)
Instrumental Variable Model		
Hosp. d.t. sub. abuse by month 12	-0.8441*	-0.9373*
	(0.4547)	(0.5134)
Dependent mean	0.1525	0.1525
First-Stage Effective *F*-statistic	9.43	7.78
%Δ from 1 s.d. Δ	-129.40	-143.68
AR *p*-value	0.0193	0.0158
AR confidence set (90%)	[-1.7263,-.394]	[-2.0552,-.4697]
Youth & peer controls	No	Yes
Observations	8991	8991

Note: The dependent variable is an indicator taking the value 1 if the youth attains sufficient grades to be eligible for high school by age 21. Own substance abuse*FD peer substance abuse and No own substance abuse*FD peer substance abuse are used as instruments for hospitalization due to substance abuse by month 12 after leaving NBIC. The 'Education Sample' is used. All regressions include facility-by-year FEs. The bottom of the table indicates whether the full set of peer and own characteristics are included as controls. Standard errors are clustered at the facility-by-day-of-entry level. * $p < .1$. ** $p < .05$. *** $p < .01$.