

How Much Variance in Offending, Self-Control and Morality can be Explained by Neighbourhoods and Schools? An Exploratory Cross-Classified Multi-Level Analysis

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Abstract Criminological studies of contextual effects on adolescent offending have focused either on residential areas (considering effects of characteristics like disadvantage and collective efficacy) or on school characteristics (studying effects of organisation and social climate, for example). However, adolescents are simultaneously exposed to multiple contexts, and the influence of these contexts on their lives should be studied simultaneously rather than separately. The principal subject of this contribution lies in analysing to which extent there is unique neighbourhood level variation and unique school level variation in adolescent offending, and in two major and stable correlates of adolescent offending, morality and low self-control. Data are used from the Study of Peers, Activities and Neighbourhoods (SPAN), with 612 adolescents in various schools and neighbourhoods in the Netherlands. The results show that there is no unique neighbourhood level variance anymore after controlling for unique school level variance, while some variation at the school level still remains with regard to self-control and morality.

Keywords Adolescent offending · Contextual effects · Multilevel analysis · Neighbourhoods · Schools · Social ecology · Variance components

Introduction and Research Problem

The notion that characteristics of a context can be related to behaviour and attitudes of individuals through processes of socialisation or informal control is deeply rooted in criminology. Traditionally, criminologists have paid most attention to neighbourhoods as collective structures and how they can influence informal control on the commission of offences (Peeples and Loeber 1994, Shaw and McKay 1942; Tolan et al. 2003; Sampson 2012; Zimmerman and

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Messner 2010). Over time, the social disorganisation/collective efficacy perspective (Sampson 1997; Bruinsma et al. 2013) proposed several mechanisms to link neighbourhood structural settings with collective and individual differences in offending. So-called ‘ecological’ studies have consistently shown that neighbourhood structural characteristics and collective and individual offending rates are related (Veysey and Messner 1999; Lowenkamp et al. 2003; Sampson and Groves 1989; Wikström 1991). This line of research has been strongly stimulated by statistical innovations, in particular advancements in multilevel analysis, a technique that can statistically differentiate between hierarchically nested levels of aggregation, and estimate how much variation in offending is actually explained by individual differences and how much by contextual differences (Sampson 2002; Oberwittler 2004).

Since the beginning of the 1990s increasing attention has been paid to the theoretical integration of individual characteristics and ecological settings in the explanation of offending (e.g. Farrington et al. 1993; Wikström 2004). It is often assumed that the effects of neighbourhood disadvantage are mediated by parental control, morality and self-control. Especially morality and self-control have previously been shown to vary significantly between neighbourhoods in U.S. based studies (Oberwittler et al. 2013; Sampson 1997; Lynam et al. 2000; Pratt et al. 2004; Zimmerman 2010).

Next to, and usually apart from neighbourhoods, schools have also been investigated as a very important collective structure in the lives of adolescents. School structural and organisational characteristics together with school social climate are often included in sociological and educational studies of negative outcomes such as unsatisfactory exam results (Brännström 2006; Brännström 2007; Goldstein et al. 1993; Goldstein and Sammons 1997), school failure (Van Houtte 2004), psychological well-being (DeFraigne et al. 2005) bullying (Bradshaw et al. 2009; school misbehaviour (Agirdag et al. 2011; Demanet and Van Houtte 2011).

In criminology, the study of the school context of offending behaviour is an established research area, evolved as tradition on its own, with only few links to the literature on social disorganisation/collective efficacy (Birnbaum et al. 2003; Felson et al. 1994; Payne et al. 2003; Gottfredson, 2001) or a subcultural tradition (Ousey and Wilcox 2005). Various studies found school level variation in measures of self-reported offending to be independent of individual demographic background variables (Bernburg and Thorlindsson 2005; Boxford 2006; Lindström 1995; Payne 2008).

The school contextual research tradition in criminology mainly “borrowed” concepts from the neighbourhood (disorganisation) tradition, but did not investigate simultaneously the effects of each ecological setting on offending. With only a few exceptions (e.g. Oberwittler 2007, Pauwels 2011), almost all previous multilevel studies of offending have focused on only one ecological setting, either the neighbourhood context or the school context. The distinct development of both research traditions is unfortunate for theoretical and methodological reasons. Theoretically, the separate study of the school context and the neighbourhood context does not adequately represent the situation of many adolescents in contemporary society, which is characterised by high levels of geographic mobility over neighbourhoods, and attendance to schools that may be located in other neighbourhoods than the areas of residence. Methodologically, the separate study of the neighbourhood context in traditional ecological studies implies inadequate control for important and possibly confounding effects of other ecological contexts, in particular the school. The same argument applies for school-based contextual models that do not take neighbourhoods into account.

In this study, we challenge the separate study of neighbourhoods and schools as analytically separate ecological units, but instead investigate whether they each have unique contributions to the explanation of individual differences in offending.

The present study answers three research questions:

(1) “How much of the variance in offending and two strong predictors is situated at the neighbourhood level?” (2) “How much of the variance in offending and two strong predictors

is situated at the neighbourhood level when the school context is simultaneously taken into account?” (3) “How much of the variance in offending and two strong predictors can be uniquely ascribed to the neighbourhood level and the school level when demographic background characteristics are taken into account?”

We have chosen to study three measures of offending, overall offending as well as violent and serious offending, because previous studies have suggested that contextual effects are strongest for violent and serious offending. Our study additionally focuses on morality and self-control, which are stable correlates of offending. Both morality and self-control are of major importance in contemporary theories of offending. In particular, Wikström’s recently developed Situational Action Theory (Wikström et al. 2012) stresses the major role of morality and self-control (and their interaction) in the explanation of offending. Previous research has shown that neighbourhood characteristics are related to levels of morality and self-control (Sampson 1997; Lynam et al. 2000; Pratt et al. 2004; Zimmerman 2010), and some studies suggest that morality and self-control may act as mediators of contextual effects on offending (Lynam et al. 2000). However, these studies did not simultaneously take the school context into account. Therefore we lack insight into the amount of variance in morality and self-control that can be uniquely situated at the neighbourhood and school level. In sum, in this study we focus on self-reported offending and two of its most stable predictors, morality and self-control. The aim is to disentangle school level and neighbourhood level variation.

Sample

The Study of Peers, Activities and Neighbourhoods (SPAN), conducted by the NSCR in the Netherlands, investigates the associations between offending, individual characteristics, contextual influences and activity patterns. Forty secondary schools in the city of The Hague and its suburbs were approached to co-operate in the study; ten of these schools (about one fourth) responded affirmatively. Because there was interest in age differences, the study was conducted among secondary school 1st graders (mainly age 12 and 13) and 4th graders (age 15 and 16). Parents were informed about the study and could refuse participation (passive consent).

Overall 843 adolescents (55 % boys and 45 % girls) in the age range between 11 and 18 years participated fully in the study. The sample includes a relative high portion of ethnic minority adolescents (47 %), who are often underrepresented in criminological and other surveys. Many adolescents come from lower forms of secondary education (see the Appendix for more information about the Dutch school system): 18.5 % from schools for ‘practical education’, the lowest level of secondary education, 53.3 % from schools for pre-vocational education (the most common form of secondary education), 9.6 % from higher general secondary (or pre-college) education, and 18.6 % from pre-university schools, the highest level of secondary education. As the sample was drawn from a non-random selection in schools in The Hague, it is not a representative sample of the youth living in the Hague, but it is highly diverse in terms of ethnicity and education, with an overrepresentation of lower educated youths from a highly urbanised region of the Netherlands. This overrepresentation is not a problem for our analysis, since we are less interested in representative descriptives of the population of youth, but more in comparing school and neighbourhood contextual effects.

The study was carried out between October 2008 and April 2009 and included a survey among secondary school students. A questionnaire was administered in groups of four adolescents, supervised by one research assistant during a school hour of about 45–50 minutes. This relatively intensive procedure assured that adolescents were closely monitored, supported and stimulated, and that any questions or concerns that they had about the questionnaire could

be addressed immediately. After completion, respondents received an incentive for their participation (a voucher for the movies, worth €5). Interviewer variance between the research assistants was estimated by the frequency of self-reported crimes and appeared to be almost zero (interviewer variance .253 with an error of 37.48). The questionnaire items had relatively low non response and missing values (with a maximum of 2 %). The questionnaire is based on the questionnaire of the PADS+study (Peterborough Adolescent and Young Adult Development Study) of Wikström and colleagues (e.g. Wikström and Butterworth 2006; Wikström et al., 2012). The items from this questionnaire were translated, extended with additional measurements, and when necessary adjusted to the Dutch situation.

For the present study, all schools were included. Neighbourhoods were only included if at least five respondents lived in the neighbourhood (although due to missing values on descriptives, one neighbourhood appeared to have four respondents). This selection resulted in an effective sample of data on 612 adolescents, clustered in 65 The Hague neighbourhoods and ten schools. While the number of neighbourhoods exceeds the number of schools in the present study, it is perfectly possible to employ the obtained variance components with cross-classified multilevel models, which can handle this imbalance when estimating variance components (Hox and Roberts 2011).

Measurement of Constructs

Total offending is a general scale of adolescent offending that measures a combination of serious and common offences, several kinds of violent behaviour and selling of drugs. It is a general frequency scale that is based on the respondents answers on 11 delinquency items that measure how often in the last year they have ‘damaged or destroyed something not belonging to you (for example, smashed windows or street lights, scratched the paint of cars, sprayed graffiti on a wall, damaged a bicycle or something else)’, ‘set fire to something you were not supposed to set fire to (for example in a building, a house, a bus or car)’, ‘stolen something from a shop that was worth less than 5 euro, for example candy, a pen or something else’, ‘stolen something from a shop that was worth more than 5 euro, for example clothes, DVDs or something else’, ‘broken into a house to steal something’, ‘broken into a car to steal something’, ‘broken in somewhere else to steal something (for example in a shop, at school, in a company)’, ‘robbed someone’, ‘stolen anything from another person (for example, money, a mobile telephone, a bicycle, a wallet or a purse, a hand-bag, jewellery, a watch)’, ‘beaten up a stranger on the streets’, and ‘carried a knife or other weapon’. The scale includes both minor offences and serious offending. Alpha is 0.82. This scale is directly adapted from the PADS+ questionnaire.

Serious offending includes five items, asking how often during the past year the respondent have: ‘broken into a house to steal something’, ‘broken into a car to steal something’, ‘broken into another place to steal something (for example a shop, a school, a business)’, ‘robbed someone’, and ‘covertly took away a purse, wallet, cell phone or something else from someone’. Alpha is .87.

Violent offending includes five items, asking how often during the past year the respondent have: ‘threatened someone to scare that person or make him or her do something’, ‘kicked or hit somebody on the street (we do NOT mean play and horsing around)’, ‘kicked or hit somebody that got injured as a result’, ‘carried a knife or other weapon’, and ‘used a knife or other weapon’. Alpha is .81.

Morality measures the adolescent’s level of tolerance towards moral rule breaking. High scores indicate high tolerance and low morality. The construct is an additive index of the

respondent's evaluation of 16 situations of potential wrong-doing. Respondents were asked to indicate how wrong it is to 'ride a bike through red light,' 'skip doing homework for school,' 'skip school or work without an excuse,' 'lie, disobey or talk back to teachers,' 'go skateboarding in a place where skateboarding is not allowed,' 'tease a classmate because of the way he or she dresses,' 'smoke cigarettes,' 'get drunk with friends on a Friday evening,' 'hit another young person who makes a rude comment,' 'steal a pencil from a classmate,' 'paint graffiti on a house wall,' 'smash a street light for fun,' 'smoke cannabis,' 'steal a CD from a shop,' 'break into or try to break into a building to steal something,' 'use a weapon or force to get money or things from another young person.' Alpha is 0.91.

Self-control is a summary construct of one's level of self-control, a latent construct of individual traits including impulsivity, insensitivity, risk-taking and short-sightedness that is assumed to have a tendency to come together in the same people (Gottfredson and Hirschi, 1990). The scale is an additive index based on the scale that was developed by Grasmick et al. (1993), but shortened in PADS to a more concise index of ten items that measure impulsivity, risk-taking behaviour and impulsivity. We reversed the scale so that high scores indicates high levels of self-control. The items are: 'I always say what I think, even if it is not nice or smart', 'If I want something, I do it immediately', 'When I have an argument with someone, I can talk calmly about it', 'I lose my temper easily', 'When I am really angry, other people better stay away from me', 'I sometimes find it exciting to do things that may be dangerous', 'I often try to avoid things that I know will be difficult', 'I get bored easily', 'I often do things without thinking of the consequences', and 'Sometimes I will take a risk just for the fun of it'. Alpha is 0.75.

Descriptive statistics of all variables used in this study are reported in Table 1.

Analytical Strategy: Variance Components in non-Hierarchical Multilevel Models

Multilevel modelling makes it possible to distinguish true contextual effects from compositional effects. The effect of a variable at the lower level (usually the individual level), is called the compositional effect. The effect of a variable at the higher level (e.g. at the neighbourhood level), independently from the compositional effects, is called the true contextual effect. Multilevel modelling (also referred to as hierarchical random coefficient modelling) have been widely used in the social sciences and also in the field of criminology (Raudenbush et al. 2003; Sampson et al. 2005; Zimmerman 2010). Usually they have two-level nested structures (e.g.

Table 1 Descriptive statistics

Variable	Valid N	Mean	S.D.	Minimum	Maximum
Age	619	14.09	1.71	11	18
Female	637	.45	.50	0	1
Immigrant background	630	.50	.50	0	1
Nontraditional family structure	637	.40	.49	0	1
Total offending	637	6.37	10.58	0	100
Serious offending	637	.36	1.88	0	25
Violent offending	637	2.40	4.23	0	25
Self-control	637	29.53	6.26	10	45
Morality	637	33.26	9.49	16	64

individuals nested in neighbourhoods), but they also can have three-level nested models (e.g. individuals in neighbourhoods in cities).

It is also possible to include two different contexts (e.g. the neighbourhood and the school) at the same hierarchical level. This is called cross-nested multilevel modelling or cross-classified multilevel modelling. This type of analysis differs from the traditional hierarchically nested models with respect to the data structure, which is not hierarchically nested.

In this study, we depart from a two-level non-hierarchical structure in which adolescents are classified by their area of residence and by their school at the same hierarchical level. If every pupil would attend a school in the neighbourhood he or she lives, then a three-level hierarchical model would be sufficient to study variation at higher levels (pupils in schools in neighbourhoods). However, in countries like Germany, the Netherlands and Belgium, the school one attends is not determined by the neighbourhood of residence (Pauwels et al 2010; Oberwittler 2007). This means that, like in Fig. 1, the nesting of individuals in neighbourhoods differs from the nesting in schools. Some adolescents live in different areas, but attend the same school (e.g. A1 and A2 in Fig. 1), while others live in the same area, but attend different schools (e.g. A1 and A5). Therefore cross-classified models are the preferred tool to study contextual effects of neighbourhoods and schools on offending. As the number of observations at the school level is rather small, bootstrapping (by sampling from the set of ten schools) was used to obtain estimates and correct standard errors of the estimates. Bootstrapping is increasingly used in quantitative studies, also in the field of criminology. The bootstrap does not rely on a theoretical sampling distribution as in statistical significance testing. Rather, the constant resampling with replacement allows the bootstrap method to develop an empirical distribution for a given sample statistic that provides the framework for computing the averages, standard errors, and confidence intervals (Higgins 2005). This method is especially useful when sample size is low (Hox and Roberts 2011), as was the case with our sample of 10 schools.

Non-hierarchical multilevel models have been applied sparsely in sociology (Brännström 2007; Kauppinen 2008; Goldstein 1994; Goldstein and Sammons 1997; Rasbah and Goldstein 1994). A sociological study, conducted by Brännström (2007), revealed that neighbourhood effects on school achievements may operate through the school context. Applications within the field of criminology are very scarce. Oberwittler (2007) simultaneously assessed the neighbourhood and school contexts of offending. He found evidence for the existence of contextual effects on the frequency of serious offending in both settings. Welsh et al. (1999) found that both the neighbourhood and the school level added to the explanation of variance in school disorder, though not much in comparison to individual differences. Pauwels (2012) estimated cross-classified models in a series of tests of social disorganisation theory and found that concentrated disadvantage at the school level had independent effects on a measure of serious offending, while neighbourhood disadvantage did not affect individual differences in serious offending at all.

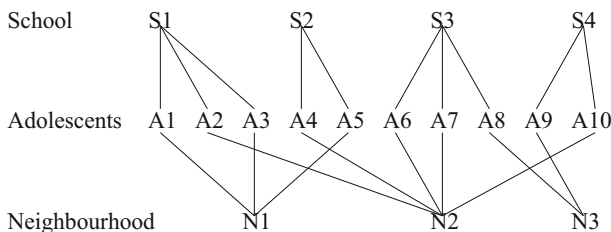


Fig. 1 Cross-classification of adolescents in neighbourhoods and schools

The aforementioned studies suggested that failure to account for a “competing ecological setting” might lead to misleading results. Neighbourhood-level variance may be overestimated because part of the observed neighbourhood-level variance is actually due to unmeasured school-level variance. Schools also need to be included because the clustering of adolescents in schools may cause flaws in standard errors if the school level structure is not taken into account. In other words, if we would not recognise that there are school effects together with neighbourhood effects on adolescent outcomes, we would be dealing with what is called an “underspecified model” (Oberwittler 2007).

To investigate how much of the variance in offending can be explained at the neighbourhood and the school level, we use the analytical strategy of variance decomposition. This method partitions the explained variance of a dependent variable (in the current study offending, morality and low self-control) into individual variance and variance on a higher level (in the current study the neighbourhood level as well as the school level). This enables us to identify the different sources of variation: variation may occur due to individual differences, unique school level differences and unique neighbourhood level differences. These sources of variation are usually referred to as components of variance. They are estimated by the Intra-Class Correlation Coefficients (ICC) for both the neighbourhood and the school context. ICC's are used when there is a number of individuals that are clustered in higher level units. Let us suppose that we have individuals who are clustered in neighbourhoods, and we are interested in knowing what level of shared variance we see between our neighbourhoods, apart from the variance between individuals. Then, the ICC is the proportion of the total variance within our data that is due to the between neighbourhood variance.

Variance components are very important in multi-level modelling. They are particularly helpful to simultaneously estimate similarities between adolescents based on different school-neighbourhood combinations (Goldstein 1994). Therefore, in this paper, we focus primarily on a comparison between variance components of the neighbourhood and the school context, to explore the potential contribution of each and to illustrate the importance of including both contexts in research. It should be noted that variance components only tell one part of the story. The other big issue in multilevel modelling is the issue of statistically explaining the variance at the higher level by higher level characteristics. A common theme in sociology and criminology is the issue of segregation and concentrated disadvantage. Variance decomposition usually leads to the detection of small, but substantial between neighbourhood variation. Structural neighbourhood characteristics usually explain a large proportion of the neighbourhood variance. The fact that neighbourhood level variances are small has raised the question of the added value of neighbourhood contextual studies. We believe this reasoning is wrong, as most contemporary studies point to complex relationships between neighbourhood characteristics and negative outcomes such as offending: the effect has been found to be indirect and some studies have pointed to the conditional effect of neighbourhood characteristics. A key example is the amplification effect of neighbourhood disorder: neighbourhood disorder is related to offending among adolescents that already have a risky lifestyle (Pauwels 2010). Sometimes gendered effects are found (Kling et al. 2005).

Variance components were computed for three multilevel models. First, the amount of variance in adolescent offending and the two key correlates of offending are estimated for empty random intercept models of only neighbourhood effects ('empty' indicating that no covariates are included). Second, we take into account unobserved school level variation and see to what extent the neighbourhood variance in offending and the two causal variables is reduced. Third, we repeat the second step, but control for compositional effects. We control for age, gender, immigrant status and family structure at the individual level. Following this methodology enables us to investigate how variance components at the neighbourhood level

are affected by not taking into account the clustering of adolescents in schools and the student composition within schools.

The standard procedure in HLM 6.8 was used to estimate the variance components.

Results

In Table 2, we present the findings of an empty random intercept model, which estimates how much variance can be found at the individual level and how much at the contextual level of the neighbourhood only. The results of this variance partitioning exercise reveal that for all variables a small proportion of the total variance is situated at the neighbourhood level. The ICC values are 0 % for total offending, 0 % for serious offending, 2 % for violent offending, 1 % for self-control and 6 % for morality. In general, in comparison to other previously mentioned contextual studies in Western Europe, these effects are rather small. No ICC value exceeds 10 %. The ICCs are only significant for violent offending, self-control and morality. The ICC values are reported in column 3. The reader should note that these are variance components that only reflect neighbourhood differences. These results have not been adjusted for compositional effects and unmeasured school level clustering.

In Table 3 step we take a closer look at the unconditional neighbourhood variance while simultaneously taking into account the clustering of adolescents in schools. In Table 3, we present different parameters that identify unique variation in neighbourhoods and schools. The intra-neighbourhood component is the intraclass coefficient that refers to adolescents who live in the same area but attend different schools, and therefore provides information about neighbourhood-level variance that is free from school-level variance. The intra-school component refers to adolescents who attend the same school but live in different areas, and therefore provides information about school-level variance that is free from neighbourhood-level variance.

Table 3 reveals that when simultaneously taking into account the clustering of adolescents in neighbourhoods and schools, the unique neighbourhood level variance seriously decreases and the unique school level variance exceeds the unique neighbourhood level variance. In fact, the unique neighbourhood level variance is no longer significant for any of the variables under scrutiny. That means that, even without controlling for compositional effects, the variance at the neighbourhood level that was found to be significant in random intercept models is completely insignificant when taking into account the school of attendance. Unique school variance still exists independent from individual variance for the following variables: violent offending, self-control and morality. The latter two are better explained by the school level

Table 2 Variance decomposition and ICC values in empty random intercept models. Respondent N=637, neighbourhood N=65. Respondents per neighbourhood: mean=9.8, minimum=5, maximum=24

Variable	Neighbourhood level variance		Residual variance level 1		ICC neighbourhood
	Variance	Bootstrapped SE	Variance	Bootstrapped SE	
Total offending	0.00	0.00	111.98	28.33	0.00
Serious offending	0.00	0.00	3.55	1.95	0.00
Violent offending	0.44	0.29	17.48	3.62	0.02
Self-control	0.24	0.20	38.97	4.04	0.01
Morality	5.76	2.79	83.78	7.37	0.06

Table 3 Variance decomposition (variances and bootstrapped standard errors) and ICC values in cross-classified empty models. Respondent N=637, neighbourhood N=65, school N=10. Respondents per neighbourhood: mean=9.8, minimum=5, maximum=24. Respondents per school: mean=63.7, minimum=3, maximum=146

Variable	Unique neighbourhood level variance		Residual variance level 1		Unique school level variance		ICC neighbourhood	ICC school
	Var	SE	Var	SE	Var	SE		
Total offending	0.00	0.00	110.26	24.67	2.17	37.21	0.00	0.01
Serious offending	0.00	0.00	3.51	2.04	0.05	0.66	0.00	0.01
Violent offending	0.00	0.00	17.31	4.92	0.82	14.68	0.00	0.05
Self-control	0.00	0.00	37.46	2.97	2.34	20.65	0.00	0.06
Morality	2.50	5.21	80.32	10.19	8.07	3.43	0.03	0.09

(ICC of 0.06 and 0.09) than the first. Comparing these findings to the earlier findings presented in Table 1, where we did not adjust for school level variance, provides a clear image: not taking into account unmeasured school effects is bound to lead to an overestimation of the unique neighbourhood effect. However, only the unique school level ICC of morality is statistically significant. While school-level variation in self-control exists, we are very careful in interpreting this finding as the bootstrapped results are affected by the few number of schools. Ideally, this study should be replicated using larger datasets, but unfortunately, few datasets allow a thorough evaluation of school contextual and neighbourhood contextual effects.

Finally, in Table 4, we have taken into account demographic background variables (age, gender, immigrant background and family structure). The conditional intra-neighbourhood component is the intraclass coefficient that refers to adolescents who live in the same area but attend different schools, and therefore provides information about neighbourhood-level variance that is free from school-level variance, while controlling for the demographic make-up of the neighbourhood. The conditional intra-school component is the intra-school coefficient, controlling for the demographic composition of the school. The descriptive results (ICC values) suggest that the school level variation exceeds the neighbourhood level variation, even when controlling for demographics. However, we are extremely careful in interpreting these findings as our results are based on very few schools; the bootstrapped standard errors are therefore rather large.

Conclusion and Discussion

Adolescents are exposed to multiple contexts, and spend substantial amounts of time in their area of residence as well as in their school. Yet, prior multilevel analyses of adolescent behaviour have either focused on contextual influences of neighbourhoods or on contextual influences of schools. In this study we simultaneously evaluated neighbourhood and school sources of variation in self-reported offending, morality and self-control. Our results reveal two interesting main findings.

First, in the initial empty model that only estimated neighbourhood level variation, the effect was already small. Only a small portion of the variance in violent offending and morality had a significant neighbourhood ICC value. Inclusion of the school level further reduced the multilevel neighbourhood effects to insignificance. This finding contradicts the previously discussed multi-level studies of neighbourhood effects on offending in the U.S.A. However, it

Table 4 Variance decomposition (variances and bootstrapped standard errors) and ICC values in cross-classified models (controlling for age, gender, immigrant status and family structure). Respondent N=612, neighbourhood N=65, school N=10. Respondents per neighbourhood: mean=9.4, minimum=4, maximum=23. Respondents per school: mean=61.2, minimum=3, maximum=139

Variable	Unique neighbourhood level variance		Residual variance level 1		Unique school level variance		ICC neighbourhood	ICC school
	Var	SE	Var	SE	Var	SE		
Total offending	0.00	0.00	87.69	15.15	0.53	9.20	0.00	0.01
Serious offending	0.00	0.00	2.62	1.37	0.00	0.00	0.00	0.00
Violent offending	0.01	0.01	14.97	2.15	0.41	7.02	0.00	0.03
Self-control	0.00	0.00	36.41	4.12	1.99	25.57	0.00	0.05
Morality	1.76	0.85	69.90	9.41	5.42	42.58	0.02	0.07

is in line with most previous multilevel studies of neighbourhood effects on offending that were conducted in Western-European cities (Oberwittler et al. 2013; Pauwels 2012; Rovers 1997). The findings with regard to self-control and morality have not been reported before, but add to the impression that the context of neighbourhoods of residence do not add much to the explanation of adolescent offending in Western Europe.

While our results show that the neighbourhood is no direct source of variance in adolescent offending anymore when the school context is taken into account, this does not imply that neighbourhoods are unimportant or that neighbourhood studies should be abandoned, on the contrary, it is important to increase our understanding of how neighbourhoods are related to a range of negative outcomes: many previous studies have documented that neighbourhoods have a differential effect regarding different outcomes (e.g. fear of crime, within-area victimisation, see Pauwels et al. 2010). Neighbourhood effects are not only different for different dependent variables, they often seem to have conditional effects, meaning that neighbourhood effects are moderated by individual level social mechanisms and propensities. Neighbourhood effects can be different in different phases of the life course. Our results merely suggest that the neighbourhood in which adolescents live is not a major direct source for their involvement in offending. The present study exclusively focused on variance components. Nevertheless, its results underscore that unconditional contextual effects of neighbourhoods, defined as small areas where adolescents live, may be seriously overestimated in contemporary contextual studies that use hierarchical multilevel modelling to assess contextual effects.

The second important finding of this study is that we only found one small but significant effects at the school level, when controlling for the demographic student composition of schools. This means that school level variation in morality is not exclusively due to the differential demographic clustering of adolescents within schools. This implies that the school context may have important indirect effects on offending, through a potential influence on individual development of morality.

The finding of a small but significant school level effect is also in line with some recent European multilevel studies about the school context of offending (Demanet and Van Houtte 2011; Op de Beeck et al. 2012; Sapouna 2010; Vynckier and Pauwels 2010). Future studies are needed to explore these potential intervening mechanisms and to explore whether these are related to school level characteristics such as the school staff, the organisation of the schools and mechanisms of control such as collective efficacy (Sapouna 2010). More research is needed to

fully understand the relationship between selective processes at the neighbourhood and school level. In a previous study it was found that the neighbourhood contributes to the selection of the school one attends thus reproducing social inequality in a denser way (Pauwels et al. 2010). Adolescents that lived in disadvantaged neighbourhoods had a higher likelihood of going to a disadvantaged school. The ecological clustering of disadvantage is reproduced at the school level.

Future cross-classified studies of neighbourhood and school effects should go beyond the study of overall effects and also investigate cross-level interactions. Such analyses require sufficient neighbourhoods and school, and sufficient numbers of respondents in each neighbourhood and school. This study did not meet that criterion.

Nevertheless, the key message derived from this study has relevance for policy and intervention: as schools are much more clustered than neighbourhoods regarding offending and risk factors derived from theories of crime causation, schools deserve an important place in local policy: in at risk schools at risk youth can be targeted. However, more extensive testing is necessary to demonstrate the effects and social processes that schools exert on their students. The processes of segregation and selection are worthwhile investigating as important topics in criminology. However, regarding the socialisation effects retargeting neighbourhood effect studies to the areas where one actually spends leisure time may yield a different picture (Wikström et al. 2012).

There are several limitations of our study, which may be improved upon in future research. Some of them apply to the neighbourhood level of analyses, others to the school level, and some to both.

A first limitation regards the definition of neighbourhoods. We used relatively large residential areas as neighbourhoods, while the recent research literature suggests that smaller spatial units with precise geographical locations are more appropriate (Weisburd et al. 2009; Weisburd et al. 2012). The boundaries used for neighbourhoods must be relevant to the mechanism being tested, but data constraints limited our ability to achieve this in high detail, like in so many other studies before. Future studies may strongly improve on this by focusing on micro-level units, like blocks or street segments (see Weisburd et al. 2012), perhaps clustered again in larger geographical units. In that way, neighbourhood level effects may really become modelled as a multi-layered phenomenon within an urban context (Taylor 1997; Kearns and Parkinson 2001).

A second limitation is that we only considered the area of residence, while in reality, adolescents are exposed to many other neighbourhood settings than those where they live. The advent of geographic information systems has made it possible to be quite precise on this, not only with regard to locating where adolescents live, but also with regard to where they spend their time. Space-time budget studies reveal that only a minor proportion of the time awake is spent in the area where one lives (Wikström et al. 2012). Criminologists that are interested in the study of contextual effects need to increase their efforts to take activity spaces rather than residential neighbourhood environments into account.

A third limitation, which applies to the neighbourhood as well as the school context, is the cross-sectional design of the present study (in line with the majority of contextual studies), which means that we can only conclude how strong individual differences in contemporaneous measures of self-reported offending, self-control and morality are associated with neighbourhood and school level differences. However, contextual effects may have delayed long-term effects. Therefore, future studies may improve on our analyses by collecting and employing longitudinal data.

A fourth limitation relates to the school context. We clustered the respondents of our sample in ten complete schools and found that only a small portion of variance in our dependent variables could be traced to the school-level. However, a sample of ten schools is relatively

low, therefore we have used bootstrapping to obtain robust standard errors. While this method is suggested in the literature (Hox 2010) our results with regard to school level variation should be interpreted with caution. Future studies based on a larger number of schools and neighbourhoods would be needed to replicate and advance our findings about school level effects. Further, like with neighbourhoods, it is well possible that this contextual effect is measured at a scale that is too large to find meaningful effects. In the present study, we were not able to empirically distinguish school classes from the school as a meso level unit. Adolescents that attend the same class are much more alike than adolescents that visit the same school, but excluding school class level variation may have to an underestimation of the contextual effect in this study. Future studies might expand the current knowledge of school effects by focusing on smaller units within the schools, perhaps layered again in school grades and complete schools.

Nevertheless, despite these limitations, our study brings a clear message: it demonstrates that multilevel studies of offending and two of its main correlates that include only one context may overestimate the variance at the neighbourhood or school level. However, it is important to notice that small does not mean not-relevant, how paradoxical that may sound (Merlo et al. 2009). We hope that our exploratory analyses of different sources of variance do not deter future researchers from analysing this interesting but complex field in criminology. Instead we hope that it may inspire scholars to rethink context in contextual studies of offending.

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Appendix

A note on the Dutch school system

A short description of the school system in the Netherlands may be useful (the following is based on Van der Velden et al., 2014). In the Netherlands, children attend primary education between the age of 4 and 12. At the age of 12, pupils enter secondary education, which is highly stratified. Three main tracks are distinguished: pre-university education (VWO), higher general secondary education or the pre-college track (HAVO), and pre-vocational education (VMBO). Within VMBO several sub tracks are distinguished that differ in theoretical and practical orientation. Apart from these three tracks, students that do not have enough cognitive or behavioural capacities to attend normal secondary education, can follow special forms of education. One type of school they may be placed in, are school for practical education, which are focused on acquiring basic practical and social skills. The transition to post-secondary education (intermediate vocational education, vocational colleges and universities) takes place at between age 16 and 18, depending on which secondary education track the student followed.

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