

Effects of Neighborhood Characteristics on Juvenile Delinquency: A Multisource and Multilevel Analysis

Paper Presented at the Annual Conference of the British Society of Criminology.
Liverpool, July 13-16, 1999.

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Abstract

In this article the influence of neighborhood characteristics on individual delinquency is investigated by using a multisource and multilevel design; several data sources are used to measure individual delinquency and the influence of neighborhood characteristics is assessed by using multilevel models. As with other multilevel studies that have been carried out so far the effect of neighborhood characteristics on individual delinquency turns out to be rather limited. Although more than marginal neighborhood effects were found for the age at which juveniles first come into contact with the police and for recidivism. However, these effects cannot be attributed to 'classical' neighborhood characteristics such as economic deprivation and lack of informal social control. According to the author the small neighborhood effects in multilevel studies can be explained among other things from the poor variance of the dependent variable on the individual level. Furthermore, the author speaks up for a more prominent role of social networks in the explanation of individual-neighborhood interactions.

Keywords

neighborhoods, social ecology, juvenile delinquency, multilevel analysis, self-report, police data

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1. Introduction

In their classic study Shaw and McKay (1942, 1969) describe the geographical distribution of juvenile delinquents over neighborhoods in the city (residence addresses). They relate the number of young people that is suspected of a crime (by the police) to the social and physical characteristics of the residential environment. They found that young people are more often suspected of committing a crime, when they grow up in fast changing neighborhoods. These changes create a situation they call social disorganization. The central hypothesis is that certain socio-structural neighborhood characteristics, such as poverty, high rates of residential mobility and ethnic heterogeneity have a positive effect on juvenile delinquency, namely in two ways: these characteristics on the one hand create a situation where social control mechanisms get lost, while on the other hand a social climate develops where deviant values are transferred. The poor social control is chiefly the result of the high rates of residential mobility and the presence of different ethnic groups that both literally and metaphorically do not speak each other's language. The transfer of deviant values mainly has its origins in the poverty in a neighborhood.

After World War II especially in the United States many ecological studies have been conducted into the relation between socio-structural neighborhood characteristics and (the origin of) juvenile delinquency. These studies confirm in broad outlines the results of Shaw and McKay (overviews in Reiss & Tonry 1986, Byrne & Sampson 1986a, Farrington et al. 1993, Rovers 1995). Supplementary to their theory it has been argued that neighborhood characteristics like population density (Gove et al. 1979), presence of high-rise buildings (Newman 1972) and poor family cohesion (Kornhauser 1978, Sampson 1987a, 1987b) have a negative effect on the social organization in a neighborhood, therefore promoting delinquency among young inhabitants.

Much of this ecological research was criticized. The criticism touches on widely divergent components of the research, such as the concepts used, the theories, the operationalizations, the data sources and the research designs (Bursik 1988, Bursik & Grasmick 1996). Two of these criticisms constitute the point of departure

for this paper. The first criticism refers to the data source mostly used for the measurement of the dependent variable (i.e. juvenile delinquency). The second criticism refers to the types of analyses used to assess neighborhood effects. Both points will be briefly explained.

In the past police data (about suspects) were used to describe the geographical distribution of (residence addresses of) juvenile delinquents over the city. However, this measurement is possibly biased by the differential attention of the police for young people from different neighborhoods (Byrne & Sampson 1986b). The direction and the degree of this bias are usually unknown.

In order to determine the influence of neighborhood characteristics on individual behavior it is necessary for both levels, the neighborhood level and the individual level, to be simultaneously involved in the analysis. Up to now this was only done very sporadically. In the past research was mainly restricted to finding correlations on the aggregated (neighborhood) level. These correlations were then interpreted in causal terms (i.e. cross-level). Kornhauser (1978) pointed out that differences in delinquency ratios between neighborhoods cannot necessarily be attributed to the influence of aggregated neighborhood characteristics. It is also possible that these differences originate in the population composition: people with different individual and micro-social background characteristics show (as a result) different behavior; when people with varying background characteristics are not evenly distributed across neighborhoods, differences between neighborhoods (e.g. with regard to delinquency) come into effect. However, these differences have nothing to do with the influence of neighborhood characteristics. In other words, to determine a context or neighborhood effect one has to check for composition effects. The number of studies in which this has been done so far is very limited (Simcha-Fagan & Shwartz 1986, Gottfredson et al. 1991, Elliott et al. 1996). Dahlbäck 1996). Up to now these studies have in common that they hardly find neighborhood effects. If they find any neighborhood effect at all it is at best marginal.

In the last few years self-report studies are increasingly used for the measurement of both delinquency and (perceived) neighborhood characteristics. (Peeples & Loeber 1994, Lindström 1996, Vowell & Howell 1998). However, these studies are in their turn limited because the effects of neighborhood characteristics on

juvenile delinquency are analyzed only at the individual level (with contextual analysis).

In this paper we try to meet the criticism on the measurement of the dependent variable (delinquency) by using three different data sources alongside: two independent police registrations of suspects, referring to first offenders and recidivists respectively. Furthermore we make use of self-report data. We investigate to what extent these data sources are comparable in their description of the geographical distribution of juvenile delinquents over neighborhoods in the city. We meet the criticism on the analyses used for determining neighborhood effects by using multilevel models. The data we analyze refer to young people and neighborhoods in Rotterdam, the latter being the second-largest city in the Netherlands (600.000 inhabitants in the core city, 1.2 million inhabitants in the urban conglomerate). The concrete research questions are the following:

1. *Which differences do exist between Rotterdam neighborhoods concerning the extent to which juvenile inhabitants show delinquent behavior?*
2. *To which neighborhood characteristics are these differences in juvenile delinquency related?*
3. *Do these neighborhood characteristics also influence individual juvenile delinquency?*

In the following paragraphs (2, 3, 4) these questions are answered. This will be followed by a summary (par. 5). The paper is concluded by a discussion of the results (par. 6).

2. The distribution of juvenile delinquents over neighborhoods

2.1. Measurement of delinquency variables

The data presented here refer to neighborhoods and young people in Rotterdam in the period 1991-1995. For deciding on the neighborhood boundaries the administrative zoning into neighborhoods of the Netherlands Central Statistical Office was used.

Rotterdam has about 80 of these neighborhoods. About 55 of them have been used for the analyses. The other neighborhoods are not suitable, because they are not used as residential area or do not have enough inhabitants (< 3000). The administrative neighborhood boundaries have a social meaning as well; inhabitants of Rotterdam recognize the neighborhoods and have certain impressions of them. (in terms of: poor neighborhood, nice houses, unsafe at night, lots of green, many migrants, etcetera)

The data about juvenile delinquents come from three sources: two police registrations (of suspects) and a self-report study. Systematic measurement bias may come with each of the data sources. It is possible that young people in certain neighborhoods have more chance of becoming a suspect than young people from other neighborhoods, because police attention varies across neighborhoods. This will result in systematic bias if one is interested in the measurement of the presence of delinquents in a neighborhood. One of the problems of self-report studies is under-reporting; in some groups people are less inclined to admit offences than in others (Rovers and Wouters, 1996). When these groups are not distributed evenly over neighborhoods the measurement of the presence of delinquents in a neighborhood is once again biased.

Apart from valid measurements the three data sources have to yield comparable measurements. There are many delinquency measurements possible. Elsewhere I have tested different measures for validity, reliability and comparability (Rovers 1997: 108-123). This has resulted in the following measurements:

Source 1: general police register: recidivists

This registration contains minors (age 12-18) who were booked at least once (possibly more) in the period 1991-1994 for committing a crime. They have been registered in the general police register of suspects. The selection comprises suspects whose report has been sent on to the Public Prosecutor. This mainly involves persons suspected of offences against property, violent offences and vandalism. Per neighborhood the number of suspects has been standardized per 1000 inhabitants from 10-20 years old. Only neighborhoods with at least 500 inhabitants in this age group have been

included in the analysis (N = 51 neighborhoods, average = 35 suspects per 1000 young people in a neighborhood, standard deviation = 16).

Source 2: youth register: first offenders

This registration contains minors who have come into contact with the juvenile police (department within the police force) in the period 1991-1992 and have been registered as suspects. However, these suspects have not been booked. The majority of this group is composed of first offenders who have committed minor offences (often petty shoplifting). A substantial part is very young (< 12 years). This registration is complimentary with the previous registration: when young people get booked at any moment (e.g. when they get caught for the second or third time) they disappear from the youth register and are subsequently registered in the general police register (source 1). The registrations are kept up independently. As with the general register the youth register chiefly involves persons accused of offences against property, violence and vandalism. On average they are somewhat younger though and the offences are less serious. The number of suspects is calculated in the same way as in the previous registration, only the period differs (1991-1992; N = 50 neighborhoods, mean = 28 suspects per 1000 young people in a neighborhood, standard deviation = 17).

Source 3: self-report study

In May 1995 a representative random sample of pupils in the final grade of primary education in Rotterdam (mean age 12) was questioned about committing offences (N=3852). This was done by using a questionnaire. These pupils were asked whether they had ever committed (specific) offences. The list contained 18 offences in the categories property crime, violence and vandalism. From the scores on six of these items a Mokken scale was constructed on the basis of which we can determine to what extent a respondent has committed serious crimes (scale coefficient $H > .45$; reliability coefficient $\rho = .72$). The six items go from not serious (= much reported) to serious (little reported). This measurement corresponds very well with the offences young people are accused of in the police registrations. Another reason for the use of this scale is that on the basis of this measurement a comparison between neighborhoods is not distorted by the varying tendency of respondents to give socially

desirable answers. Per neighborhood the average total score (sumscore) on these six offence items is used. This score goes from 0 (no minor offences reported) to 6 (serious crimes reported). Only neighborhoods with at least 25 respondents in the sample have been included in the analysis (N=44 neighborhoods; average score = 0.83, standard deviation = 0.23). Considering the comparability with the police registrations a second measurement has been used, that is the extent to which respondents report one or more police contacts. Per neighborhood this involves the average score on the rough variable (0=never, 1=once, 2=a few times, 3=often, 4=very often). (N=44 neighborhoods; average score = 0.14 standard deviation=0.07). In view of the average age of the respondents (aged 12) we presume that the time-frame of the answers roughly covers the period 1991-1995.

2.2. Results

On the basis of the above we can compare the neighborhoods in Rotterdam by four delinquency measures:

1. number of recidivists per 1000 young people (general register of police)
2. number of first offenders per 1000 young people (youth register of police)
3. extent to which young people report serious crimes (self-report study)
4. extent to which young people report police contacts (self-report study)

With the help of each of these measures neighborhoods can be ordered by the presence of juvenile delinquents. By comparing the four rank orders with each other, we can see to what degree the different descriptions match.

In table 1 the rank-order correlations have been given. We see several interesting results. What strikes us is the strong correlation between the two police registrations. Although this involves two separate registrations, that have moreover been completed in different ways, they appear to describe the geographical distribution of juvenile delinquents over neighborhoods in an almost identical way ($r_s = .82$). The correlations between on the one hand the descriptions based on the police registrations and on the other hand the descriptions based on the self-report study are considerably less strong ($38 \leq r_s \leq 56$). Nevertheless these correlations are still moderate. It is striking too that the descriptions of the police registrations are more strongly correlated with the number of reported offences than with the number of reported police contacts. The reverse was to be expected. A possible explanation can

be found in the reliability of the latter measurement (police contacts); contrary to the measurement of the number of reported offences this measurement is based on only 1 item in the questionnaire.

TABLE 1 ABOUT HERE

In the neighborhoods surrounding the city center proportionally most young people come into contact with the police. This mainly involves the old, partly renovated quarters. Here the percentage of young people with police contacts is on average twice as high as elsewhere in the city. The geographical distribution of respondents that have reported serious crimes deviates to the extent that in this group a bigger concentration of delinquents is found in the neighborhoods in South-Rotterdam. However, broadly speaking we see in this measurement also the same pattern: overrepresentation of young people from the old neighborhoods around the city center.

Which conclusions can be drawn from these findings? First we have to note the fact that the different measurements are not identical concerning the delinquents' age, the type of offences, the period the measurement refers to, etcetera. These differences determine at least partly the discrepancies between the data sources. It seems however, that this influence cannot be very strong, as the descriptions on the basis of the two police registrations show a strong similarity, despite a difference in population (first offenders versus recidivists), a difference in offences (minor versus serious crimes), a difference in age of the suspects (first offenders are on average a few years younger) and a difference in the period the respective measurements refer to (1991-1992 versus 1991-1994). It is not obvious to ascribe the strong similarity between the two police registrations to a common distortion factor (police bias), as most first offenders have not ended up in the registration as a result of police action; in most cases the suspects involved have been caught in the act of shoplifting. So the police did not have a great influence on the selection of this group. Nevertheless the geographical distribution of this group is almost similar to the distribution of the group of suspects that the police did track down through their own actions (the recidivists). Therefore we may have some confidence in the validity of these data. The smaller correlation between the

police registrations and the self-report data cannot easily be explained. Possibly the age difference does play a big part in this: the respondents in the self-report study have reported on offences they have committed up to and including their twelfth/thirteenth year, whereas most young people in the police registrations were (much) older than twelve when they were accused of committing an offence. There is also a possibility that as a result of demographic developments the geographical distribution of juvenile delinquents in the city is shifting.

3. Relations between neighborhood variables and the presence of juvenile delinquents

In the foregoing we have established that, especially in the American literature, a relationship between social disorganization in a neighborhood and the presence of juvenile delinquents has frequently been found. This particularly involves the following neighborhood variables: economic deprivation, ethnic heterogeneity, high rates of residential mobility, high population density, the presence of high-rise buildings, social problems in households (poor family cohesion) and poor neighborhood cohesion (all characteristics have been specified thus that the correlation with the presence of juvenile delinquents is positive).

In this paragraph we investigate to what extent these correlations can also be found in a Dutch context. To the preceding list of neighborhood variables three demographic control variables are added: (1) the proportion of young people in the population, (2) the number of pupils following secondary education in a neighborhood (as a proportion of the population in a neighborhood) and (3) the male/female ratio in the juvenile population. Each of these variables can be seen as an opportunity factor. To determine the influence of socio-structural neighborhood variables on juvenile delinquency we have to control for these factors.

3.1 Measurement of neighborhood variables

Table 2 shows the neighborhood variables, their indicators, the applied measurement technique and the data sources. The variable 'social problems in families' is an approach of the variable 'poor family cohesion'. The operationalization of the variable 'poor neighborhood cohesion' should also be seen as an approach. The reasoning behind this operationalization is that poor cohesion in a neighborhood can be derived

from the number of conflicts between inhabitants and from the degree to which these inhabitants are able to solve these conflicts together. The number of times conflicts on the streets and disturbance/ noise pollution are reported to the police is at the same time an indication of the number of conflicts that occur and an indication of the extent to which inhabitants choose as a solution an appeal to a formal control mechanism (the police). Thus the incidents reported can be seen as indicative of the lack of social cohesion in a neighborhood. The presence of tramps, drug addicts and drunkards gives a supplementary indication for the lack of social cohesion.

TABLE 2 ABOUT HERE

3.2 Results

In table 3 the neighborhood variables have been related to the three delinquency measures (bivariate correlations). The extent to which young people in a neighborhood show delinquent behavior appears to be related to a large number of the neighborhood variables mentioned here, as expected. Five variables show a significant correlation with each delinquency measure: economic deprivation, ethnic heterogeneity, social problems in families, poor neighborhood cohesion and the proportion of young people in the population. Several neighborhood variables, such as residential mobility, population density and the presence of high-rise buildings show varying results. Two of the three control variables appear to have no relation with the extent to which juvenile inhabitants show delinquent behavior.

TABLE 3 ABOUT HERE

These findings confirm the results of the American research mentioned above. However, the various neighborhood variables appear to correlate very strongly. Probably these variables refer to the same theoretical dimension. The strong correlations make it impossible to test the separate influence of these neighborhood variables in a multivariate analysis (as a result of the multicollinearity that will occur). Our solution to this problem is combining several variables into an index. The variables 'economic deprivation' and 'social problems in families' have been combined

(through principal components analysis, PCA) to represent a dimension of economic deprivation. The variables 'residential mobility' and 'poor neighborhood cohesion' have been combined (also through PCA) to represent a dimension of 'lack of informal social control'. The variable 'ethnic heterogeneity' has been left out of the analysis, as this variable has high factor loadings on both the deprivation and the social control dimension and causes both dimensions to become collinear again. The variable 'population density' appears to be strongly correlated with the proportion young people in the population. In view of the achievements of both variables in the bivariate analysis and taking into account the unclear theoretical status of the first variable, we opted for including only the variable 'proportion of young people in the population' as a control variable in the subsequent multivariate analysis. This means that the number of neighborhood variables has been reduced to three: economic deprivation, lack of informal social control and proportion of young people in the population.

In table 4 the results of the multivariate regression analyses are shown. These results are somewhat diffuse. In two out of three cases economic deprivation appears to be significantly related to the presence of juvenile delinquents (based on police data). In these instances the two other neighborhood variables show no 'effect'. So the correlations between these neighborhood variables and the number of juvenile delinquents disappear when controlled for economic deprivation. However, in the self-report data the correlation between economic deprivation and self-reported serious crimes disappears when controlled for the lack of social control in a neighborhood. For the time being we will give these three neighborhood variables 'the benefit of the doubt' and assume that all three of them *possibly* influence individual variations in juvenile delinquency. To assess this assumption several multilevel analyses will be performed.

TABLE 4 ABOUT HERE

4. The influence of neighborhood variables on individual juvenile delinquency

4.1 Multilevel models

Multilevel models have become very popular in the last ten years or so. These models enable us to analyze data on different levels (nested data) simultaneously. In this respect they have important advantages compared to more traditional data analyses techniques. (Summarizing discussion in Rovers 1997: 170-174; specialized multilevel literature can be found in Boyd & Iversen 1979; Bryk & Raudenbusch 1988, 1992; Hox 1995; Goldstein 1995; Van den Eeden et al. 1990; Hüttner & Van den Eeden 1995). Below the reader will find a brief introduction of the model.

An analysis on two levels, for example individuals (level-1) and neighborhoods (level-2), is performed in two steps. First on level-1 the influence is estimated of an independent individual variable, for example socio-economic status (SES), on a dependent variable, for example number of offences committed. Let us start from a regression model (other models are conceivable too, see Goldstein 1995). The starting point for a multilevel analysis is that the parameters of the individual-level estimation, the intercept (β_0) and the regression coefficient for SES (β_1) can vary per neighborhood. These level-1 parameters therefore are the dependent variables on level-2 (neighborhood level). β_0 on this level stands for the average number of offences committed in a neighborhood and β_1 for the average relation (in all neighborhoods) between individual SES and number of offences committed. Subsequently, neighborhood variables are used to explain the (possible) neighborhood differences in β_0 and β_1 . Please notice that differences in β_0 indicate a direct contextual effect, whereas differences in β_1 indicate an interaction effect (see Lindström 1996, on spreading effects and multiplicative effects). The multilevel analysis on the neighborhood level is not similar to a traditional ecological regression analysis, because only the *between*-neighborhood variance can be explained. The variance *within* neighborhoods cannot be explained on the neighborhood level.

It is possible to specify different models. In the analyses following below two models will be presented. The first model is a model without explanatory factors on any level. This analysis is comparable to an ordinary analysis of variance. It enables us to determine to what extent the variance in scores on the dependent variable (juvenile delinquency) can be ascribed to differences *within* and *between* neighborhoods respectively. This is done by dividing the total variance into a percentage of between-neighborhood variance and a percentage of within-neighborhood variance. This gives us an indication of the relative importance of the

neighborhood in the explanation of juvenile delinquency. The second model that will be presented here is a fully specified multilevel model, with explanatory factors specified on both the individual and the neighborhood level. The explanatory factors on the neighborhood level are the three variables mentioned above.

4.2 Results

Multilevel models without explanatory factors

To get an impression of the relative importance of the neighborhood, we have first specified several multilevel models without explanatory factors. As we have mentioned before this model can be compared with an analysis of variance. (Technical information on the analyses: the scores on some variables were transformed to enable estimation of linear parameters. *Logodds* transformations were applied to dichotomous variables, *log* transformations were applied to count variables. Scores on the variable 'self-reported (serious) crimes' were corrected for social desirability bias. Scores on the variable 'self-reported police contacts' were not (geographically) biased by social desirability.)

In table 5 within- and between-neighborhood variances are calculated for a number of individual-level variables referring to juvenile delinquency. In the first part of the table two dependent variables from the self-report study, reporting serious crimes and reporting police contacts, are presented. The analyses show that most of the variance in the scores on these variables occurs between individuals within neighborhoods; the percentages of within-neighborhood variance are 97 and 99 respectively. This means that the dispersion of (individual) scores around the neighborhood means is so high, that there is hardly any homogeneity (in scores) within neighborhoods. This in its turn implies that on the neighborhood level there is hardly anything to explain (the between-neighborhood variances are in both cases very marginal: 3 and 1 percent respectively).

TABLE 5 ABOUT HERE

In the second part of the table several dependent variables from the recidivists registration are described, like the number of registered offences per suspect, the type of offences these persons are accused of and the age of suspects at the first police

contact. Five out of six variables cannot or can hardly be explained on the neighborhood level; the between-neighborhood variances do not exceed 1 percent here. Only when we look at the number of registered offences we see that almost a quarter of the variance in the scores can be explained on the neighborhood level. So in this case there is a substantial neighborhood effect.

In the lower part of the table two variables from the youth registration are presented. We see that the number of offences per suspect, contrary to the recidivists registration, hardly varies between neighborhoods; the between-neighborhood variance is only 1 percent. This should not surprise, as this registration mainly comprises *first offenders*; so there is hardly any variation between individual suspects, let alone between neighborhoods. On the other hand, the age of suspects at the first police contact is to some extent influenced by neighborhood characteristics (the between-neighborhood variance amounts to 6 percent). This percentage is higher than in the recidivists registration. This should not be surprising either, as the recidivists registration has an age limit of 12; suspects younger than 12 are not found in this registration. This means that the age variation in that registration is rather limited. The registration of first offenders does not have this restriction, as suspects of all ages (from 5 up to 18) are registered.

We can now establish that in 8 out of 10 variables the neighborhood does not play an important role in explaining individual variations in juvenile delinquency. The percentage of the total variance that can be explained between neighborhoods is in these cases 3 percent at most. In one case the neighborhood has a marginal effect (age at first police contact) and in another case a substantial effect (number of registered offences). All in all we have to conclude that the influence of neighborhood characteristics on juvenile delinquency is rather limited.

A fully specified multilevel model

Only in 1 out of 10 variables investigated here, it turns out that a substantial part of the total variance (23 percent) can be ascribed to the influence of the neighborhood. However, we do not know yet which neighborhood variables are involved. In this paragraph we investigate whether the three neighborhood variables that correlate strongly to the different delinquency measures have any effect on the number of registered offences of a suspect. To that end we specify a full multilevel model. By

determining the influence of these three neighborhood variables the influence of explanatory factors on the individual level are taken into account. As we are dealing with police data the number of variables that we can specify on the individual level is limited.

An analysis on the individual level (not presented here) shows that age, sex and age at first police contact have an effect on the number of registered offences of a suspect: older suspects, male suspects and suspects that were younger when they had their first police contact show significantly higher numbers of registered offences. It appears moreover that these relations differ significantly between neighborhoods. The average number of offences per suspect also differs significantly between neighborhoods. All this implies both direct and interaction effects of the neighborhood. (This information has been derived from a multilevel analysis, in which no explanatory factors were specified on the neighborhood level. The results of this analysis are presented in Rovers 1997: 186).

In table 6 the results of a fully specified multilevel model are presented with the above-mentioned variables on the individual and the neighborhood level. The betas (β_0 , β_1 , β_2 , β_3) are the parameters for the individual factors (intercept plus effects of sex, age and age at first police contact). The gamma values ($\gamma_{.0}$) indicate the average effect of the individual factor per neighborhood. The gamma values ($\gamma_{.1}$, $\gamma_{.2}$, $\gamma_{.3}$) are the parameters of the neighborhood variables (proportion young people in the population, economic deprivation and lack of informal social control). An effect is significant when the t-ratio of the parameter is ≥ 1.96 ($p < .05$).

TABLE 6 ABOUT HERE

The three neighborhood variables appear to have no effect at all. These characteristics are therefore ineligible to explain differences in recidivism between neighborhoods. From the lower part of the table we can derive that both the average number of offences as the effects of sex, age and age at first police contact differ between neighborhoods. The χ^2 -values indicate that these parameters are still significantly different between neighborhoods ($p < .05$). However to explain these differences we have to look for other neighborhood variables than those mentioned here.

Apart from the analysis presented here more full-model analyses have been performed on the other dependent variables from table 5. There is not much of a chance that the three neighborhood variables show significant effects in these analyses, because the between-neighborhood variances in these variables are much smaller. For the sake of completeness we mention however, that in none of these analyses the three neighborhood variables show any significant effect on individual variations in juvenile delinquency (neither direct nor interaction effects; tables in Rovers 1997).

From these findings two conclusions can be drawn. First, differences in juvenile delinquency (of inhabitants) between Rotterdam neighborhoods is to a large extent caused by differences in population composition. Second, if the neighborhood context has nevertheless any influence on individual variations in juvenile delinquency, this influence cannot be attributed to the economic deprivation or the lack of social control in a neighborhood. These are the characteristics that on the neighborhood level show the strongest correlations with the presence of juvenile delinquents.

5. Summary

In many studies relationships have been found between socio-structural neighborhood characteristics and various crime phenomena. This also applies to juvenile delinquency of inhabitants. These correlations make it likely that the neighborhood context influences the behavior of inhabitants in any way (contextual effects). However, an alternative explanation is thinkable too: the differences between neighborhoods can also be caused by the fact that people with different background characteristics live in different neighborhoods (compositional effects). These individual background characteristics influence peoples' (delinquent) behavior and cause aggregate correlations if there is any spatial segregation of socio-demographic characteristics. The stronger this segregation, the stronger the aggregate correlations between neighborhood characteristics and delinquency. These two hypotheses have been tested in this paper.

The research is conducted in three phases. In *the first phase* the description of juvenile delinquency across neighborhoods is worked out as a research problem. By using three data sources, two police registrations and a self-report study, a description

is given of the geographical distribution of juvenile delinquents over Rotterdam neighborhoods (in the period 1991-1995). The police registrations describe this distribution in an almost identical way. The self-report study shows slightly different results, even though this description shows a moderate correlation with that of the police registrations. Especially in the old neighborhoods surrounding the city center the percentage of young people showing delinquent behavior is higher than in the rest of the city.

In the *second phase* the geographical distribution of juvenile delinquents is related to socio-structural neighborhood characteristics, such as economic deprivation, ethnic heterogeneity, residential mobility, etcetera. As in many other studies, these relations turn up in the present study. Although it has to be acknowledged that the different neighborhood variables are mutually correlated. Behind the majority of these variables two theoretical dimensions can be found, a deprivation dimension and a lack-of-social-control-dimension. Both dimensions are correlated with the presence of juvenile delinquents in a neighborhood. The proportion of young people in the population is also correlated with the presence of juvenile delinquents.

In the *third phase* we have tried to find out whether these three neighborhood variables influence *individual* variations in juvenile delinquency. This appears not to be the case. Several analyses were performed using different data sources. The result was always that the differences in juvenile delinquency between neighborhoods are mainly caused by differences in population composition. If neighborhood influence is involved at all (as with recidivism), it appears that it cannot be attributed to the three neighborhood characteristics mentioned above. In view of the different operationalizations of the dependent variable and the use of different data sources, this result may be called robust. It is common sense to consider growing up and living in a 'bad' neighborhood (economic deprivation, lack of social control) as causing juvenile delinquency. The present research does not confirm this view.

6. Discussion

The results of this study correspond in broad outlines with the results of earlier studies that also used multilevel models to analyse the data (Simcha-Fagan & Schwarz 1986, Gottfredson et al. 1991, Dahlbäck 1996, Elliot et al. 1996). These

studies too showed the effect of neighborhood characteristics on individual delinquency to be marginal or absent. Different explanations have been proposed for this finding. The most well-known is that the influence of neighborhood characteristics on individual delinquency is not direct, but indirect. The neighborhood influence is mediated by socialization processes (Simcha-Fagan and Schwarz 1986), by poor supervision/surveillance over young people, by family disruptions (Sampson & Groves 1989), etcetera (Sampson 1993).

An alternative explanation can be found in the social networks of young people. Neighborhood influence presupposes the existence of neighborhood related social networks. For an individual will not experience any neighborhood influence when he has hardly or no social contacts there. However, this hypothesis is not always realistic. Social networks of Dutch young people hardly originate in the neighborhood. School and leisure activities seem much more important in this respect. When we look at neighborhoods where relatively many young people report offences or where many young people come into contact with the police, we can see that these neighborhoods are usually characterized by high rates of residential mobility. This makes it difficult for these youngsters to build up a social network via the neighborhood. Another indication of the fact that social networks of juvenile delinquents are not bounded by neighborhoods can be found in the composition of criminal youth groups in Rotterdam; members of these groups hardly ever come from the same neighborhood. Often they do come from the same district, though (a district is a collection of neighboring areas; Rovers 1996).

The network hypothesis may be useful in explaining why the neighborhood context does influence recidivism, but does not influence other indicators of juvenile delinquency. Possibly the social networks of young people committing many offences have a more local, neighborhood-bound character compared to the networks of young people committing no (or hardly any) offences. Young people from this last group attend school further from home for a longer period of time. This makes them geographically more mobile and increases the chance of social contacts outside the neighborhood.

The lack of substantial neighborhood effects (on individual delinquency) in multilevel studies does not necessarily mean though, that these effects are actually non-existent. The absence of these effects can also be caused by the lack of variance

in the dependent (individual-level) variable. When there is no variation on this level (each individual shows the same behavior) there can be no differences between neighborhoods either. When we look at the multilevel studies that have been conducted so far, as well as to a part of the present study, it is striking that in all these studies the measurement of the dependent variable (juvenile delinquency) refers to a general (juvenile) population. Whether these measurements were obtained through self-report (Simcha-Fagan & Schwarz 1986, Gottfredson et al. 1991, Elliott et al. 1996, this study) or based on police arrest data (Simcha-Fagan & Schwarz 1986, Dahlbäck 1996), in both cases the young people that report (hardly) no offences or the young people who have never been arrested, represent the vast majority in the sample. Only a (small) minority reports delinquency or has ever been arrested by the police. To put it briefly: *bad guys cause variance, good guys don't*. The larger the latter group, the smaller the total variance that can be explained and the more difficult it is to attain explanations with a high fit. (that is why researchers of etiological models are already very happy with a model fit of $R^2 = 20$.) This applies to explanations on the individual level but even more for explanations on the neighborhood level, because the variance that can be explained on that level is the variance left unexplained at the individual level (residual variance). The police data in this study are not facing these problems (to the same extent), because the samples consist of suspects only. Their scores on the delinquency variables are not as skewed as the scores on the same kind of variables in general populations. The police data show that neighborhood characteristics have in two cases a more than marginal effect on individual juvenile delinquency (with regard to recidivism and age at first police contact).

Baring in mind these considerations future research should focus on two points. On the one hand more attention should be paid to the skewness/variance problem described here, for example by experimenting with (parts of) populations that have sufficient variance in the dependent variable. On the other hand research should be redirected in such a way that new factors can be found that explain the neighborhood effect. These factors can possibly be found in the social networks of young people. These networks form the missing link between individual crime and neighborhood contexts.

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Effects of Neighborhood Characteristics on Juvenile Delinquency; A Multisource and Multilevel Analysis

Tables

TABLE 1 *Comparison of Four Measures of Juvenile Delinquency at the Neighborhood Level (Spearman Rank Correlations)*

(N=neighborhoods)	<i>Self Report</i>		<i>First Offenders</i>
	Serious Crimes	Police Contacts	Suspects/1000 Youths
<i>Recidivists</i>	.56**	.38*	.82**
Suspects per 1000 Youths	(N=39)	(N=39)	(N=50)
<i>First Offenders</i>	.45**	.44**	-
Suspects per 1000 Youths	(N=39)	(N=39)	

* $p \leq .05$ ** $p \leq .01$ (two-sided)

TABLE 2 Description of Neighborhood Variables (M =mean/ SD =standard deviation)

Variable	Indicators	Measurement	Sources
Economic Deprivation	1- % unemployed in working population (everyone 20-65 year) 2- % on welfare in working population 3- % in working population with only primary education	principal components factor loadings: .95, .96, .72 eigenvalue: 2.34; $R^2 = .78$	1: employment agency 2: social services depart. 3: city survey
Ethnic Heterogeneity	4- Blau's index (number of different groups and relative size)	$1 - \sum p_i^2$; p_i = fraction of each group in population: M .24/ SD .18	population statistics
Residential Mobility	5- migration from and to other neighborhoods and cities	net migration as % of population M .12/ SD .04	population statistics
Population Density	6- % of households greater/equal 5 persons 7- mean number of persons per room 8- mean number of persons per housing unit	principal components factor loadings: .89, .94, .89 eigenvalue: 2.46; $R^2 = .82$	population statistics
High-rise Build.	9- % of houses located on the fourth floor or higher	M .09/ SD .10	city statistics
Social Problems in Families	10- reports to police about conflicts in families per 10,000 residents 11- % of residents who consider own health satisfactory 12- % of residents with psychological and/or social problems 13- contacts with (socio-legal) welfare workers per 10,000 residents	principal components factor loadings: .83, -.74, .68, .82 eigenvalue: 2.37; $R^2 = .59$	10: police emergency 112 11,12:city survey 13: agency registration
Poor Neighborhood Cohesion	14- reports to police on tramps, drug-addicts and drunks/10,000 res. 15- reports to police on conflicts in the street/10,000 residents 16- reports to police on disturbance&noise pollut./10,000 residents	principal components factor loadings: .87, .94, .81 eigenvalue: 2.30; $R^2 = .77$	police: emergency 112
Youths/Popul.	17- youths (10-20 year) as % of total population in neighborhood	M .10/ SD .02	population statistics
Pupils in Sec. Schools	18- pupils in secondary schools (in neighborhood) as % of total population in neighborhood	M .06/ SD .08	education statistics
M/F Ratio	19- % males minus % females in age group 10-20 year (residents)	M .02/ SD .04	population statistics

TABLE 3 Rank Correlations Between Neighborhood Variables and Measures of Juvenile Delinquency (aggregated data)

	<i>Delinquency Measures[#]</i>		
	Self Reported Serious Crimes	Number of Recidivists	Number of First Offenders
N (neighborhoods)	39	51	50
<i>Neighborhood Variables</i>			
Economic Deprivation	.60**	.80**	.69**
Ethnic Heterogeneity	.49**	.69**	.57**
Residential Mobility	.59**	.39**	.23
Population Density	.26	.50**	.59**
High-rise Buildings	-.39**	-.24	-.24
Social Problems in Families	.53**	.77**	.68**
Poor Neighborhood Cohesion	.61**	.48**	.43**
Proportion Youths in Population	.35*	.59**	.65**
Pupils in Secondary Schools	-.30	-.03	-.18
Male/Female Ratio of Youths	-.19	-.10	-.09

* $p \leq .05$ ** $p \leq .01$ (two-sided)

Number of suspects (first offenders and recidivists) is standardized per 1000 residents in age group 10-20 year

TABLE 4 *Effects of Selected Neighborhood Variables on Juvenile Delinquency; Multivariate Standardized Regression Coefficients (aggregated data)*

<i>Neighborhood Variables</i>	<i>Delinquency Measures[#]</i>		
	Self-Reported Serious Crimes	Number of Recidivists	Number of First Offenders
Economic Deprivation	.39	.72**	.49*
Lack of Informal Social Control	.42*	-.06	-.09
Proportion of Youths in Population	-.12	.20	.44**
<i>R² / (N)</i>	<i>.47 (35)</i>	<i>.67 (49)</i>	<i>.62 (48)</i>

* $p \leq .05$ ** $p \leq .01$ (two-sided)

Number of suspects (first offenders and recidivists) is standardized per 1000 residents in age group 10-20 year

TABLE 5 *Relative Importance of Neighborhood Variables on Individual Variations in Juvenile Delinquency (Multilevel Models Without Explaining Factors/Analysis of Variance)*

	N ₁ /N ₂	Total Variance	
		% Within Neighborhoods	% Between Neighborhoods
<i>Self-Report</i>			
Self-Reported Serious Crimes	3466/54	97	3
Self-Reported Police Contacts	3466/54	99	1
<i>Recidivists</i>			
Number of Registered Offences	4526/54	77	23
Nature of Offences:*			
50% or more is Violent Property Crimes	4526/54	100	0
50% or more is Violent Crimes	4526/54	99	1
50% or more is Property Crimes	4526/54	99	1
50% or more is Vandalism	4526/54	99	1
Age at First Police Contact	4526/54	99	1
<i>First Offenders</i>			
Number of Registered Offences	2603/54	99	1
Age at First Police Contact	2603/54	94	6

N₁ = number of individuals in analysis; N₂ = number of neighborhoods in analysis

* Variable 'nature of offences' is defined as a dichotomy, with score 1 if the majority of registered offences is of the type mentioned in the table

TABLE 6 *Effects of Selected Neighborhood Variables on Number of Registered Offences of Suspects (Fully Specified Multilevel Model)*

Values	Parameter	Coefficient	Standard Error	<i>t</i> -Ratio	
<i>Neighborhood Mean β_0 (#)</i>					
	mean in population γ_{00}	1.162	0.029	39.97**	
	proport. youths in population γ_{01}	2.315	1.608	1.44	
	economic deprivation γ_{02}	-0.055	0.048	-1.16	
	lack of informal social control γ_{03}	0.042	0.037	1.13	
<i>Effect of Sex β_1</i>					
	mean effect in neighborhood γ_{10}	0.599	0.062	9.63**	
	proport. youths in population γ_{11}	4.415	3.485	1.26	
	economic deprivation γ_{12}	0.055	0.108	0.51	
	lack of informal social control γ_{13}	-0.024	0.080	-0.30	
<i>Effect of Age β_2</i>					
	mean effect in neighborhood γ_{20}	0.337	0.015	21.68**	
	proport. youths in population γ_{21}	-0.932	0.858	-1.08	
	economic deprivation γ_{22}	0.032	0.025	1.26	
	lack of informal social control γ_{23}	0.008	0.020	0.43	
<i>Effect of Age at First Police Contact β_3</i>					
	mean effect in neighborhood γ_{30}	-0.337	0.014	-23.15**	
	proport. youths in population γ_{31}	0.015	0.804	0.01	
	economic deprivation γ_{32}	-0.000	0.024	-0.03	
	lack of informal social control γ_{33}	-0.003	0.018	-0.20	
Analysis of Variance		Variance Component	df	χ^2	p-value
	Neighborhood Mean u_0	0.038	48	350.03	0.000
	Sex u_1	0.124	48	131.81	0.000
	Age u_2	0.010	48	348.01	0.000
	Age at First Police Contact u_3	0.009	48	490.23	0.000

* $p \leq .05$ ** $p \leq .01$ (two-sided)

conditional neighborhood mean (i.e. mean value after correction for individual level effects)

N_neighborhoods = 54; N_individuals=4526