

## ORIGINAL PAPER

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# The association of inequality with the incidence of schizophrenia

## An ecological study

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**Abstract** *Background* Socio-economic factors are known to be associated with schizophrenia, but no studies have investigated the effect of inequality on incidence rates of schizophrenia. The aim of the study was to determine whether those electoral wards with greater inequality have a higher incidence of schizophrenia. *Method* An ecological study was carried out involving a retrospective case record study to calculate the incidence of schizophrenia across wards in Camberwell, South London for the period 1988–1997, and an index of inequality within each ward was calculated. *Results* There was no significant effect of inequality overall. However, in the group of deprived wards, the incidence of RDC schizophrenia increased as inequality increased (IRR 3.79, 95%CI 1.25–11.49  $p = 0.019$  after adjusting for age, sex, absolute deprivation, ethnicity, proportion of ethnic minorities and the interaction between individ-

ual ethnicity and proportion of ethnic minorities. *Conclusion* Increased inequality is associated with increasing incidence of schizophrenia, but only in the most deprived areas. This is independent of other known social risk factors.

**Key words** schizophrenia – inequality – deprivation – incidence – social risk factors

### Introduction

There has recently been increasing interest in the social causation of schizophrenia. Several studies have found a relationship (not necessarily linear) between deprivation and incidence rates of psychosis [1], prevalence rates of schizophrenia [2] and admission rates for schizophrenia [3].

Associations between inequality within residential areas, usually defined using income and mortality levels [4–7] and several causes of morbidity (cardiovascular, cancer, low birth-weight) [5, 8], are currently a matter of much debate [9]. It may be that the measurement of inequality solely using income is imprecise. Since inequality may exert its effect, at least in part, via psychological processes, it is possible that psychiatric morbidity may also be influenced by inequality. Two studies have investigated associations between non-psychotic disorders and income inequality [10, 11] with conflicting results. However, no studies (to our knowledge) have been carried out into the effect of inequality, of any kind, on rates of psychoses such as schizophrenia. We, therefore, sought to investigate whether social inequality within electoral wards was associated with incidence rates of schizophrenia after adjusting for deprivation itself. As inequality is likely to have different effects according to deprivation level [8], we also investigated whether any effect of inequality differed as a function of deprivation. Finally, we determined whether any effect of inequality was independent of our previous finding that the rate of schizophrenia in non-white ethnic minority groups is

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greater when they comprise a smaller proportion of the local population.

## Subjects and methods

Clinical and demographic information was collected on all people, from a defined area of South London (the now defunct London Borough of Camberwell), who presented to psychiatric services with their first onset of psychosis between 1988 and 1997.

Case records were checked to ensure the individuals were true incident cases (i.e. had not had prior psychiatric contact) and were rated using the OCCPI checklist [12]. Two authors, JK and JvO, carried out the ratings and inter-rater reliability for Research Diagnostic Criteria (RDC) [13] schizophrenia was good ( $\kappa = 0.79$ ). Computer diagnoses of RDC schizophrenia were made by the OPCRIT program [14], using the OCCPI checklists.

Inequality was measured using the distribution of composite deprivation scores for each electoral ward. Our study area (approx. 120,000 people) is divided into 15 electoral wards of approx. 10,000 people, which have very different socio-economic characteristics. The electoral wards are further sub-divided into small areas of 750 people. Socio-economic status of the wards and constituent small areas was measured using a composite deprivation score (Department of Environment Index of Local Conditions) [15] which includes unemployment, overcrowding, child poverty, lack of amenities, low earning, no car, low education participation (but not ethnic group); these had been measured in 1991. The distribution of these scores, for the small areas, was used to calculate an index of inequality for each ward. The Index of Inequality was created by calculating the median absolute deviation from the median of each deprivation variable across the small areas. The level of ward deprivation was used to create three groups of wards (with one-third of the wards in each group) representing low, medium and high deprivation wards. The first known address at first presentation to psychiatric services was used to identify wards for all incident cases. Homeless people were not included. The calculation of incidence and population data is more fully described in previous publications [16, 17].

## Analysis

Indirect standardisation was carried out by applying the RDC schizophrenia rates for the total 10-year population to each ward, stratifying for age, sex and ethnic minority group, using the ISTDIZE procedure in the STATA statistical program (StataCorp 1999) [18]. This allowed standardised incidence ratios (SIR) to be calculated by dividing the actual observed cases by the expected cases.

Multilevel Poisson regression analysis was then carried out to calculate incidence rate ratios for RDC schizophrenia for individual (age, sex, membership of non-white ethnic minority group) and ward (median deprivation level, inequality index and proportion of non-white ethnic minorities) level variables. Also fitted was an interaction between median deprivation level and inequality index that was assessed by the likelihood ratio test. We also adjusted for the interaction between individual membership of a non-white ethnic minority group and proportion of non-white ethnic minorities in the ward to determine whether any inequality effect was independent of this interaction.

## Results

We identified 222 people with first-onset schizophrenia who presented between 1988 and 1997, 126 (57%) were male and 96 (43%) were female. For the whole sample, increasing inequality within wards did not significantly increase the incidence rate ratio for schizophrenia. There was, however, a significant positive interaction between level of deprivation and inequality ( $LRS = 6.55$ ,  $p = 0.037$ ). Stratified analyses revealed a greater effect of inequality in the most deprived group of wards, shown in Table 1. Inequality was associated with a higher incidence of schizophrenia only in the most deprived group of wards (IRR 3.79 95%CI 1.25, 11.49  $p = 0.019$ ) after adjusting for age, sex, ethnicity, proportion of non-white ethnic minorities, and the interaction between individual membership of a non-white ethnic minority group and proportion of non-white ethnic minorities in the local area. The inequality finding was independent of this interaction.

## Discussion

Our data showed an increased incidence of schizophrenia in deprived electoral wards that also had greater inequality.

### Methodological issues

Differential case ascertainment across wards and differential census under-numeration could have affected the results, although probably not in the direction of our findings. The study was based on retrospective case records, but our results would have been biased only if case notes were recorded differently for different electoral wards and this is unlikely as the doctors rotated around the different teams. We were not able to control for individual level deprivation, but the main exposure variable assessed in this study, social inequality, has no individual-level equivalent that can be adjusted for as it only exists at the ecological level.

**Table 1** Effect of inequality on incidence rate ratio of OPCRIT derived RDC schizophrenia in electoral wards in South London grouped by deprivation level

Deprivation	level IRR**	p
Affluent	0.77	0.417
Average	1.2	0.582
Deprived	3.78	0.019*

\* highly significant; \*\* Adjusted for age, sex, individual non-white ethnicity, proportion of non-white ethnic minorities and interaction between individual non-white ethnicity and proportion of non-white ethnic minorities

## ■ Previous findings

To our knowledge, this is the first study to investigate the association of inequality with incidence rates of schizophrenia. We have previously shown in the same population, that the rate of schizophrenia in non-white ethnic minority groups was greater when they comprised a smaller proportion of the ward population [17]. The findings presented here are independent of our previous findings, i. e. the effect of inequality does not explain, and is not explained by, the interaction between individual ethnicity and proportion of non-white ethnic minorities in an area.

There have been several recent reports questioning whether income inequality has an effect on all-cause mortality and specific morbidity [9, 19, 20], whether the cultural context attenuates the effect, and whether individual level social status or education is the key determinant [19]. Our finding that inequality had a greater effect in the deprived areas (as has also been shown for cardiovascular risk factors [8]) may be relevant to this debate. We also expand the debate by using a wider view of inequality. Our index measures social exclusion rather than simply income.

## ■ Interpretation

Although we have found an association between inequality and higher rates of schizophrenia in deprived areas, we do not know whether everyone in these areas is at higher risk or only the most deprived individuals. Further work is needed to answer this question. It is possible that inequality might influence presentation to services, for example if aberrant social behaviour is less well tolerated in the deprived areas with high inequality, compared to the uniformly deprived areas. Possible confounders of the inequality effect include drug abuse and crime. These are likely to be higher in the deprived wards and maybe particularly so in the unequal wards. Factors such as crime and drug abuse, however, may be the consequence of inequality and, therefore, not true confounders, but rather part of the mechanism.

## ■ Mechanism

Possible mechanisms underlying the inequality effect include reduced social cohesion, reduced social support, increased mistrust, and increased isolation. The finding that inequality was only significantly associated with schizophrenia in the most deprived areas suggests that cognitive factors (such as self-esteem) may be important.

## Conclusion

The incidence rate of RDC schizophrenia in deprived areas in London is greater where there is greater inequal-

ity within the area. This is independent of other known social risk factors.

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