


A Comparison between Indoor and Outdoor Rape Suspects in Sweden

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ABSTRACT

As the number of rapes is increasing in Sweden, and the number of individuals convicted of these crimes is decreasing, it is of importance to study offender characteristics of those committing these crimes and the circumstances in which these crimes are conducted, such as indoors or outdoors. Data from Swedish population-based registers were used to identify individuals suspected of rape, aggravated rape, attempted rape or attempted aggravated rape (in short: rape+) against females ≥ 18 years old between 2007–2017. Latent Class Analysis was then used to identify classes of rape+ suspects with respect to the location of the rape+ and then compare the two groups. A total of 19,723 individuals were included of which the majority ($n = 17,520$; 88.8%) were suspected of indoor rape+. In both groups, we identified a low offenders' class and a high offenders' class. In addition, first-generation immigrants had a higher odds of being suspected of outdoor rape+ than Swedish-born suspects, and a previous conviction of violent crime was a risk factor for committing outdoor rape+.

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Introduction

Between 2009 and 2015, the mean annual number of rapes, including aggravated rapes, reported to the Swedish police authority was over 6,000 cases. After 2015, the number of reported rapes has steadily increased and reached record high levels in 2018 with almost 8,000 reported rapes (BRÅ 2019a). In conjunction with the increased number of reported rapes, the number of suspects has also increased and, in 2018, 3,628 individuals were suspected of rape. However, only 224 individuals were convicted (BRÅ 2019a). This low number may be related to the decreasing proportion of reported rapes leading to a charge, i.e., solved or cleared by the police. Since 2009, when the person-based clearance rate for rape was 31%, this rate has steadily decreased and, in 2018, the clearance rate was as low as 17% (BRÅ 2019b). With both an increasing number of reported rapes in the country and a continued low person-based clearance rate, more knowledge is needed on both offender characteristics and the circumstances in which these serious crimes are conducted.

International literature on rape has foremost been focused on the motives of the offenders to commit rape (Hall and Hirschman 1991; Prentky and Knight 1991), rates of sexual offenses across sex offenders or the role of offender characteristics and their criminal careers. The latter has shown that adult onset is more common than adolescence onset, that most adolescent sexual offenders do not become adult sexual offenders and that most adult sexual offenders were not sexual offenders in their adolescence (Lussier and Cale 2013; Lussier, McCuish, and Cale 2020). In addition, a recent study showed that adolescent sexual offenders have no link to adult criminal career factors such as frequency and severity of sexual offending (Reale, McCuish, and Corrado 2020). Previous literature on sexual

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offending has also focused on prevention with respect to only offender characteristics without any focus on the potential difference between sexual offenders with regard to indoor and outdoor rape and sexual assault (Blokland and Lussier 2015). Other questions of interest have been factors that contribute to an individual committing sexual offenses and which theories that can explain sexual offending (Thakker and Ward 2015). There is also a common consensus that there is a clear heterogeneity among sexual offenders (Lussier and Davies 2015). This consensus is thus fully established based on offender characteristics but not on the location of the offense, i.e., indoors or outdoors. There is thus a current gap in the literature regarding differentiating offenders based on the location where the crime has been committed.

Few Swedish studies have attempted to describe rape offender characteristics (e.g., Ahlberg 1996; BRÅ 2019c; Khoshnood et al. 2019a; Martens and Holmberg 2005; Stiernströmer et al. 2019) as well as the circumstances, such as indoors or outdoors, in which the rapes in Sweden occur. Statistics from the Swedish National Council for Crime Prevention (for short; BRÅ) between 2008 and 2017 showed that indoor rapes against women have increased while outdoor rapes have decreased to a stable number of under 1,000 cases annually (BRÅ 2019c). Studying rapes based on location, i.e., indoors or outdoors, is critical because outdoor rapes are foremost committed by an offender unknown to the victim and is thus often classified as an assault rape (Ceccato, Guangquan, and Haining 2019). Understanding and mapping offender characteristics with respect to outdoor rapes can therefore provide information on individuals' crime inclinations, which can be used to understand the interaction between rape and other criminogenic factors (Ceccato 2014; Ceccato, Guangquan, and Haining 2019) and how they can be used in crime preventive efforts. Outdoor rapes, mostly committed by unknown offenders, may also have serious implications in regard to females feeling safe, female fear of crime and possibly the public's confidence for the judicial system. Differentiating the characteristics between the offenders committing indoor and outdoor rapes is thus highly important.

The objectives of the current study are two: (1) to identify classes of individuals being suspected of rape, aggravated rape, attempted rape or attempted aggravated rape (in short: rape+) against an adult female ≥ 18 years old in Sweden, based on location, i.e., indoors or outdoors; and (2) comparing indoor and outdoor suspects of rape+.

Materials and methods

We used data on individuals from Swedish population-based registers with national coverage. These registers were linked using each individual's unique identification number replaced by a serial number to preserve confidentiality. The study was covered by ethical approval from the Regional Ethical Review Board in Lund (Dnr: 2012/795). The datasets were created by selecting all individuals suspected for indoor and/or outdoor rape+ between 2007 and 2017 ($n_{\text{indoor}} = 17,520$ and $n_{\text{outdoor}} = 2,203$). Note that 794 individuals were included both in the Indoor and the Outdoor sample, of which 116 were suspected for Outdoor and Indoor rape+ at the same date. The rationale of focusing on suspects for rape+ and not on individuals convicted of rape+ was because of limitations in the Swedish national registers. Information on whether the rape+ offenses were committed indoors or outdoors is only available for individuals being suspected of rape+ and not for those who have been convicted for the same.

Rape+ was defined as rape, aggravated rape, attempted rape or attempted aggravated rape based on information from the Swedish Criminal Suspect Register that includes nationwide data on all individuals suspected of a crime. The Swedish Law regulating the Criminal Suspect Register (1998:621) states that individuals suspected on reasonable grounds for a crime are to be registered in the Criminal Suspect Register (§1) and that they are to be removed from the register if the preliminary inquiry by the police has been dropped (§13, point 1), if an indictment by the prosecutor has been dropped (§13, point 2), if a court of law has passed a sentence convicting or acquitting the

accused (§13, point 3), or if an accused has been requested to be extradited and this request has been refused or executed by the court of law (§13, point 4).

It was with the help of codes in the Criminal Suspect Register which rape+ outdoor¹ and rape+ indoor² were identified. We also included individual information on white-collar crimes, property crimes, and violent crimes from the Swedish Crime register, which includes nationwide almost complete data on all convicted individuals. Based on information from other Swedish population-based registers, such as the Swedish nationwide health care registers, we included information on drug abuse, alcohol abuse and psychiatric disorders. For a definition of these, see Appendix 1. These registrations had to occur prior to the suspicion for rape+ (i.e., from 1973 until the date of the rape +) in order to be included in the dataset.

Definition of rape+

The included offenses in this study were defined in accordance with the Swedish Criminal Code, Chapter 6, Sexual Crimes (Swedish Government 2020).

Section 1 of the code defines *rape* as the following: “A person who performs sexual intercourse, or some other sexual act that in view of the seriousness of the violation is comparable to sexual intercourse, with a person who is not participating voluntarily is guilty of rape and is sentenced to imprisonment for at least two and at most six years. When assessing whether participation is voluntary or not, particular consideration is given to whether voluntariness was expressed by word or deed or in some other way.” The section defines *aggravated rape* as: “If an offense referred to in the first paragraph is considered gross, the person is guilty of gross rape and is sentenced to imprisonment for at least five and at most ten years. When assessing whether the offense is gross, particular consideration is given to whether the perpetrator used violence or a threat of a particularly serious nature, or whether more than one person assaulted the victim or took part in the assault in some other way, or whether, in view of the method used or the young age of the victim or otherwise, the perpetrator exhibited particular ruthlessness or brutality.”

Section 15 of the code begins as follows: “Responsibility is assigned under Chapter 23 for attempting to commit rape, gross rape, sexual assault, gross sexual assault [. . .].”

Latent class analysis

We used Latent Class Analysis (LCA) to identify homogeneous classes of rape+ suspects based on the selected variables. We entered, into the LCA, six dichotomous variables (yes/no) for each of the following registration types: white-collar crime, property crime, violent crime, drug abuse, alcohol abuse, and psychiatric disorder. The rationale for choosing these six variables was because many of the other types of crime, substance use disorders and psychiatric disorders are to different degrees correlated and linked to violent crimes including rape (Brody and Kiehl 2010; Cale 2015; Cornell 1990; DeLisi 2015; Hendriks, Van Den Berg, and Bijleveld 2015; Jennings et al. 2015; Khoshnood et al. 2019a; Långström, Sjöstedt, and Grann 2004; Smith and Taylor 1999).

We also used a categorical variable defining number of registrations for rape+ (1 or more). The number of latent classes indicated by the selected variables was determined by comparing model fit statistics between nested models. Improvement in model fit was indicated by smaller values of the log-likelihood, Akaike’s Information Criterion (AIC), and the adjusted Bayesian information criterion as well as the entropy value. Higher entropy values represent better fit. The number of classes is influenced by the number of included variables so both empirical (improved model fit) and theoretical (model interpretability) aspects were also considered. Individuals were then assigned class

¹Included codes: 0644, 0648, 0656, 0658, 0660, 0684, 0688, 0692, 0696, 9607, and 9611.

²Included codes: 0645, 0649, 0657, 0659, 0661, 0685, 0689, 0693, 0697, 9608, and 9612.

membership based on their particular response profile's resemblance/fit to the latent class. The LCA was performed using PROC LCA in SAS v. 9.4 for rape+ indoor and rape+ outdoor separately.

We then included several external validators at the individual level (year of birth, sex, low education, age at first suspicion for rape+, country of birth, resilience, IQ, school achievement, income, social welfare, and neighborhood deprivation) and at the parental level (psychiatric disorder, white-collar crime, property crime, violent crime, drug abuse, and alcohol abuse) to investigate potential differences across LCA classes. Chi-square analyses were used to compare categorical variables and one-way ANOVA was used for the continuous variables. Thereafter, we compared, by logistic regression, indoor and outdoor rape+ suspects using the previously described external validators. For a description of the external validators see Appendix 1. All statistical analyses were performed using SAS 9.4.

Results

Descriptive data

Indoor rape+

Between 2007–2017, there were a total of 17,520 suspects of indoor rape+ against a woman (Table 1). The majority of the suspects were men ($n = 17,316$; 98.8%). A large proportion was first-generation immigrants, i.e., born outside of Sweden ($n = 7,158$; 40.9%). The second-generation immigrants were born in Sweden with no parent born in Sweden ($n = 1,106$; 6.3%) as well as born in Sweden with one parent born in Sweden ($n = 1,273$; 7.3%). One-fifth of the suspects ($n = 3,648$; 20.8%) received social welfare and over one-third had low education ($n = 5,745$; 34.9%). Variables like resilience, IQ and school achievement showed 0.43, 0.54 and 0.73 lower SDs compared to the general population, respectively.

Table 1. Descriptive data of the included individuals.

	INDOOR	OUTDOOR
N	17,520	2,203
Demographics		
Year of Birth [mean (SD)]	1979 (13.4)	1983 (12.0)
Male sex [n (%)]	17,316 (98.8)	2,190 (99.4)
Age at first Registration [mean (SD)]	33.1 (13.0)	28.4 (11.9)
Low Education [n (%)]	5745 (34.9)	805 (36.5)
Country of birth		
Swedish born with Swedish born parents [n (%)]	7,983 (45.6)	918 (41.7)
Swedish born with one parent born in Sweden [n (%)]	1,273 (7.3)	131 (5.9)
Swedish born with no parent born in Sweden [n (%)]	1,106 (6.3)	174 (7.9)
Born outside Sweden [n (%)]	7,158 (40.9)	980 (44.5)
Socioeconomic status		
Neighborhood Deprivation [SDI (SD)]	1.10 (2.3)	1.27 (2.3)
Income [mean (SD)]	-0.13 (0.3)	-0.16 (0.2)
Social Welfare [n (%)]	3,648 (20.8)	486 (22.1)
Number of registrations		
1 registration [n (%)]	16,108 (91.9)	2,112 (95.9)
>1 registrations [n (%)]	1,412 (8.1)	91 (4.1)
Prior convictions		
White collar crime [n (%)]	2,429 (13.9)	260 (11.8)
Property crimes [n (%)]	4,938 (28.2)	597 (27.1)
Violent crime [n (%)]	5,338 (30.5)	693 (31.5)
Psychiatric ill-health		
Psychiatric disorders [n (%)]	2,517 (14.4)	263 (11.9)
Drug use disorder [n (%)]	3,751 (21.4)	491 (22.3)
Alcohol use disorder [n (%)]	2,939 (16.8)	271 (12.3)
Others		
Resilience [mean (SD)]	-0.43 (1.1)	-0.50 (1.0)
IQ [mean (SD)]	-0.54 (1.0)	-0.67 (0.9)
School achievement [mean (SD)]	-0.73 (1.1)	-0.89 (1.1)

For prior convictions, close to a third of the suspects were convicted of violent crimes ($n = 5,338$; 30.5%) and/or property crimes ($n = 4,938$; 28.2%). The rates of both alcohol abuse ($n = 2,939$; 16.8%) and/or drug abuse ($n = 3,751$; 21.4%) among the included individuals were considerably higher in comparison to the general population. Psychiatric disorders were also more common ($n = 2,517$; 14.4%).

Information regarding the suspect's parents was available for a part of the individuals ($n = 12,617$) (Table 2). The most common parents' convictions were property crimes ($n = 3,170$; 25.1%), followed by violent crimes ($n = 2,234$; 17.7%). Close to a quarter of the parents had psychiatric disorders ($n = 2,949$; 23.4%). The corresponding percentages for alcohol abuse and drug abuse were 20.1% and 8.6%, respectively.

Outdoor rape+

There were 2,203 suspects of outdoor rape+ against a woman (Table 1). Most of the suspects were men ($n = 2,190$; 99.4%) and a considerable part of the included individuals had a low education ($n = 805$; 36.5%). Immigrants constituted a majority of the outdoor rape+ suspects with 44.5% being first-generation immigrants, and 15.4% being second-generation immigrants (5.9% born in Sweden with one parent born outside of Sweden, and 7.9% born in Sweden with two parents born outside of Sweden). A little over one-fifth of the suspects ($n = 486$; 22.1%) received social welfare and had lower values in regard to resilience (-0.50 SD), IQ (-0.67 SD) and school achievement (-0.89 SD) in comparison to the general population.

The most common prior conviction was for violent crime ($n = 693$; 31.5%) followed by property crime ($n = 597$; 27.1%). A considerable part had psychiatric disorders ($n = 263$; 11.9%) as well as drug ($n = 491$; 22.3%) and/or alcohol ($n = 271$; 12.3%) abuse.

Information regarding the suspect's parents was available for a part of the individuals ($n = 1,654$) (Table 2). Property crime ($n = 430$; 26.0%) was the most common crime a parent had been convicted for, followed by violent crime ($n = 318$; 19.2%). Parental psychiatric disorders were relatively common ($n = 371$; 22.4%) and so was drug ($n = 171$; 10.3%) and alcohol ($n = 294$; 17.8%) abuse.

Latent class analysis

Indoor rape+

Class enumeration (Table 3) was conducted by using fit indices. Even though the entropy value increased when going from four to five classes, there was a significant drop in log-likelihood and AIC

Table 2. Descriptive data of the included individuals' parents.

	Indoor	Outdoor
N	12,617	1,654
Convictions		
White collar crime [n (%)]	1,866 (14.8)	269 (16.3)
Property crimes [n (%)]	3,170 (25.1)	430 (26.0)
Violent crime [n (%)]	2,234 (17.7)	318 (19.2)
Psychiatric ill-health		
Psychiatric disorders [n (%)]	2,949 (23.4)	371 (22.4)
Drug abuse [n (%)]	1,084 (8.6)	171 (10.3)
Alcohol abuse [n (%)]	2,531 (20.1)	294 (17.8)

Table 3. Fit indices (indoors).

Number of latent classes	Log-likelihood	AIC	Adjusted BIC	Degrees of freedom	Entropy
2	-50153.76	1540.74	16090.64	112	0.80
3	-49780.22	809.67	915.32	104	0.67
4	-49498.32	261.86	395.39	96	0.71
5	-49468.54	218.31	394.98	88	0.75

when going from three to four classes. There were indications of conditional dependence for some of the manifest variables. This also strengthens the restriction of the number of classes to four, as local independence often leads to additional classes in the final model. The four classes are hereafter referred to and labeled as Low Offending Class (LOC), Intermediate Offending Class A (IOC A), Intermediate Offending Class B (IOC B), and High Offending Class (HOC).

The highest class membership probability was assigned to the LOC (63.8%) followed by, chronologically, the IOC A, the IOC B as well as the HOC (Table 5). Assigning individuals to classes with their highest class membership showed that individuals were mainly assigned to the LOC ($n = 11,626$; 66.4%) followed by the IOC A ($n = 2,275$; 13.0%), the HOC ($n = 1,849$; 10.6%) and the IOC B ($n = 1,770$; 10.1%) (Table 7).

The largest difference was observed between the LOC and the HOC (Table 7). While members of the LOC had low rates of previous criminality, substance abuse and psychiatric disorders, members of the HOC were heavier offenders with a significantly higher rate of these variables (Table 5). Table 7 shows that members of the LOC had lower mean year of birth (1981) and were younger at their first crime registration (31.1 years) in comparison to the HOC (1972 and 40.0 years, respectively). The LOC also had a lower proportion of individuals (30.6%) with low education in comparison to the HOC (50.1%). The majority of the members in the LOC (57.0%) were individuals born outside of Sweden or born in Sweden with at least one parent born outside of Sweden. In contrast, the majority of the members in the HOC (57.3%) were Swedish-born with Swedish-born parents. Members of the HOC had a higher proportion of individuals receiving social welfare (42.4%) in comparison to those in the LOC (15.2%).

Outdoor rape+

Class enumeration (Table 4) was conducted by using fit indices. There was a significant drop in log-likelihood and AIC when going from two classes to three classes. The entropy value also decreased suggesting that the separation of classes got worse. For the outdoor rape+ group, there were indications of conditional dependence for some of the manifest variables, why three classes were used. The three classes among the outdoor rapes are hereafter referred to and labeled as Low Offending Class (LOC), Intermediate Offending Class (IOC), and High Offending Class (HOC).

The LOC (64.1%) had the highest class membership probability followed by the IOC and the HOC (Table 6). The LOC can be considered to be a low offense class as the members of this class had

Table 4. Fit indices (outdoors).

Number of latent classes	Log-likelihood	AIC	Adjusted BIC	Degrees of freedom	Entropy
2	-5813.13	277.75	315.55	112	0.79
3	-5760.48	188.46	246.43	104	0.72
4	-5735.37	154.23	232.37	96	0.71

Table 5. Assignment probabilities by class (Indoors).

	Class 1	Class 2	Class 3	Class 4
Class membership probabilities	63.8%	14.3%	12.1%	9.8%
Item response probabilities				
White Collar Crime	1.9%	32.9%	10.9%	67.6%
Property Crime	6.4%	75.7%	29.9%	98.3%
Violent Crime	11.8%	64.2%	41.1%	89.6%
Drug use disorder	6.4%	39.8%	35.3%	75.2%
Alcohol use disorder	1.7%	8.0%	54.8%	81.1%
Psychiatric Disorder	3.4%	9.6%	48.0%	51.5%
Number of registrations for the studied crimes				
1 registration	94.2%	86.5%	91.5%	86.0%
2 registrations	5.8%	13.5%	8.5%	14.0%

Table 6. Assignment probabilities by class (Outdoors).

	Class 1	Class 2	Class 3
Class membership probabilities	64.1%	29.5%	6.4%
Item response probabilities			
White Collar Crime	1.4%	21.1%	72.9%
Property Crime	5.8%	57.8%	99.2%
Violent Crime	11.1%	62.1%	93.4%
Drug use disorder	6.8%	42.4%	84.4%
Alcohol use disorder	1.4%	22.1%	76.5%
Psychiatric Disorder	3.4%	20.1%	59.7%
Number of registrations for the studied crimes			
1 registration	96.2%	95.8%	92.8%
2 registrations	3.8%	4.2%	7.2%

Table 7. Comparison of covariates across classes (indoors).

	Class 1	Class 2	Class 3	Class 4	P-value
Most probable class membership [n (%)]	11,626 (66.4%)	2,275 (13.0%)	1,770 (10.1%)	1,849 (10.6%)	
Mean Posterior Probability	91.6%	71.7%	71.2%	78.6%	
Demographics					
Year of Birth [mean (SD)]	1981 (13.0)	1978 (12.0)	1973 (14.4)	1972 (12.0)	<0.001
Male sex [(%)]	98.4%	99.9%	99.3%	99.7%	0.86
Age at first Registration [mean (SD)]	31.1 (12.5)	32.8 (11.9)	38.7 (14.0)	40.0 (11.9)	<0.001
Low Education [(%)]	30.6%	44.2%	33.7%	50.1%	<0.001
Country of birth					
Swedish born with Swedish born parents [%]	43.0%	42.1%	57.2%	57.3%	
Swedish born with one parent born in Sweden [%]	6.6%	7.8%	8.3%	10.2%	
Swedish born with no parent born in Sweden [%]	5.7%	9.9%	4.4%	7.7%	
Born outside Sweden [%]	44.7%	40.1%	30.1%	24.8%	<0.001
Socioeconomic status					
Neighborhood deprivation [SDI (SD)] (n = 13,937)	1.02 (2.2)	1.4 (2.4)	0.9 (2.1)	1.4 (2.4)	<0.001
Income [mean (SD)] (n = 13,803)	-0.12 (0.3)	-0.15 (0.2)	-0.12 (0.2)	-0.16 (0.2)	<0.001
Social welfare [%]	15.2%	30.6%	22.9%	42.4%	<0.001
Parents (n = 12,617)					
Psychiatric disorder [%]	18.7%	25.0%	30.6%	37.8%	<0.001
White collar crime [%]	11.8%	20.3%	13.6%	23.9%	<0.001
Property crime [%]	20.6%	36.3%	25.3%	34.3%	<0.001
Violent crime [%]	14.5%	25.2%	18.0%	24.3%	<0.001
Drug use disorder [%]	6.6%	11.3%	10.5%	13.3%	<0.001
Alcohol use disorder [%]	15.2%	22.1%	28.0%	34.3%	<0.001
Resilience (n = 5,153) [mean (SD)]	-0.19 (1.0)	-0.64 (0.9)	-0.47 (1.0)	-1.00 (1.0)	<.0001
IQ (n = 5,895) [mean (SD)]	-0.34 (1.0)	-0.80 (0.9)	-0.61 (0.9)	-0.92 (0.9)	<.0001
School Achievement (n = 8,013) [mean (SD)]	-0.53 (1.1)	-1.20 (1.0)	-0.91 (1.1)	-1.43 (0.9)	<.0001

significantly lower rates of previous criminality, substance abuse and psychiatric disorders in comparison to the HOC, which can be considered to be a high offense class (Table 6).

Most suspects were members of the LOC (n = 1,531; 69.5%) followed by the IOC A (n = 558; 25.3%) and the HOC (n = 114; 5.2%). While members of the LOC had a mean year of birth of 1985, the IOC and especially the HOC were older and born 1980 and 1975, respectively. Those in the LOC also had a lower mean age at their first crime registration (26.7 years) in comparison to the IOC and the HOC (31.3 and 36.9 years, respectively). Close to half (47.7%) of those in the HOC had low education which can be compared to 35.1% in the members of the LOC. The majority (50.9%) of the members in the HOC were Swedish-born with Swedish-born parents. The majority in the LOC (60.3%) was individuals born outside of Sweden or born in Sweden with at least one parent born outside of Sweden. The

Table 8. Comparison of covariates across classes (outdoors).

	Class 1	Class 2	Class 3	P-value
Most probable class membership [n (%)]	1,531 (69.5%)	558 (25.3%)	114 (5.2%)	
Mean Posterior Probability	89.4%	84.6%	86.4%	
Demographics				
Year of Birth [mean (SD)]	1985 (11.3)	1980 (12.6)	1975 (11.9)	<.0001
Male sex [(%)]	98.5%	98.8%	98.3%	0.88
Age at first Registration [mean (SD)]	26.7 (11.1)	31.3 (12.6)	36.9 (11.7)	<.0001
Low Education [(%)]	35.1%	51.0%	47.7%	<.0001
Country of birth				
Swedish born with Swedish born parents [%]	39.7%	46.6%	50.9%	
Swedish born with one parent born in Sweden [%]	5.7%	6.6%	7.0%	
Swedish born with no parent born in Sweden [%]	7.9%	8.4%	6.1%	
Born outside Sweden [%]	46.7%	38.4%	36.0%	0.0112
Socioeconomic status				
Neighborhood deprivation (n = 1,783) [SDI (SD)]	1.24 (2.3)	1.34 (2.3)	1.38 (2.5)	0.636
Income (n = 1,699) [mean (SD)]	-0.15 (0.2)	-0.16 (0.2)	-0.17 (0.3)	0.561
Social welfare [n (%)]	14.7%	37.1%	47.4%	<.0001
Parents (n = 1,654)				
Psychiatric disorder [%]	17.0%	30.4%	44.2%	<.0001
White collar crime [%]	13.6%	20.5%	25.3%	0.0002
Property crime [%]	21.7%	33.8%	35.8%	<.0001
Violent crime [%]	15.1%	27.5%	25.3%	<.0001
Drug use disorder [%]	8.4%	12.7%	21.1%	<.0001
Alcohol use disorder [%]	12.9%	26.6%	29.5%	<.0001
Resilience (n = 482) [mean (SD)]	-0.30 (0.9)	-0.7 (1.0)	-1.18 (1.0)	<.0001
IQ (n = 564) [mean (SD)]	-0.51 (0.9)	-0.84 (0.9)	-1.07 (0.8)	<.0001
School Achievement (n = 1,126) [mean (SD)]	-0.71 (1.1)	-1.36 (1.0)	-1.57 (1.0)	<.0001

proportion of members in the LOC receiving social welfare was much lower (14.7%) than those in the HOC (47.4%). The variables and their corresponding figures are presented in [Table 8](#).

Comparing indoor and outdoor rape+ suspects

[Table 9](#) shows the results of the multivariable analysis, which compares the indoor rape+ suspects with the outdoor rape+ suspects. There were three noteworthy findings: individuals born in Sweden with no parent born in Sweden had 1.10 times higher odds than Swedish-born individuals with Swedish-born parents to be suspected of outdoor rape+ (albeit not to a significant extent); individuals born outside of Sweden had 1.19 times higher odds than Swedish-born individuals with Swedish-born parents to be suspected of outdoor rape+; individuals convicted for violent crime had 1.17 times higher odds of being suspected of outdoor rape+.

Discussion

In order to identify potential avenues for prevention, we aimed to classify suspects of rape against adult females considering the circumstances in which the rape occurred, i.e., indoors or outdoors. We used Latent Class Analysis for this purpose and then compared the two groups of rape offenders. Our study had three main findings: 1) in both the indoor rape+ group and the outdoor rape+ group, we could identify one low offenders' class and one high offenders' class; 2) immigrants suspected of rape+ had higher odds than Swedish-born individuals with Swedish-born parents to be suspected of outdoor rape+; 3) suspects of outdoor rape+ had 1.17 times higher odds of having been convicted for previous violent offenses in comparison to those suspected of indoor rape+.

Table 9. Results from multivariable analysis – Comparing Outdoor with Indoor rape.

	Outdoors = 1 Indoors = 0
Demographics	
Year of Birth	0.96 (0.95; 0.98)
Men vs Female	0.79 (0.44; 1.43)
Low Education	1.08 (0.98; 1.19)
Age at first registration	0.93 (0.92; 0.95)
Country of birth	
Swedish born with Swedish born parents	Reference
Swedish born with one parent born in Sweden	0.81 (0.67; 0.99)
Swedish born with no parent born in Sweden	1.10 (0.92; 1.32)
Born outside Sweden	1.19 (1.07; 1.33)
Prior convictions/Psychiatric ill-health	
Psychiatric disorder	1.00 (0.86; 1.16)
White collar crime	0.98 (0.83; 1.14)
Property crime	1.04 (0.92; 1.17)
Violent crime	1.17 (1.05; 1.31)
Drug use disorder	1.01 (0.89; 1.14)
Alcohol use disorder	0.90 (0.77; 1.05)
Neighborhood deprivation	1.02 (0.99; 1.04)
Income	0.89 (0.71; 1.11)
Social welfare	0.90 (0.80; 1.01)

Low and high offenders' classes

Our two groups (indoor and outdoor rape) had several latent classes and there were clear distinctions in both groups with one class consisting of low offenders and one consisting of high offenders. That there is no homology between rapists in our both groups are in accordance with a previous study on 100 British male stranger rapists which found no similarities between the individuals with respect to being represented among other criminal records even though the rapists committed their crimes in a similar fashion (Mokros and Alison 2002).

Our finding is also consistent with previous research on homicide by Vaughn et al. (2009) as well as preliminary findings on homicide in Sweden where 14,466 individuals convicted of or suspected for homicide were analyzed. The authors identified three latent classes where Class 1 and Class 3 seem to be low offending class and high offending class, respectively (Khoshnood et al. 2019b). Vaughn et al. (2009) evaluated 160 multiple homicide offenders and identified three latent classes highly resembling the classes identified in the present study on indoor and outdoor rape and our preliminary findings on homicide. That our study resembles studies in regard to deadly violence (Khoshnood et al. 2019b; Vaughn et al. 2009) should not be regarded as a surprise since there are close similarities between rapists and other criminals, not least violent criminals (Scully 2013).

The identification of low offending and high offending classes in this study, similar to the study on homicide mentioned above, suggests that there may be two different types of offenders committing rape+: First, more “traditional” criminals with a high rate of previous criminality and pronounced problems with psychiatric disorders and substance use disorders, and, second, individuals not seeming to have an obvious criminal lifestyle, i.e., with low rates of previous criminality, as well as less problems with psychiatric disorders and substance use disorder.

Of high interest is that the absolute majority of suspects in both the indoor rape+ (66.4%) and outdoor rape+ (69.5%) groups belonged to the LOC. This suggests that a majority in both groups consists of individuals propelled and motivated by sexual deviance rather than a criminal lifestyle per se. The rape literature is divided on this matter and is thus supporting our findings. While some scholars suggest that sexual assaults like rape are because of a lack

of intimacy (Marshall 1989), other scholars deem that rape is part of an offenders' criminal lifestyle (Scully and Marolla 1983, 1985). The first group fits well with our LOC while the second group better fits our HOC and, therefore, none of the scholars are necessary "wrong." Our results clearly show that suspected rapists are not a homogenous group.

Immigrants and rape+

More than half ($n = 10,822$; 54.9%) of our total study population ($n = 19,723$) are defined as immigrants, i.e., first-generation immigrants and second-generation immigrants with at least one parent born abroad.

Immigrants constituted more than half of those in the indoor rape+ group ($n = 9537$; 54.4%) as well as the outdoor rape+ group ($n = 1285$; 58.3%). Our findings are in line with previous studies from Sweden showing that a majority of convicted or suspected individuals in the criminal statistics are immigrants (Adamson 2020; Ahlberg 1996; Martens and Holmberg 2005; Stiernströmer et al. 2019). Studies from other European and Nordic countries also show similar results (Andersen, Holtmark, and Mohn 2017; Andersen and Tranæs 2013; Killias 1997; Skardhamar, Aaltonen, and Lehti 2014).

Our findings indicate, however, that the rate of immigrants among suspected offenders is lower (54.9%) than the rate of immigrants among convicted offenders presented by Stiernströmer et al. (2019). In that study, the authors included 21 individuals convicted of rape and aggravated rape against adult females. The offenders were all convicted between 2013–2018 in Malmö, Sweden's third largest city. A total of 17 individuals (71%) were classified as immigrants. The study, however, had some limitations, which may explain the higher rate of immigrants compared to our findings; the study was based on a small sample, only one city was included, and the timeframe was shorter than ours. Another study which focused on nationwide data from the whole of Sweden showed that the proportion of registered rape and attempted rape with regard to immigrants between the years 2002–2006 and 2013–2017 had decreased from close to 60% to approximately 55%. The majority of the registered individuals were – like in our findings – first-generation immigrants followed by unregistered immigrants and then second-generation immigrants (Adamson 2020).

However, both studies support that immigrant status is of importance to consider in regard to offenders. Immigrant status is important also in studies of crime victims (Maier 2008; Messner and Rosenfeld 1999; Nagel et al. 2005; Sommers 2007). Our findings showing that immigrants – foremost first-generation immigrants – constitute a majority of rape+ offenders may be used in order to design evidence-based specific programs for first-generation immigrants. Although such evidence is still scarce (DeGue et al. 2014), some regions in Sweden, including the second largest one, have started to inform first-generation immigrants about the Swedish law on sexual crimes, on central democratic and humane ideas in the Swedish society, such as societal values, and also on character of and relations between the sexes (Hostetter, Nilsson, and Pherson 2017). Previous researchers have suggested that many developing countries have a need for legal reforms with respect to sexual rights like rape (El-Kak 2013; Ercevik Amado 2004). For example, marital rape is not considered as rape in many countries (El-Kak 2013). In the US, marital rape is experienced by close to 14% of all married females and, partly because of extensive educational efforts, marital rape was prohibited in all of the country's 50 states in the beginning of the 1990s (Martin, Taft, and Resick 2007). It is possible that educational efforts, providing first-generation immigrants education on Swedish laws and values, will improve many women's sexual rights, including those immigrant women who are unaware of Swedish laws, although more research is needed before crime reduction policies are implemented in a large scale.

Individuals in our study being first-generation immigrants and second-generation immigrants with both parents born outside of Sweden, had a 1.19- and 1.10 times higher odds than Swedish-born individuals with Swedish-born parents to be suspected of outdoor rape+. This finding may be explained by the following two reasons: 1) immigrants may be more prone to commit outdoor rape + or 2) there is a judiciary bias against immigrants in regard to rape+ in general and outdoor rape+ in particular. These two different reasons mean that our results should be interpreted with caution.

Violent crimes and outdoor rape+

Suspects of outdoor rape+ had 1.17 times higher odds of having been convicted for previous violent offenses. In regard to the rate of violent crimes for both the indoor and outdoor groups, it is of interest that almost 70% of the suspects had not previously been convicted for violent crimes. The interest lies in that prior studies have pointed out that previous violent crimes are a risk factor for committing further violent crimes (Khoshnood and Fritz 2017; Langevin and Handy 1987; Pridemore 2006; Salfati and Canter 1999). The low rate of suspects convicted for prior violent crimes may be because a high rate of the individuals was born outside of Sweden and their previous criminal records are unknown for the Swedish authorities. Another explanation behind our findings is that individuals committing rape+ may be more motivated by sexual deviance rather than a criminal lifestyle per se.

Outdoor rape is usually committed by offenders unknown to the victim (Ceccato, Guangquan, and Haining 2019). The offenders' attack may therefore be a surprise for the victim and the offender should need to use violence in order to commit the rape against the woman. It has also been shown that females fighting back during a rape are also subjected for an increased violence (Ullman 1998). This leads us to assume that individuals who are more prone to violence may commit outdoor rape+ against unknown females to a higher extent than other rape offenders. This is in line with our findings that individuals committing outdoor rape+ have higher odds of having been previously convicted of violent crimes. Previous studies on stranger rapes have shown that hostility like the use of violence is a common phenomenon (Häkkanen, Lindlöf, and Santtila 2004; Santtila, Junkkila, and Kenneth Sandnabba 2005).

Conclusion

A total of 19,723 individuals suspected of indoor and outdoor rape+ were classified using Latent Class Analysis and then compared. We found that both groups had one low offenders' class and one high offenders' class. Those suspected of outdoor rape+ were to a higher extent immigrants and particularly first-generation immigrants and had significantly higher odds of being previously convicted of violent crimes. Our results are of importance for crime prevention in different settings and for the formulation of appropriate policies in identifying individuals at risk for committing rape+. The results can also be used by the police authority in order to create more comprehensive profiles of rape+ offenders. The different variables used in our study and the results presented can also be used in conducting more effective risk assessments by the police, the prison and probation services, as well as the mental health services. Our findings can also be used as a screening tool when trying to narrow-down suspects of rape+.

So far, research on rape+ with respect to the location of the crime – indoors or outdoors – is scarce as most studies on rape+ have focused on offender characteristics and victimology. Future studies in other settings are needed to confirm and extend our findings on the characteristics of rape+ offenders based on the location of the crime, which may improve preventive efforts at different levels.

Ethical permission

Regional Ethical Review Board in Lund (Dnr: 2012/795)

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