Perceived neighbourhood insecurity and psychosomatic health complaints among adolescents in Stockholm

Exploring district-level and gendered inequalities

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Abstract

The neighbourhood is an essential arena for adolescents’ health development and research suggests that perceived neighbourhood insecurity (PNI) is associated with socio-economic status and self-rated health. The present study explored the distribution of adolescents’ PNI and its association with psychosomatic health complaints across districts. It also examined gender differences and whether family socio-economic position, foreign background and previous exposure to crime could explain part of the association. Data came from classroom-surveys within Stockholm municipality’s 14 districts in 2010, 2012 and 2014 (n=10,291). Linear and logistic multilevel regression models were applied. Results showed that the average level of PNI varied considerably between districts and were strongly connected to its socio-demographic composition. However, individual characteristics in terms of family background and previous exposure to crime only explained a minor part of the variation in PNI across districts. Girls reported more insecurity than boys in all districts. Gender differences in PNI decreased in absolute numbers, but increased in relative numbers, as the overall ‘neighbourhood safety’ increased. Between-district differences in health were minor, but PNI was still a strong predictor of individual-level health, especially for boys. Furthermore, the predictive power of PNI on health was stronger in districts perceived as safer.

Key words
Perceived neighbourhood insecurity, psychosomatic health complaints, adolescents, social disorganisation theory, collective efficacy theory, gender theories.
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Introduction

Few factors are likely to be as tightly connected to people’s sense of safety as the geographical place they find themselves in. This notion is also supported by research pointing to substantial variations in levels of perceived security across urban residential districts, relating these to neighbourhood characteristics such as crime rate (Ross & Jang, 2000) and socio-demographic composition (Diez Roux, 2001).

The study of people’s residential place as crucial for their social development and wellbeing has a long history. Advocators of the so-called social disorganization theory have, since the 1940s, sought to explain the role of neighbourhood characteristics in adolescent crime (Sampson & Wikström, 2008). According to this theory, failure to organize a community into common values and goals (e.g. a safe environment), through mechanisms such as social ties and informal social control, will lead to increased insecurity among its residents. As an extension of this hypothesis, the theory of collective efficacy emerged in the 1990’s (Sampson, Raudenbush, & Earls, 1997), emphasizing the importance of informal social control and social cohesion for the neighbourhood’s capacity to translate its collective resources into certain outcomes, like a safe neighbourhood. This capacity can be measured by e.g. willingness to help neighbours and perceptions of reciprocal trust among residents (Roman & Chalfin, 2008). Collective efficacy has been empirically linked to lower violence rates and self-reported victimization rates in urban districts (Sampson & Wikström, 2008), and is therefore likely to promote perceptions of security. Social stratification processes are seen as the major dividers of collective efficacy between districts (Sampson et al, 1997).

Apart from the individual’s position in society’s hierarchy of class and status, researchers have also stressed individual and psychological traits as influencing a person’s level of perceived neighbourhood security, for example sense of control, perceived vulnerability and self-confidence (Pacilli, 2007). Moreover, previous exposure to crime (for instance having been robbed or assaulted) is of course crucial for feelings of insecurity (Cops, 2013), something which is more commonly experienced by lowly than highly educated (Statistiska centralbyrån, 2015). Knowing
someone who has been victimized in their local residential district has also been found to negatively affect one’s sense of security regardless of one’s personal experiences (Hale, 1996). Furthermore, rumours and reputations of committed crimes and potential hazards in one’s neighbourhood can establish identities of “safe” or “unsafe” neighbourhoods. For example, when crimes are committed in the suburbs of Stockholm, Swedish newspapers have been found to report the specific location more often than when it is committed closer to the city centre (Heber, 2011).

Beside associations with the above mentioned conditions at both the district- and individual level, it seems reasonable to assume that neighbourhood security also has implications for, and is contingent upon, one’s health. The interest in studying neighbourhood characteristics as crucial for health has grown sharply during the past decades, recognizing these as social determinants of health in their own right (Diez Roux, 2001). Research suggests that neighbourhood insecurity, socio-economic indicators and self-rated health are closely associated. For instance, disparities in neighbourhood security have been found to contribute to differences in self-rated health between residential districts, even when individual health behaviours and socio-economic factors have been controlled for (Chandola, 2001). Taking Stockholm municipality as an example, districts perceived as least safe (Stockholms stad, 2015a) and districts that score highest on social deprivation (Sandahl, 2010), also coincide with those whose residents report the poorest self-rated health (Stockholms stad, 2015b). The aim of this thesis is to explore the association between perceived neighbourhood insecurity (henceforth abbreviated PNI) and psychosomatic health complaints across Stockholm municipality’s 14 districts in further detail.

Even though health effects from PNI probably exist in all age groups, this study will focus on one in particular: adolescence. With increasing age, children are normally allowed increased levels of independent mobility in their nearby area (Pacilli, 2007). In fact, the neighbourhood has been proposed as one of the most health-determining arenas for adolescents (Aneshensel & Sucoff, 1996). Frequencies of self-reported psychosomatic health complaints - such as headaches, stomach aches, sleeping disruptions and a low mood - are relatively equal between girls and boys in childhood, but begin to disperse in adolescence, when girls start to report more health complaints than boys (Statens Folkhälsoinstitut, 2011). A similar tendency has been found for
PNI (Goodey, 1997). This gendered development takes place despite the fact that boys more often fall victims to crime in public space (Pain, 2000). However, taking the perceived threat of sexual violence among girls into account – something that is not nearly as common among boys – can help explain this “paradox”. Late adolescence is a period of sexual identity formation in which girls – to a considerable larger extent than boys – begin to view themselves as possible victims of sexual violence (Johansson, Laflamme & Eliasson, 2012). In fact, the threat of sexual violence stands out as the main perceived social threat among women in all ages (Ferraro, 1996). Accordingly, gender has been identified as the most prominent predictor of PNI (Pain, 1991), reported as twice as strong a predictor than socio-economic status (Ferraro, 1996). In a recent Swedish national survey of living conditions, three percent of the boys and 19 percent of the girls aged 16-24 reported PNI (Statistiska centralbyrå, 2015).

In this study, a special focus will be placed on gendered inequalities when exploring the role of adolescents’ PNI for health across the 14 districts of Stockholm municipality. Furthermore, the role of socio-economic status, length of stay in Sweden and previous exposure to crime in the studied association will be investigated. Finally, potential differences across districts in the association between PNI and health will be examined. Below, a more detailed account of the theories on social disorganisation and collective efficacy is given, followed by an extended section of gender theories. Thereafter, perceived neighbourhood insecurity and its connection to health and to adolescents will be briefly discussed, before presenting this study’s methods and results.

**Social disorganization theory**

The interest for studying residential place as crucial for the individual’s sense of security is not a new phenomenon, but dates back to urban sociology-research in the 1920s’, within the so-called Chicago-school. In the 1940s, Clifford Shaw and Henry D. McKay formed the theory of *social disorganization*, while examining the role of neighbourhood factors for adolescent crime in the Chicago slums (Sampson & Groves, 1989). Shaw and McKay were able to show that social disorganization
operated as a mediator in the association between neighbourhood socio-economic status and crime rates (Shaw & McKay, 1942).

The term “disorganization” refers to the inability of a community to organize itself according to common goals shared by its inhabitants. A safe and crime-free environment is generally considered a fundamental collective goal. Organization according to common goals makes it possible for a community to achieve informal social control, or as Sampson et al (1997, p.918) puts it “to regulate its members according to desired principles – to realize collective, as opposed to forced, goals”.

Social control can be operationalized as the degree to which neighbours are willing to intervene for the good of their neighbourhood (Sampson et al., 1997). A high informal social control implies a willingness to intervene in possible detrimental activities like vandalism or mugging. Lack of social control is linked to increased levels of violence and can therefore be viewed upon as a source of neighbourhood insecurity.

Apart from social control, the theory introduces social ties as important for perceptions of neighbourhood security, both informal (between neighbours) and formal social ties (within neighbourhood organizations) (Ross & Jang, 2000). PNI and fear of crime can be seen as a consequence of weak social ties within a community, as people are less likely to trust strangers than friends. It can of course also go in the reversed direction, with PNI resulting in, or increasing, weak social ties. Ross & Jang (2000) found that in districts perceived as unsafe, informal social ties could alleviate some of the insecurity. That social ties and social order are linked to each other has also been shown in a study by Sampson & Groves (1989), demonstrating that social ties have a positive effect on the degree of social control within neighbourhoods.

So, having recognized the importance of social control and social ties for neighbourhood safety, a relevant question to pose when studying differences in PNI across districts is which factors that can lead to different amounts of social ties and social control across districts? Shaw and McKay argued that in socially disorganized districts, structural barriers such as low economic status, high residential mobility and ethnic heterogeneity would hinder social ties from being developed – and thus have a negative effect on social control (Sampson & Groves, 1989). Poorer areas, they maintained, lack resources to organize themselves into formal organizations, and high
residential mobility hampers possibilities of developing and maintaining social ties. Moreover, ethnic heterogeneity within a district was viewed as possibly leading to fear and mistrust between ethnic groups, impeding social relations and efforts towards common goals. Support for this hypothesis has more recently been found in a nationally representative survey from 2003 in Sweden, showing that levels of interpersonal social trust were lower in districts with a large ethnic diversity (Fritzell & Strömblad, 2011).

Social ties furthermore seem to affect the degree of social order (or disorder) in a neighbourhood. Hence, perceived cues of social disorder (e.g. graffiti, vandalism) is associated with increased fear of victimisation, but informal social ties can reduce some of the negative effect of social disorder on PNI and mistrust (Ross & Jang, 2000). One cue of social disorder is peer adolescent groups gathering at night without a specific aim or direction, as they are seen as constituting a growing-ground for crime (Sampson & Groves, 1989). Thus, the ability of a community to control these adolescent groups, through for instance provision of alternative activities than just “hanging around”, is viewed as a sign of social order. Then again, Ross & Jang (2000) argues that peer adolescent gangs also could be seen as evidence of social ties – since they constitute a network of friends – in spite of their potentially negative influence on neighbourhood safety.

Collective efficacy theory

Around five decades after the social disorganization theory was developed, in the late 1990s, its ideas was extended by the theory of collective efficacy. Sociologist Robert J Sampson founded the theory while studying violent crime across neighbourhoods in Chicago (Sampson et al., 1997). One basic assumption here – as well as in the previously mentioned theory – is that crime statistics across urban areas cannot fully be explained by variances in aggregated demographic characteristics of individuals without taking social and organizational characteristics of the neighbourhood into consideration.

The theory of collective efficacy differs from the social disorganization theory in terms of regarding strong social ties as something facilitating - but not necessarily a
requirement for – social control in a district (Sampson & Wikström, 2008). Personal social ties can be strong even in disadvantaged areas, but perhaps not entwined to formal social ties (Sampson et al., 1997). The theory claims that in today’s urban society, a tendency to intervene for the common good of one’s neighbourhood - independent of the amount of social ties – might have the greatest importance for perceptions of neighbourhood safety. This phenomenon should rather be referred to as *social cohesion* than social ties.

In fact, *social cohesion* among neighbours along with *informal social control* are key elements in this theory, and seen as contributing to rates of neighbourhood violence (Sampson et al., 1997). *Social cohesion* refers to the quality of social networks and social relations among residents of a community, as well as the degree of mutual trust and solidarity within it (Browning & Cagney, 2002; Ross & Jang, 2000). *Informal social control* is, as previously mentioned, the ability of a community to organize itself into common values and principles in order to reach collective goals (Sampson et al., 1997).

Both social cohesion and informal social control are constructs that exist in relation to certain tasks. Collective efficacy speaks of the ability of communities to translate collective resources into certain outcomes – like the amount of crime (Sampson et al., 1997) and PNI (Roman & Chalfin, 2008). Spatial stratification processes according to social characteristics such as socio-economic status or ethnicity, will create different amounts of collective efficacy across districts. The creation and realization of positive shared norms within a community, like helping one’s neighbours, is, in turn, linked to lower levels of PNI (Roman & Chalfin, 2008; Sampson et al., 1997). Collective efficacy has also – in settings as diverse as Chicago and Stockholm – been found to correspond with lower violence rates as well as lower self-reported victimization rates within neighbourhoods (Sampson et al., 1997; Sampson & Wikström, 2008). There is also evidence for the importance of collective efficacy for health outcomes. Multilevel studies of a Chicago setting in the 1990s showed that residents in districts with higher amounts of collective efficacy reported better physical health (Browning & Cagney, 2002).
Gender theories

Differences in PNI between districts can, despite their pervasiveness, appear as relatively small compared to individual-level effects of being part of an ethnically or socioeconomically underprivileged group (Diez Roux, 2001). Another underprivileged group in this context is women. Studies are consistent in their findings that women report a higher PNI compared to men (e.g. BRÅ, 2009; Koskela & Pain, 2000; Pain, 1991), and some studies also conclude that PNI has a larger impact on women’s quality of life (BRÅ, 2009). Women must not be seen as one unifying category though, as e.g. age, socio-economic status, sexuality and ethnicity cuts across gender in its connection with PNI (Koskela & Pain, 2000).

Occasionally, the terms sex and gender is confused, so for clarification sex refers to biological sex (male or female) and gender refers to socially and culturally constructed maleness or femaleness (Hammarström et al., 2014; Hirdman, 1988). In order to apply a gender perspective on PNI – and not merely discuss manifest differences between men and women – it will be framed in the gender system theory – developed by the Swedish historian Yvonne Hirdman in the late 1980s. The theory emphasizes men’s systematic advantages over women through socially structured power relations, and can also be called gender order or patriarchy (Gustafsson, 1998; Hirdman, 1988). The gender system builds on hierarchies - unequal power relations favouring men and in which men are viewed as the norm - and the creation of a dichotomy, leading to segregation between men and women. These segregation effects can become visible by distinctions and separations between men and women into what is labelled as male and female. Hierarchy and segregation mechanisms are expressed in a time and place-dependant gendered ideology (internalized values and norms) and gendered practices (ways in which one does gender).

Gender differences in PNI can be analysed by applying the gender system theory. Gendered ideologies can for instance be expressed in prohibitions for women to be outside alone at night, or messages on how to behave in public spaces in terms of behaviour, clothing, sexuality etc. These messages can stem from multiple agents in society – friends, media, police etc., and have potential consequences for women’s gendered practices. As expressed in Pain (1991, p. 423): “women learn that there is a
series of boundaries in the physical and social worlds which they must not cross if they wish to remain safe.” Women are socialized into avoiding risks (Andersson-Ek, 2009; Pain, 2000) and thus report more restrictions on movements in public space than men, since avoidance is a common coping strategy (Valentine, 1989).

Consequently, men and women are exposed to different risks through their differential access to public space (Gustafsson, 1998; Pain, 1991). This can be seen as stemming from segregation effects. Risks connected to the public sphere communicated to women tend to be exaggerated compared to statistical risk, and the maintenance of these risks can force women to rely on male partners for protection (Gustafsson, 1998), strengthening men’s position in gendered hierarchies. Thereby, PNI can be seen as facilitating the reproduction of the gender system, which favours men.

Although men are favoured through the gender system and by their lower levels of PNI, they are more often than women victims of crime in public space (Johansson et al, 2012; Pain, 2000). This so-called “fear-risk paradox” needs, due to its complexity, some further explanation. Firstly, women are subjected to violence (both indoors and outdoors) to a considerably larger extent than statistics hold, since rape and sexual assault – mainly affecting women – are amongst the most under-reported crimes (Koskela & Pain, 2000). Many sexual offences are left unreported due to their stigmatizing character, and they can have potentially large negative health effects (Ferraro, 1996; Pain, 1991). Out of all types of crime, rape is the main perceived threat among women, something that seem to explain much of their heightened fear of other interpersonal violence as well, in comparison with men (Ferraro, 1996).

Secondly, some studies suggest that women’s fears are less restricted by location, time of day and activity compared to men’s (Pain, 2000). Perceived threats are more constant, seen in a ‘continuum of violence’, ranging from e.g. unwelcomed comments to rape. PNI can therefore be regarded as a social construct, not necessarily corresponding to statistical risk (Madriz, 1997). Even though many studies suggest that the majority of sexual offences occur indoors by someone familiar to the victim (Pain, 1991), perceptions of insecurity among women can be elevated regardless of location.
Thirdly, it is possible that men under-report their fears due to gender norms and social desirability factors (Goodey, 1997; Pain, 2000). Sutton & Farrall (2005) tested the influence of social desirability in answers regarding PNI with help of a “lie scale”. They found that men who were truly honest about their fears reported more fear of crime than women. Thus, all things considered, the so-called fear-risk paradox might not be much of a paradox after all.

Plausible explanations for why men would underestimate their fears can be found in another theory within gender studies called hegemonic masculinity. This theory was founded in the 1980s by Australian sociologist R.W. Connell (Connell, 1987). It states that the concept of masculinity is dynamic, culture-specific and multifaceted, as opposed to so-called sex role-theories, in which more static innate traits are ascribed to men and women (Connell, 2005). Masculinities – being multiple due to their context-bound character – must, just as femininities, be understood in relation to e.g. class, ethnicity, age and sexuality (Goodey, 1997). The hegemonic masculinity is considered the superior form of expressed masculinity that all men and women have to relate and accommodate to. It does not speak of a certain type of man, and even if it did, very few men would be able to fulfil its standards. It can rather be seen as ideas and fantasies, expressed in practices and relations. It “embodies the currently most honoured way of being a man” (Connell, 2005, p 835). The hegemonic masculinity keeps both men and women “in place” through culture, institution and persuasion, and restricts their abilities and opportunities (Goodey, 1997). Accordingly, if boys or men report fear or insecurity, they risk stepping out of the realm of “acceptable” masculinity and thus endanger themselves as being atypical males. The hegemonic masculinity in today’s Western society implies a risk-taker, not easily admitting to feelings of insecurity or fear in public places.

Perceived neighbourhood insecurity as a health and health equity issue

Studies indicate a positive association between usage of public areas and perceptions of neighbourhood safety (Hale, 1996). Generally, the more familiar an individual becomes in his or her neighbourhood, the safer it is perceived (Ferraro, 1996). As stated previously, there are indications of PNI not only being distributed differently
across urban districts and among individuals, but that it also constitutes a social determinant of health and health inequalities. There are several potential pathways between PNI and health, and with possible bi-directional causality. PNI has, at an individual level, shown to be associated with poor health outcomes, like anxiety (Middleton, 1998), poor sleep quality (Hale et al., 2013; Stockholms stad, 2015b) and poor self-rated health (Chandola, 2001; Hale, 1996). Furthermore, Ziersch et al. (2005) found that people who rated their neighbourhood as safe also reported better physical and mental health and Baum et al. (2009) found that different perceptions of safety across districts could explain a part of the locational health inequities. In addition, individual health can also be strengthened in areas perceived as safe through maintenance of health-promoting behaviour, e.g. usage of sports and recreation areas.

Even though PNI is clearly related to health at an individual level, this association needs to be discussed in proximity to “upstream” factors such as discrimination and residential segregation (Diez Roux, 2001). PNI seems to correspond not only to levels of affluence per district (BRÅ, 2009; Chandola, 2001; De Jesus, Puleo, Shelton, & Emmons, 2010; Stockholms Stad, 2015b), but also to the distribution of health between districts (Chandola, 2001; Stockholms Stad, 2015b). Socio-economic conditions are strong indicators of health, following a social gradient even among the most privileged groups (Pickett & Pearl, 2001). Taking Stockholm as an example, proportions of immigrants differ from 14–57 percent across districts, with the most immigrant-dense districts reporting the highest levels of PNI (Stockholms stad, 2015b) and the most economically privileged districts reporting the lowest levels of PNI. Independent of statistical risk of crime, high levels of PNI can thus be seen as a marker of wider patterns of economic disadvantage (Baum et al., 2009).

As with variation in PNI, differences in health between districts could also be attributed to either “composition effects” (i.e. composition of residents according to their social background) or “contextual effects” (i.e. certain characteristics of each neighbourhood) (Lindström, Moghaddassi, & Merlo, 2004). A multilevel study in the south of Sweden found that variances in self-reported health across neighbourhoods were mainly attributable to individual characteristics. Level of social participation, country of origin and socio-economic status (as measured by level of education),
rather than contextual neighbourhood attributes, explained most of the variations in self-reported health between residential districts (Lindström et al., 2004).

Perceived neighbourhood insecurity, gender differences, and health in adolescence

Although the above discussed theories and empirical findings emanate from conditions in the adult population, they are in many respects just as relevant for the age group of interest in this study, namely adolescents. Firstly, the neighbourhood has been put forward as one of the most essential arenas, along with e.g. the school, the peer group and the family, for adolescents’ health development (Aneshensel & Sucoff, 1996). Cues of neighbourhood social disorder have been found to be positively associated with both depression and anxiety among adolescents. Secondly, socio-economic indicators will undoubtedly affect adolescents in a similar manner as adults. Parental socio-economic status plays a significant role in regulating access to collective resources (e.g. social cohesion) and exposures to stressors (e.g. crime, drugs and vandalism). For example, adolescents with low educated parents report more insecurity (Statistiska centralbyrån, 2015). Apart from socio-economic indicators, factors that are important for adults, such as strong social networks, high social trust, social cohesion and sense of community, have been shown to protect also against adolescents’ PNI (Pacilli, 2007; Cops, 2013). Thirdly, studies on PNI among adolescents differ from those of adults, since adolescents often are considered to be the source of neighbourhood insecurity. Adolescents “hanging around” without a specific direction or goal are commonly viewed upon as a cue of social disorder.

Taking the adolescents’ perspective, hence, they can themselves be perceived as a threat to safety by others, while simultaneously perceiving other adolescents of equal or older ages as sources of insecurity. According to a Swedish qualitative study on perceptions of risk among adolescents, both boys and girls identified adolescent gangs as one of the main threats to safety in public spaces. Boys’ fears stemmed from the risk of unprovoked violence and girls’ from the risk of sexual assault (Johansson, Laflamme, Eliasson, 2012). Studies have also pointed to the fact that fear of rape is higher among younger than older females (BRÅ, 2009; Ferraro, 1996) and victimization rates of sexual assault as well (Statistiska centralbyrån, 2015). During adolescence, girls begin to regard themselves as potential victims of sexual violence,
and thus as increasingly vulnerable in public spaces. Boys can, depending on the appearance of the potential perpetrator/s (i.e. other boys), position themselves in an more equal power position – and therefore perceive less risks (Johansson et al, 2012). Still, both boys and girls go through a critical period of sexual and social identity formation in late adolescence when qualities relating to fear or fearlessness develop (Goodey, 1997). Studies have shown that boys report more fear than girls at age 11, but that a change occurs in adolescence, after which girls begin to report more PNI than boys. Along with growing physical strength, boys’ fears diminish: “Boys’ fear is effectively internalized with age, as a form of coping strategy against the rigorous onset of the hegemonic masculine demands of adulthood.”(Goodey, 1997, p. 411).

A similarly diverging trend is also seen for psychosomatic health complaints. Among Swedish children, girls and boys report approximately the same amount of psychosomatic health complaints up to around 10-11 years of age (Statens Folkhälsoinstitut, 2011). However, during adolescence and young adulthood, girls’ health deteriorates and they subsequently report more health complaints than boys. In a survey of ninth graders, 37% of the girls reported having had symptoms like headaches, stomach aches, sleeping disturbances and a low mood “all the time” or “often” during the last six months, as compared to 16% of the boys (Statens Folkhälsoinstitut, 2011). So, despite boys generally being more risk-taking and engaging in more health-damaging behaviour, like drinking alcohol and using physical violence, they still tend to report fewer health complaints and seek medical care less often than girls (Courtenay, 2003). Furthermore, boys more seldom talk to friends about their mental health, and have less strong social networks compared to girls.

**Definition of concepts**

The term *neighbourhood* implies a person’s immediate residential area, and in the context of health studies, an area that is hypothesized to have an influence on one’s health (Diez Roux, 2001). In this study, 14 administrative districts (Sw. *stadsdelsområden*) within Stockholm municipality will be examined, and neighbourhood will be used interchangeably with district. In previous studies, *insecurity* is occasionally replaced by for instance fear (of crime), risk perception,
worry or vulnerability. Throughout the present study, the term *perceived neighbourhood insecurity (PNI)* will be used. The focus is on social fears, e.g. fear of interpersonal crime, assault or harassment, rather than on traffic, air pollution or other environmental sources of insecurity.

*Psychosomatic health complaints* (henceforth often abbreviated to *health complaints* or merely *health*) are commonly operationalized by items concerning somatic and sleep-related problems (e.g. Östberg, Alfvén & Hjern, 2006). For the purpose of this study, such items as well as a few additional items measuring psychological health has been included. (See Methods-section for details on items included.)

As previously stated, the term *sex* refers to biological sex (male or female) and *gender* refers to socially and culturally constructed maleness or femaleness. Gender is therefore something which people *do* in their everyday lives (Hammarström et al., 2014; Hirdman, 1988). Since both PNI and health are contingent upon social and cultural constructions, the term *gender* will be used when referring to differences between the sexes in PNI or health complaints.

*Aim and research questions*

The overall aim of the following study is to explore whether perceived neighbourhood insecurity (PNI) is associated with psychosomatic health complaints among 11th grade boys and girls in Stockholm municipality. In doing so, individuals nested in districts will be investigated with a particular focus on gendered differences. The research questions are:

*Question 1*

a. Are there differences between districts of Stockholm in adolescents’ perceived neighbourhood insecurity?

b. Can any such differences be accounted for by family socio-economic position, length of stay in Sweden or previous exposure to crime?

c. Are there gender differences?
**Question 2**

a. Is a high degree of PNI associated with an increased level of health complaints?

b. If so, can it be accounted for by family socio-economic position, length of stay in Sweden or previous exposure to crime?

c. Are there gender differences?

**Question 3**

a. Does any association between PNI and health complaints vary across districts of Stockholm?

b. Are there gender differences?
Methods

Data material

The data were drawn from the Stockholm School Survey, a classroom survey carried out biennially among students in all public schools and the majority of private schools in all districts in Stockholm municipality. Respondents are those attending 9th grade (compulsory school) and 11th grade (upper secondary school). The Social Development Unit in Stockholm municipality administers the survey. A technical report on the survey of 2012 has estimated the external attrition (i.e. absentees on the day of the survey, students who refrained from taking part in the study, non-participating classes etc.) and internal attrition (unreliable or incomplete responses) to 24% (Sandberg et al, 2012). The current study population was defined as 11th grade students (~17-18 years old) who participated in the study in 2010, 2012 or 2014 and who resided in any of the 14 districts of Stockholm municipality (n=12,758) at the time of the survey. The analysis was further restricted to the 10,291 respondents who provided complete information on all variables used in this study, corresponding to 81% of the above defined study population.

Main dependent and independent variables

The study explored perceived neighbourhood insecurity (PNI) as both an independent and dependent variable. PNI was measured by one item: If you go out late at night in the area where you live, do you feel: Very safe; Pretty safe; Pretty insecure; Very insecure; I don’t go out at night because I’m worried I’ll be subject to a crime; I don’t go out at night for other reasons. The last option was excluded since it did not measure the phenomena of interest. The variable was dichotomized into low PNI (consisting of options very safe and pretty safe) and high PNI (consisting of the three remaining options).

The main dependent variable was psychosomatic health complaints. An index based on six complaints was created, ranging from 0-24, with higher scores representing worse health. Items included in the index were: How often have you had a headache this school year?, Do you feel sad and depressed without knowing why?, How often this school year have you had a “nervous tummy” (e.g. stomach-ache, stomach
cramps, upset stomach, nausea, wind, constipation or diarrhoea)?, How often this school year have you had difficulties falling asleep?, Do you feel sluggish and uneasy?, How often during this school year have you slept uneasily and woken up during the night? Depending on the nature of the question, response alternatives ranged from Never to Several times a week/ Several nights a week or from Seldom to Very often. All questions had five response options.

The index was approximately normally distributed (somewhat skewed towards lower values for boys) with a mean of 10 and a standard deviation of 5. A factor analysis indicated that the items fell into one single factor (Eigenvalue for Factor 1=1.93 and for Factor 2=0.11) with factor loadings ranging between 0.40–0.57. The index indicated good internal reliability (Chronbach’s alpha=0.75).

**Background variables**

**Biological sex** was measured by the question: Are you a boy or a girl? And with response options: Boy/Girl.

**Length of stay in Sweden** was used as an indicator of foreign background and measured by the question: How long have you lived in Sweden? Response options were: All my life; 10 years or more; 5-9 years and Less than 5 years. The variable was dichotomized into having lived in Sweden ten years or more or less than ten years.

Parental education and parental employment were used as crude measures of socio-economic status. **Parental education** was measured through the question: What is the highest education your parents have? And response options were: Old elementary school (folkskola) or compulsory school (max 9 years of schooling); Upper secondary school; University and university college and Don’t know. **Parental employment** was measured by the question: What do your parents do? Response options were: Work (full-time or part-time); Study; Leave of absence; Parental leave; Unemployed; Other and Don’t know. Separate response options were available for mothers and fathers on both these socio-economic indicators. For the parental education-variable, three categories were created for the analysis: none, one, or both parents having university
education. The same categorization was used for the parental employment-variable; none, one, or both parents having employment.

The last set of background variables concerned previous exposure to crime, since having such experiences undoubtedly could have an effect on PNI. The question was posed as: Has any of the following happened to you during the last 12 months? The exposures included were: Felt seriously threatened; Been robbed; Been assaulted; Been forced to have sex/raped. Options to all questions were Yes or No. For distributions of variables in the study sample, see Table 1.

Statistical methods

For the purpose of this study, a multilevel approach makes it possible to separate district-level effects from individual-level effects. Therefore, a two-level random intercepts model was used, taking account of the fact that the regression lines for each district crosses the y-axis at different points, while assuming that the strength of the association between x and y is the same in all districts (Rasbash, Steele, Browne, J, & Goldstein, 2004).

Results were presented as beta-coefficients from linear regression or odds ratios from logistic regression, depending on whether the outcome was dichotomous (PNI) or continuous (health complaints). Furthermore, intra-class correlations (ICC) were calculated (Hox, 2002). In the present study, ICC gives information on how much of the variance in the dependent variable that is accounted for by the district-level. STATA version 13.0 was used for the statistical analyses.

Analytical strategy

Firstly, frequencies, percentages or means were calculated for all variables comprised by the study. Secondly, the percentage of adolescents reporting a high PNI were plotted across districts and compared to a district-specific index of social deprivation, developed and used by the municipality of Stockholm (Sandahl, 2010). Thirdly, a series of models were estimated to determine the extent to which each addition of background variables could account for the variation in PNI between districts. The first model controlled only for gender, whereupon length of stay in Sweden, socio-
economic indicators and previous exposure to crime were successively added to the three subsequent models. Fourthly, the association between PNI and health complaints was examined in a series of models to estimate the extent to which they altered the association between PNI and health complaints. Background variables were added successively in the same manner as described above. Furthermore, an interaction term between gender and PNI was created and included in the model together with the original variables, to explore whether the association with health differed significantly between boys and girls. Fifthly, to explore possible patterns in the association between PNI and health complaints across districts, separate regressions were run for each of the 14 districts. Finally, gender-separate analyses of the association between PNI and health complaints across three identified clusters of districts were performed.

*Ethical considerations*

Students’ participation in the survey was anonymous and voluntary. Since all respondents were above the age of 15 there was, according to the ethical regulations in Sweden (see: [http://codex.vr.se/manniska1.shtml](http://codex.vr.se/manniska1.shtml)), no need for informed consent from parents or caregivers. Teachers distributed the survey in each class and it was answered under exam-like circumstances (Sandberg et al., 2012). The completed questionnaire was collected in sealed envelopes to eliminate the risk of identification of individual students. Since the survey contains personal and possibly sensitive questions, it begins and ends with suggestions for the student to - if in need - contact e.g. the school counsellor.
Results

Table 1 shows that around one in five adolescents in the current study report a high PNI. Clear gender differences exist, with higher proportions of girls reporting a high PNI compared to boys (27% versus 10%). Girls also score higher on the index of psychosomatic health complaints, with a mean of 11.8 compared to 8.4 among boys. The mean score for the full sample is 10.4. The distribution across the socio-demographic variables included in the study does not differ between boys and girls to any substantial degree; 6% have lived in Sweden less than 10 years, 36% have parents without university-education and 7% have one or two unemployed parents.

Table 1. Description of variables used in the study, gender-specific and for the total sample (N= 10,291).

<table>
<thead>
<tr>
<th>Variable</th>
<th>BOYS (n=4,924)</th>
<th>GIRLS (n =5,367)</th>
<th>TOTAL (n =10,291)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level of PNI</strong>*</td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Low</td>
<td>4,445</td>
<td>90</td>
<td>3,922</td>
</tr>
<tr>
<td>High</td>
<td>479</td>
<td>10</td>
<td>1,445</td>
</tr>
<tr>
<td><strong>Length of stay in Sweden</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;10 years</td>
<td>314</td>
<td>6</td>
<td>316</td>
</tr>
<tr>
<td>≥10 years</td>
<td>4,610</td>
<td>94</td>
<td>5,051</td>
</tr>
<tr>
<td><strong>Parental university education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both parents</td>
<td>1,964</td>
<td>40</td>
<td>2,140</td>
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<tr>
<td>One parent</td>
<td>1,151</td>
<td>23</td>
<td>1,330</td>
</tr>
<tr>
<td>None of the parents</td>
<td>1,809</td>
<td>37</td>
<td>1,897</td>
</tr>
<tr>
<td><strong>Parental unemployment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None of the parents</td>
<td>4,598</td>
<td>93</td>
<td>4,995</td>
</tr>
<tr>
<td>One parent</td>
<td>291</td>
<td>6</td>
<td>332</td>
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<tr>
<td>Both parents</td>
<td>35</td>
<td>1</td>
<td>40</td>
</tr>
<tr>
<td><strong>Health complaints</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean score**</td>
<td>8.4</td>
<td></td>
<td>11.8</td>
</tr>
</tbody>
</table>

*Dichotomized variable. Low PNI includes options very safe and pretty safe. High PNI includes options pretty insecure, very insecure and I don’t go out at night because I’m worried I’ll be subject to a crime.

**Ranges from 0-24.
Figure 1. Upper part: distribution of high PNI among girls and boys across districts of Stockholm municipality, divided into three “clusters” (N=10,291). Lower part: information about the socio-demographic characteristics of each district, based on a “social deprivation”-index from 2009, developed by the City of Stockholm. The higher the score, the more socially deprived the district.¹

The upper part of Figure 1 shows the proportion of boys and girls reporting a high level of PNI in each of the 14 districts of Stockholm. Districts have been grouped into

¹ The index of social deprivation is developed and used by the municipality of Stockholm to guide allocation of resources. It consists of: the number of children between 0-17 with foreign background, the number of households with children between 0-17 with low income and the number of children with low educated parents (elementary school as highest), out of the total number of children in each district. It also contains the number of youth between 15-20 having been prosecuted under the penal code and the number of pupils without complete grades, as well as a child-density measurement per district (Sandahl, 2010).
three “clusters”: outer suburban, southern and inner city\(^2\), according to their average level of PNI. Differences between districts in proportions of adolescents’ reporting of PNI are substantial, ranging between 14.8% to 44.7% for girls and 2.9% to 11.4% for boys. There is - in absolute numbers - a “gender gap” across all districts, as girls consistently report higher proportions of PNI compared to boys. However, the size of this gap differs across districts. Girls in the outer suburban cluster are ten times more likely to report a high PNI compared to boys in the inner city cluster (37.3% versus 3.6%). Furthermore, girls in the inner city cluster – composed by the districts perceived as most safe – report almost the same amount of PNI as boys in the cluster perceived as least safe – the outer suburban cluster (15.4% versus 14.9%).

The absolute differences in reported PNI between districts are larger among girls, but among boys, the relative differences are greater: Girls in the outer suburban districts are 2.4 times more likely to report a high PNI, compared to girls in the inner city districts (37.3/15.4=2.4). For boys, the corresponding figure is 4.1 (14.9/3.6=4.1). In absolute numbers, the gender differences in PNI decreases as the overall perceived safety in the cluster increases (outer suburban: 37.3-14.9=22.4; southern: 24.1-8.7=15.4; inner city: 15.4-3.6=11.8). Thus, the absolute difference between boys and girls is 10.6 percentage points higher in outer suburban compared to inner city districts. However, a reversed pattern exists with regard to relative differences in PNI between boys and girls (outer suburban: 37.3/14.9=2.5; southern: 24.1/8.7=2.8; inner city: 15.4/3.6=4.3). Accordingly, the relative difference between boys and girls is 1.7 times higher in the inner city than in the outer suburban districts.

The lower part of Figure 1 illustrates index scores of social deprivation per district\(^3\). When comparing the statistics in the upper and the lower part of Figure 1 it becomes evident that the most socially deprived districts also tend to have the highest proportions of adolescents reporting high PNI. The dotted line in the figure separates the seven districts with highest proportions of PNI from the seven districts with the lowest proportions. This line also seems to represent a clear boundary between districts with higher or lower amounts of social deprivation.

\(^2\) All districts within the inner city cluster are centrally located, except from Bromma, which is situated in the western part of Stockholm.
Table 2. Random intercepts model. Odds ratios for reporting high neighbourhood insecurity, controlled for background characteristics (10,291 individuals in 14 neighbourhoods).

<table>
<thead>
<tr>
<th></th>
<th>Empty model</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Boys (ref)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
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</tr>
<tr>
<td>Girls</td>
<td>3.55 (3.17-3.98)**</td>
<td>3.58 (3.20-4.02)**</td>
<td>3.62 (3.22-4.06)**</td>
<td>3.78 (3.36-4.25)**</td>
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<tr>
<td><strong>Length of stay in Sweden</strong></td>
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<tr>
<td>≥10 years (ref)</td>
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<tr>
<td>&lt;10 years</td>
<td>1.00</td>
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<td>1.00</td>
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<td>1.00</td>
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<tr>
<td></td>
<td>1.78 (1.47-2.16)**</td>
<td>1.68 (1.89-2.04)**</td>
<td>1.65 (1.36-2.00)**</td>
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<tr>
<td><strong>Parental university education</strong></td>
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<tr>
<td>Both parents (ref)</td>
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<td>One parent</td>
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<tr>
<td>None of the parents</td>
<td>1.00</td>
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<tr>
<td></td>
<td>1.19 (1.04-1.38)*</td>
<td>1.18 (1.02-1.36)*</td>
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<td></td>
<td>1.36 (1.20-1.55)**</td>
<td>1.38 (1.21-1.56)**</td>
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<td><strong>Parental unemployment</strong></td>
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<td>No parent (ref)</td>
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<td>One parent</td>
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<td>1.00</td>
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<tr>
<td></td>
<td>1.57 (1.30-1.91)**</td>
<td>1.59 (1.31-1.94)**</td>
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<td></td>
<td>2.04 (1.23-3.37)**</td>
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<td><strong>Exposure to crime (yes/no)</strong></td>
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<tr>
<td>Felt seriously threatened</td>
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<tr>
<td>Been robbed</td>
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<tr>
<td>Been assaulted</td>
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<tr>
<td>Forced to have sex/raped</td>
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</tr>
<tr>
<td>ICC</td>
<td>7.2% (0.03-0.14)</td>
<td>7.9% (0.03-0.15)</td>
<td>7.5% (0.03-0.15)</td>
<td>6.2% (0.03-0.13)</td>
<td>6.3% (0.02-0.12)</td>
</tr>
</tbody>
</table>

*** = p< 0.001, ** = p< 0.01, * = p< 0.05
Table 2 shows the results from the multilevel analysis with PNI as the outcome (using the 14 districts as the higher level unit). Presented are the odds ratios of reporting high PNI across districts, while successively adding background characteristics into new models. Model 1 shows that girls have 3.5 times higher odds of reporting high PNI compared to boys (95% CI 3.17-3.98). In Model 2, length of stay in Sweden is added. A short stay (< 10 years) is associated with increased odds of reporting a high PNI (OR=1.78, 95% CI 1.47-2.16), compared to respondents who have lived in Sweden 10 years or more. Parental educational level and employment status, added in Model 3, indicate that having low educated parents, and having one or two parents who are unemployed, is associated with higher odds of PNI. Model 4, finally, also takes previous exposure to four types of crime into consideration, demonstrating that adolescents who have been seriously threatened, robbed or forced to have sex/raped during the last 12 months report higher PNI. The association is especially strong for having been seriously threatened (OR=2.00, 95% CI 1.72-2.42) or robbed (OR=1.67, 95 % CI 1.28-2.15).

In the empty model the ICC, stating how much of the variation in PNI that can be attributed to the district-level, is 7.2% and statistically significant. When sex is added in Model 1, the ICC increases to 7.9%. This indicates a so-called suppression effect (Plenty, Östberg, & Modin, 2015) in which the prediction of an estimate (the ICC) will increase when the suppressor (sex) is included in the regression model. This occurs since the suppressor accounts for some of the non-observed variance. Gender-stratified analysis revealed a larger variation in PNI between districts among boys (ICC=0.102) than among girls (ICC=0.069) (data not shown). Throughout the remaining three models, the ICC decreases, down to 7.5% when length of stay in Sweden is introduced to the model, and further down to 6.2% when socioeconomic conditions also are added. The addition of previous exposure to crime does not render any further decrease in ICC, suggesting that these types of experiences do not contribute to the “explanation” behind district-differences in perceived PNI. Thus, after having controlled for individual background characteristics, 6.3% of the variance in PNI remains to be explained by contextual differences between districts. It is also worth noticing that the odds of PNI for girls (versus boys) is higher in the fully adjusted than in the crude model (OR=3.78, 95% CI 3.36-4.25).
Table 3 presents estimates for health complaints (beta-coefficients), in relation to PNI, successively controlling for background characteristics. Model 1 indicates that there is a positive association between PNI and psychosomatic health complaints among adolescents in Stockholm. Those who report a high PNI score on average 2.40 points higher on the health complaints index, compared to those who report a low PNI.

Model 2 shows that girls, on average, score more than three units higher on the health complaints index compared to boys. The estimate for PNI decreases to 1.51 when gender is adjusted for, indicating that gender explains a substantial part of the association between PNI and health complaints. Adding length of stay in Sweden in Model 3 reveals a small but significant “excess risk” of health complaints among adolescents with less than 10 years stay in Sweden. However, this aspect does not alter the relationship between PNI and health complaints. Adjusting for parental educational level and employment status in Model 4 further reduces the estimate of PNI, suggesting that socioeconomic background accounts for part of the association between PNI and health complaints. Both socioeconomic indicators are also directly linked with health complaints, suggesting that having highly educated parents and gainfully employed parents is associated with less health complaints. In Model 5, finally, the role of having been exposed to crime for the association between PNI and health complaints is explored. Having been seriously threatened and having been forced to have sex is associated with an average of two points increase on the psychosomatic health complaints index, whereas the corresponding increase for having been robbed and having been assaulted are 0.49 and 1.06, respectively. Controlling for previous exposure to crime leads the estimate for PNI to drop further. Nevertheless, the final model still demonstrates a statistically significant effect (b-coefficient=1.22) of PNI on health complaints among adolescents in Stockholm.

The ICC, providing information about the between-district variance in health complaints, amounts to a modest 0.29% in the empty model. Thus, in the final model, although statistically significant, the ICC only corresponds to a fraction of the total variance in health complaints (0.16%).
Table 3. Random intercepts model. Beta-coefficients for health complaints, in relation to PNI and controlled for background characteristics (10,291 individuals in 14 neighbourhoods).

<table>
<thead>
<tr>
<th></th>
<th>Empty model</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
<th>Model 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level of PNI</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low (ref)</td>
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<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td></td>
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</tr>
<tr>
<td>2.40 (2.16-2.65)***</td>
<td>1.51 (1.27-1.75)***</td>
<td>1.50 (1.25-1.74)***</td>
<td>1.41 (1.17-1.65)***</td>
<td>1.22 (0.97-1.45)***</td>
<td></td>
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</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Boys (ref)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Girls</td>
<td>3.12 (2.93-3.30)***</td>
<td>3.12 (2.93-3.31)***</td>
<td>3.13 (2.95-3.32)***</td>
<td>3.38 (3.09-3.46)***</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Length of stay in Sweden</strong></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>≥10 years (ref)</td>
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<tr>
<td>0.00</td>
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</tr>
<tr>
<td>&lt;10 years</td>
<td>0.18 (-0.20-0.56)*</td>
<td>0.075 (-0.31-0.46)</td>
<td>0.022 (-0.35-0.40)</td>
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<tr>
<td><strong>Parental university education</strong></td>
<td></td>
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<tr>
<td>Both parents (ref)</td>
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</tr>
<tr>
<td>One parent</td>
<td>0.56 (0.32-0.79)***</td>
<td>0.51 (0.28-0.74)***</td>
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<tr>
<td>None of the parents</td>
<td>0.64 (0.42-0.85)***</td>
<td>0.63 (0.41-0.83)***</td>
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<tr>
<td><strong>Parental unemployment</strong></td>
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<tr>
<td>No parent (ref)</td>
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<tr>
<td>One parent</td>
<td>0.78 (0.40-1.17)***</td>
<td>0.76 (0.35-1.10)***</td>
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<tr>
<td>Both parents</td>
<td>1.42 (0.35-2.49)**</td>
<td>1.30 (0.25-2.35)*</td>
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<tr>
<td><strong>Exposure to crime (yes/no)</strong></td>
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<td></td>
<td></td>
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<tr>
<td>Felt seriously threatened</td>
<td></td>
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</tr>
<tr>
<td>Been robbed</td>
<td>2.09 (1.78-2.41)***</td>
<td></td>
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<tr>
<td>Been assaulted</td>
<td>0.49 (0.05-0.98)*</td>
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<tr>
<td>Forced to have sex/raped</td>
<td>1.06 (0.60-1.52)***</td>
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<tr>
<td><strong>Interaction pni*sex</strong></td>
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<td>-0.72**</td>
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<tr>
<td><strong>ICC</strong></td>
<td>0.29% (0.00-0.01)</td>
<td>0.22% (0.00-0.01)</td>
<td>0.20% (0.00-0.01)</td>
<td>0.21% (0.00-0.01)</td>
<td>0.20% (0.00-0.01)</td>
<td>0.16% (0.00-0.01)</td>
</tr>
</tbody>
</table>

***= p< 0.001, ** = p< 0.01, *= p< 0.05.

* Interaction analyses were run in a separate model
In contrast to the relatively large proportion of PNI that can be ascribed to variations between districts, hence, the average level of health complaints among adolescents does not seem to vary much between different districts in Stockholm. Additional results from cluster- and gender-specific analyses of the association between PNI and health complaints are presented in Figure 4, Appendix 1.

A separate interaction analysis also revealed a statistically significant interaction between PNI and gender, indicating that gender modifies the effect of PNI on health complaints (b= -0.72, Table 3). The coefficient indicates that the association between PNI and health complaints is stronger among boys as compared to girls. Figure 2 illustrates this interaction and shows that compared to the reference group (= boys reporting a low PNI), girls with a low PNI has a health complaint score of 3.22. Among those reporting a high PNI the estimates are 2.20 for boys and 4.52 for girls, compared to the reference group. These results point to stronger health implications of reporting a high degree of PNI for boys than for girls.

![Figure 2](image)

**Figure 2.** Illustration of the interaction between gender and PNI on health complaints. (N=10,291)

**Figure 3** illustrates the association between PNI and psychosomatic health complaints according to the three clusters of districts: outer suburban, southern and inner city. The vertical dotted line corresponds to that in Figure 1, separating the districts with the highest proportions of PNI from those with the lowest proportions of PNI. Adding the horizontal dotted line separates the figure into four squares. The upper right
square correspond to districts in which the effect of PNI on health complaints is strongest. Here, the majority of the southern and inner city districts are represented, i.e. districts in which the proportions of PNI are lowest (see Figure 1). The lower left square consists of districts in which the association between PNI and health complaints is weaker. Here, all the districts in the outer suburban cluster are represented (and one of the southern districts), i.e. districts in which the proportions of PNI are highest. Consequently, districts with relatively low proportions of adolescents reporting a high PNI generally display a stronger association between PNI and health complaints, and vice versa. Health complaint scores across districts ranges from 1.34 to 3.88.

![Figure 3. Linear regression analysis. Effect of PNI on health complaints, by districts within Stockholm municipality (N=10,291).](image)

**Figure 4.** finally, illustrates how the pattern found in Figure 3 differs between girls and boys. For ease of presentation, results are given per cluster of districts. Here too, the association between PNI and health complaints is stronger in neighbourhoods perceived as relatively safe, as the southern and inner city districts. Furthermore, the association is consistently more pronounced among boys compared to girls, as previously illustrated in Figure 2. The difference between the sexes is smallest in the cluster perceived as least safe, the outer suburban, and largest in the southern cluster.
**Figure 4.** Random intercepts model. Gender-specific beta-coefficients for psychosomatic health complaints according to PNI, within clusters of Stockholm municipality (10,291 individuals in 14 neighbourhoods).
Discussion

The purpose of this study was to examine the distribution of adolescents’ perceived neighbourhood insecurity (PNI) across districts of Stockholm, and its possible association to health complaints. It also aimed to investigate whether any such association could be accounted for by family socio-economic position, length of stay in Sweden or previous exposure to crime. Furthermore, a special focus was placed on gendered differences in PNI and health.

Research question 1a concerned differences in PNI between districts of Stockholm municipality. Results showed that the amount of adolescents reporting a high PNI varied considerably between the 14 studied districts (ranging between 14.8% to 44.7% for girls and from 2.9% to 16.9% for boys). Differences in PNI among adolescents were shown to correspond closely with the districts’ socio-demographic composition.

Thus, even in the capital city of an egalitarian country like present-day Sweden, just as in the 1940’s Chicago, substantial differences in perceptions of safety seem to exist across districts. Shaw and McKay (1942) hypothesized that districts characterised by low socio-economic status and ethnic heterogeneity would be hampered in their neighbourhood social order, and consequently neighbourhood safety. A related theory, put forward decades later by Sampson et al (1997) - the theory of collective efficacy – also argued that socio-economic status and ethnicity were of importance for perceptions of neighbourhood security. These two stratification processes were seen as determinants of a neighbourhood’s amount of informal social control and social cohesion, which in low amounts can hamper possibilities for residents’ to create a safe environment.

In accordance with the above theories, this study showed that districts with the largest amount of social deprivation (Sandahl, 2010) and immigrants (Stockholms stad, 2015b) also displayed the highest levels of adolescent PNI. Socio-economic position has been established as one of the main determinants of PNI (Baum et al., 2009; Diez Roux, 2001) and results from the present study are in line with the notion that PNI can be seen as contributing, or at least corresponding, to social inequalities. Even though
this study was restricted to adolescents, previous local studies of the adult population in Stockholm have found similar results regarding perceptions of “unsafe” versus “safe” districts (Stockholms Stad, 2015a).

Research question 1b asked whether any between-district variation in adolescents’ PNI could be fully or partly ‘explained’ by their family socioeconomic position, length of stay in Sweden or previous exposure to crime. Results showed that while there was an association between all these background characteristics and PNI, they only ‘explained’ a minor part of the variation in PNI across districts. The ICC (intraclass correlation) decreased from 7.2% in the empty model to 6.3% in the fully adjusted model. It thus seems like a “contextual effect” (i.e. due to differences in neighbourhood characteristics) remains even when “compositional” characteristics were adjusted for. The results are comparable with a multilevel population-based study set in Malmö in Sweden (among ages 20-80), in which an ICC of 8.5% was found for ‘sense of neighbourhood security’, adjusted for individual age and sex composition (Lindström, Merlo, & Östergren, 2003). Without having tested the level of social cohesion and informal social control across districts in this study, a reasonable assumption is nevertheless that these aspects are central components of this remaining contextual effect.

Research question 1c explored individual- and district-level differences in PNI according to gender. Results showed that girls had almost four times higher odds of suffering from a high PNI compared to boys, in the fully adjusted model. This “gender gap” was seen across all districts with female gender being the strongest individual predictor of PNI. This is in agreement with arguments put forward by e.g. Pain (1991) and Ferraro (1996).

Regarding gender differences across clusters of districts with different socio-demographic profiles, an interesting finding was that while the absolute differences in PNI between clusters were considerably higher among girls, the relative differences were larger among boys. Furthermore, even though the absolute differences in PNI decreased, the relative gender differences in PNI increased, as the overall perceived safety in the districts increased. For rare outcomes, small absolute differences will have a larger impact on the relative differences than it has for more common
outcomes. In this case, PNI is undoubtedly rare in the cluster perceived as most safe (especially among boys where it is under 5%), and thus relative differences become larger in these districts.

How can the larger relative gender differences in PNI in “safer” districts be understood? Perhaps girls in the “safe” districts have reached the lowest frequency of PNI possible, as seen through gender theory and the previously mentioned ‘continuum of violence’ framework (Koskela & Pain, 2000; Pain, 2000). Gender theorists have argued that due to the fear of varying degrees of sexual harassment or violence, girls are socialized - in a gendered ideology (Hirdman, 1988) - into being apprehensive and fearful in public space – more or less regardless of location (Pain, 1991). As boys generally do not experience the same structural obstacle as girls – i.e. the threat of sexual violence - their PNI can reach very low levels, given that the contextual characteristics of the district are favourable. This results in larger relative gender differences in “safer” districts – even though girls’ PNI also is considerably lower in these districts compared with in more “unsafe” districts.

By experiencing and reporting neighbourhood insecurity, girls perform an example of a gendered practice, which seem to be less place-dependent than boys’ PNI. Thus, girls’ fears in public space can, through gendered ideologies and practices, be seen as contributing to the maintenance of the gender order, or patriarchy (Pain, 1991; Valentine, 1989). Contrary to what is suggested in the “fear-risk-paradox” (i.e. that women, even though less often falling victims of crime, report more PNI) girls’ elevated levels of PNI are thus not surprising or unexpected. It can, as previously discussed, be explained by the fear and underreporting of sexual crime and by unequal gender relations. Another gendered practice and consequence of the elevated amount of PNI is girls refraining from going outside due to PNI. It has been demonstrated as more common among girls and women in earlier studies (Valentine, 1989) and was confirmed also in this study (data not shown).

Research question 2a addressed the association between adolescents’ PNI and health complaints. Results revealed substantially poorer health among those suffering from a high level of PNI. Similar results have also been shown in previous studies for outcomes such as anxiety (Middleton, 1998), poor sleep quality (Hale et al., 2013;
Stockholms stad, 2015b) and poor self-rated health (Chandola, 2001; Hale, 1996). For adolescents in particular, cues of neighbourhood social disorder have been found to be positively associated with depression and anxiety (Aneshensel & Sucoff, 1996). It is reasonable to assume that perceptions of one’s neighbourhood as safe can have positive health effects in multiple ways. Such an association could operate both through the direct health effects that neighbourhood-related anxiety, troubled sleep or worry about crime can bring about, and through indirect health effects, such as opportunities for physical activity by usage of common recreational areas. Collective outcomes, such as a districts’ social cohesion, have in previous studies been found to be higher in districts perceived as safe, and also positively associated to physical health (Browning & Cagney, 2002). A safe district creates opportunities to participate in common activities and facilitates meetings between its residents, possibly further strengthening the districts’ social cohesion and social ties.

The difference between districts in average health complaints was very low, although statistically significant. This might be due to methodological reasons, like too few or too large units of observation at the second level. Smaller units usually give rise to larger between-group variation in the outcome of interest. It could also be due to flaws of the index of health complaints. Outcomes such a headache and stomach-ache is relatively common among adolescents (Statens folkhälsoinstitut, 2011) and might not express health differences across districts as evidently as for instance a one-item question on self-rated health or an estimate of life expectancy does. Previous studies imply rather large differences in both self-rated health and life expectancy between districts of Stockholm, and also that the health distribution seem to follow a social gradient (Stockholms stad, 2015b). A multilevel study based on a Malmö sample, found far larger variances in self-reported health across districts than the present study (ICC=2.8%). However, these differences were mainly attributable to individual characteristics rather than contextual neighbourhood characteristics (Lindström et al., 2004).

Research question 2b asked whether any association between PNI and health complaints could be accounted for by family socio-economic position, length of stay in Sweden or previous exposure to crime. Controlling for these background characteristics, the association diminished, but a statistically significant association
between PNI and health complaints remained (beta-coefficient=1.22). As previous studies have reported socio-economic status to be of importance not only for PNI, but also for health (Pickett & Pearl, 2001), this finding was expected.

Research question (2c) addressed gender differences in the association between PNI and psychosomatic health complaints. It is well known that girls report more PNI as well as health complaints compared to boys. But this does not necessarily mean that the association between PNI and health is stronger among girls than boys. In order to examine gender differences in the association between PNI and health complaints, an interaction analysis was performed. Results pointed to a significant interaction between gender and PNI on adolescents’ health complaints, showing a stronger association among boys than girls.

This finding makes sense when looked upon through a hegemonic masculinity-lens. Since there is a 3.5 times higher likelihood for girls to report a high PNI, doing so as a girl is less of a norm-breaking behaviour than it is among boys. Therefore girls might have “adjusted” to being insecure in a different way than boys, thus merely reporting what is “expected” of them. For boys, on the other hand, reporting a high PNI is more of a norm-breaking statement, thus contradicting prevailing norms set out by within the hegemonic masculinity. Constituting only 10% of the sample in this study, boys who reported a high PNI might be extraordinarily vulnerable due to e.g. some kind of norm-breaking identity or position, which could explain their heightened level of health complaints.

An example of such a norm-breaking identity is homosexuality. There is evidence for that homosexual boys are victimized to a larger extent than heterosexual boys (Pain, 2000) and homosexual adolescents have in many studies been found to have worse health than the majority population (Winzer & Boström, 2007). A Swedish study found that victimized gay men reported the same amount of fear as victimized lesbian women, and among non-victims of violent crime, men actually reported more fear than women (Tiby, 2000).

Not only homosexual boys might have been exposed to crime. Among all types of crime, except from having been forced to have sex/raped, boys were more commonly
victimized than girls (data not shown), in line with previous studies (Courtenay, 2003). It was therefore expected that part of the elevated health effect of PNI on boys operate through previous exposure to crime. However, gender-separate analysis indicated that all exposures, except for having been forced to have sex/raped, were more strongly associated with health complaints among girls than boys (data not shown). Furthermore, controlling for previous exposure to crime in gender-separate analysis, it became clear that the association between PNI and health diminished slightly more for girls than for boys. Considering the stigmatized character of rape – and even more so for boys as they are not seen as the “usual” victims of sexual crimes – this is not surprising. But boys carrying these experiences were very few in this study and therefore not likely to alone explain the heightened health effects from PNI compared to girls.

Those who reported having been assaulted - more commonly boys than girls (data not shown) – had a negative likelihood of reporting PNI, in contrast to every other exposure to crime where the likelihood for reporting PNI was heightened. Perhaps boys with these experiences are risk-takers following traditional masculine ideals and therefore not likely to be the ones experiencing (or admitting to experiencing) PNI. It is also possible that they spend a lot of time outdoors in their neighbourhood, putting themselves at an increased risk of crime like assault, while at the same time decreasing their amount of PNI. Such a pattern has been found in previous studies (Ferraro, 1996).

Research question 3a addressed the variation across districts in the association between PNI and health complaints. Results showed that the association between PNI and health complaints were stronger in districts perceived as relatively safe and weaker in districts perceived as less safe. Living in a district with a reputation of being unsafe, and where the norm more or less is to report a certain amount of PNI, one does not “stick out” in doing so. Reporting a high PNI in a “safe” district, on the other hand, might be seen as a marker of individual vulnerability, whether it is socially structured (e.g. being relatively deprived economically in comparison to peers within your neighbourhood) or based on individual traits or experiences (as previous exposure to crime). Some of the districts perceived as safe have large spans in their socio-economic composition (Stockholms Stad, 2015b), possibly leading to
feelings of relative deprivation among those worst off economically. These vulnerabilities might have health implications to start with, leading to a reversed causality between PNI and health complaints. In short, being insecure in a neighbourhood where most people are secure will probably generate and/or reflect larger health problems than being insecure in a district where this is the norm.

The final research question, 3b, concerned potentially gendered differences in the association between PNI and health complaints between advantaged and disadvantaged clusters of districts. The association was consistently stronger among boys than girls (as discussed under question 2c). The smallest gender differences were found in districts perceived as least safe and the greatest gender differences were found in districts perceived as relatively safe. In districts where is it more of a norm to report PNI, boys and girls thus seem to be more equally affected health-wise, whereas in districts perceived as safer, boys’ health is considerably more affected than girls’ from having a high PNI. Relating this to the previously discussed findings of the present study – i.e. health complaints being heightened in “safer” districts and among boys – this pattern was expected. When examining both district-wise and gendered differences simultaneously, even more pronounced “selection effects” of vulnerable adolescents takes place. There is a minority of seemingly extraordinarily vulnerable boys who, contrary to what it is expected of them, are insecure in their neighbourhood. It is not surprising then that they also report heightened levels of health complaints. Further studies of boys in affluent districts reporting a high PNI as well as high levels of health complaints “against all odds”, are warranted in order to determine the more precise mechanisms behind this pattern.

Strengths and limitations of the study

As proposed by e.g. Cops (2013) a more comprehensive measure of PNI than a one-item survey question would have been more ideal, since the phenomena is both situational and dynamic. This is perhaps especially true when making gender comparisons, since men tend to underreport their PNI (Sutton & Farrall, 2005), which might be easier to do if only asked one question. In future research, qualitative studies could be combined with quantitative, to fully capture the complexity of PNI, being a construct embedded in political and social structures.
Regarding the psychosomatic health complaints index, this is not a validated instrument with the capacity of detecting adolescents at risk. However, it contains items that are commonly used in health research. Moreover, the internal reliability of the measure was good (alpha=0.75).

There is furthermore a risk of responding bias when respondents are to define their neighbourhood. The question was posed: “the area where you live” (Sw. område) and respondents can differ in their perceptions of what constitutes their area. It might be considerably more spatially limited than the administratively defined district (Sw. stadsdelsområde) that is used for the analyses in this study. However, mean levels of PNI across districts in this study correspond quite well to other studies (Stockholms Stad, 2015a).

There are also some drawbacks with the study design. One of the hypotheses before embarking on this study was that high levels of PNI would cause more health complaints among adolescents, given the fact that neighbourhood conditions are considered as a social determinant of health (Diez Roux, 2001). But due to the study’s cross-sectional design, possibilities to draw any such causal inferences are limited. However, some independent measures have inbuilt temporal order, like exposure to crime during the last 12 months. Nevertheless, statistically significant associations between PNI and health complaints were found, implying that PNI is a relevant public health issue for adolescents in Stockholm municipality. Furthermore, the present study is, in spite of its cross-sectional design, a total sample-survey comprising the vast majority of all adolescents attending the 11th grade in Stockholm municipality in three succeeding years. The data has very recently been collected, making conclusions drawn up-to-date.

Since data were collected at different time points (2010, 2012 and 2014), neighbourhood characteristics and thus PNI and health complaints could have been changed in-between years, making year of data collection a potential confounder. However, a comparison of estimates from analyses with and without control for year of data collection revealed that the results remained practically the same.
Another issue with the survey - even though it comprises a large amount of all adolescents in Stockholm municipality - is its external and internal attrition. A risk associated with external attrition is that students who did not attend school on the day of the survey could have a worse health status. Therefore the amount of health complaints in the studied sample might be underestimated. Furthermore, the generalizability from this study might be limited due to a rather high internal attrition on the question about parental education. Having adolescents reporting on their parents’ socio-economic status has also been identified as problematic in earlier studies (Currie et al, 1997). The high attrition can be understood when considering the normative manner in which the question is asked: Not all respondents can be expected to have information on both a father and a mother. Some respondents will have homosexual parents, and some will define more than two adults as being their parents. Since Swedish children living with a lone parent report more health complaints (Östberg, Alfvén & Hjern, 2006); it could be that health complaints are underestimated in the present sample of adolescents.

Conclusions

This study has highlighted current patterns of PNI among adolescents in Stockholm and shown that it is linked to health-, gendered and district-wise inequalities. Large differences across districts in their average levels of PNI were found, but only minor between-district differences existed with regard to health complaints. Accordingly, there was not much health disparities between districts to be explained by PNI (or other factors). However, adverse health effects from PNI were clearly visible at an individual level.

PNI can be seen as a complex interplay between an individual’s vulnerability and spatial and social position with potential implications for one’s health status. It is furthermore associated with residential segregation based on ethnic and socioeconomic composition. PNI is more common among marginalized and subordinate groups; whether it is girls, newly arrived Swedes or people living in socially deprived districts. Being restricted by insecurity in one’s neighbourhood can lead to less involvement in the local area, and vice versa. This makes PNI a question
of equal participation and democracy among residents and not merely a health equity issue.

When discussing district-level differences in PNI, broader macro-level aspects must be included. If not considering how political and social policies can affect health and social inequities such as PNI, there is a clear risk for a “blame the neighbourhood” approach, in which certain districts are stigmatized as being unsafe and strengthening their perhaps already bad reputation. It is important to have in mind that perceptions of insecurity might depend more on images and ideas than on actual statistical risk (Madriz, 1997). Research has shown that district-measured PNI might not be reduced in any significant amount through applying narrowly targeted efforts to reduce crime (Schafer, Huebner, & Bynum, 2006). However, by making a neighbourhood more orderly and improving the quality of life for its residents, fears can diminish. This is also suggested within the theories of social disorganization and collective efficacy, as for instance cues of social order are proposed as being of importance for neighbourhood security (Ross & Jang, 2000).

In the same manner, equally narrow efforts to “build away” insecurity by architectural improvements would probably not eradicate gendered differences in PNI. As exemplified earlier, PNI is entrenched in deep-rooted gendered practices according to a gendered ideology. These gendered inequalities are socially structured, but can of course be moderated by individual traits like social position or ethnicity. But generally speaking, girls are to a larger extent than boys socialized into be sensitive of their vulnerability, in both a physical and social sense, thus leading them report more PNI than boys.

On the other hand, for boys who reported a high PNI in this study, health effects were more detrimental than for girls. This is possibly rooted in current norms on masculinity – that boys and men must not admit to any fear or insecurity if they wish to remain within the boundaries of the hegemonic masculinity. There are also possible “selection effects”, in which boys reporting a high PNI are more socially vulnerable or suffer from poor health to begin with. In order to reduce PNI and be able to address its potential health consequences, we must address social and gendered inequities at both a macro- and micro level, and acknowledge potential issues relating to both
constructs of femininity and masculinity. The perhaps most detrimental consequence of the current norms on masculinity - male violence – constitutes a possible threat to both girls and boys.

Even though *relative* gender differences in PNI have been discussed, it can be argued that for a policymaker, the *absolute* levels of PNI found in this study are of most relevance. I would therefore propose efforts towards the less affluent districts in order to reduce PNI, even if health effects from PNI were smaller in these districts. Health effects from PNI in more affluent districts can perhaps be attributed to feelings of relative deprivation and individual traits and identities – rather than to neighbourhood characteristics. However problematic it may be, it is less of a problem in a public health perspective, as the amount of PNI are comparably low in these districts. Also, PNI might lead to additional negative health consequences than those measured in this study. So, if aiming to improve feelings of safety among the whole population of adolescents in Stockholm, one should focus on the less affluent areas.

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References


**Appendix 1.** Gender-specific distribution of PNI and health complaints per cluster of districts, and average PNI for the whole cluster (N= 10,291).

<table>
<thead>
<tr>
<th></th>
<th>Boys</th>
<th></th>
<th>Girls</th>
<th></th>
<th>Average PNI</th>
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<tbody>
<tr>
<td></td>
<td>PNI</td>
<td>Health complaints</td>
<td>PNI</td>
<td>Health complaints</td>
<td></td>
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<td>Outer suburban districts</td>
<td>14.9%</td>
<td>8.58</td>
<td>37.3%</td>
<td>11.48</td>
<td>26.6 %</td>
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<tr>
<td>Southern districts</td>
<td>8.74%</td>
<td>8.39</td>
<td>24.1%</td>
<td>12.12</td>
<td>16.7%</td>
</tr>
<tr>
<td>Inner city districts</td>
<td>3.59%</td>
<td>8.13</td>
<td>15.42%</td>
<td>11.28</td>
<td>9.7 %</td>
</tr>
</tbody>
</table>