Higher prevalence of mental disorders in socioeconomically deprived urban areas in the Netherlands: community or personal disadvantage?

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Abstract

***Objective*—Major mental disorders occur more frequently in deprived urban areas. This study examines whether this occurs for all mental disorders, including less serious ones. It further assesses whether such a concentration can be explained by the socioeconomic status (SES) of the residents concerned or that a cumulation of problems in deprived areas reinforces their occurrence.**

***Design*—Mental disorders were assessed by means of the General Health Questionnaire (GHQ) among 4892 residents. Additional data were obtained on area deprivation, and on individual SES. Multilevel logistic regression models were used to take the hierarchical structure of the data into account, residents being nested in boroughs.**

***Setting*—General population of the city of Amsterdam, the Netherlands.**

***Main outcome measure*—Prevalence of an increased (≥ 2) score on the GHQ, 12 item version.**

***Results*—Mental disorders occur more frequently in deprived areas but this can be explained by the lower SES of the residents concerned.**

***Conclusions*—The cumulation of mental disorders in deprived urban areas is mainly a result of a concentration of low SES people in these areas. Contextual factors of deprived urban areas give hardly any additional risk above that resulting from a low individual SES.**

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Mental disorders seem to occur more frequently in (socioeconomically) deprived urban areas.[1 2] Early work of Faris and Dunham (1939) showed first admissions for schizophrenia to concentrate in the inner city of Chicago.[3] Many studies since then have supported this finding, both with regard to psychiatric treatment rates,[1 4–8] and with regard to the occurrence rates of major mental disorders like schizophrenia.[1 9] Furthermore, mental disorders in general occur more frequently in urban areas,[10–14] but this may mainly hold for treated mental disorders.[4 15]

The concentration of mental disorders in deprived urban areas has been explained in two ways. Firstly, low socioeconomic status (SES) people concentrate in these deprived areas. Among them mental disorders occur more frequently.[1 16–20] The socioeconomic composition of the population of deprived areas thus leads to a corresponding concentration of mental disorders in these areas. In this explanation, there is no factor at area level, apart from its population composition, which contributes to the occurrence of mental disorders. Secondly, however, (other) factors at area level—that is, contextual factors—may contribute to the occurrence of mental disorders, in addition to the aforementioned contribution of individual SES. If so, the prevalence of mental disorders in deprived urban areas will be higher than is to be expected on the basis of the socioeconomic composition of these areas alone.

The effect of contextual factors in deprived areas on mental health may occur via two area related processes—that is, selective migration and causation. Selective migration can consist of a selective drift of mentally diseased people to deprived areas or a selective retention of them in these areas.[1] In both cases, these people can keep their ground more easily in deprived areas than elsewhere, for instance because of a looser social structure and cheaper housing.[1 14] The socioeconomic context of deprived areas may also cause mental disorders among residents, again irrespective of their SES.[1 21 22] These causal contextual factors may concern social factors in the deprived community, like the existence of a specific culture and the poor reputation of these areas. In addition, physical aspects of the deprived area, like the quality of housing, buildings, and public spaces, may contribute, as well as a poor provision of health care and other services in these areas. All contextual effects of area deprivation on mental health can only be studied properly after adjustment for the socioeconomic composition of the population of the areas concerned.[22–25]

The available evidence on area differences in mental health within cities is incomplete, because of two reasons. Firstly, evidence mainly applies to major disorders and treated mental disorders, and not to less serious disorders, which in terms of point prevalence constitute most of all mental disorders.[26] With regard to the less serious disorders, two analyses on the UK 1984–85 health and lifestyle survey provide some, although conflicting, evidence.[27 28] Blaxter studied area differences in "psychosocial" health, measured by two questions on mental complaints in this survey. She found some indications for local area effects, after adjustment for age, sex, and social class, but failed to present an overall comparison. Duncan *et al* found no differences at the level of regions and electoral wards, using the General

Health Questionnaire, 30 item version, as measure of mental health.[28] The power of this analysis was low, because only a small part of the 6500 respondents in this survey lived in highly urbanised areas.

Secondly, most studies on within city differences in mental health did not properly assess area effects. In such studies it is implicitly assumed that residents of the same area are more similar to each other than they are to residents of other areas, because characteristics of the area have an impact on all its residents. This implies that the variability of their responses is smaller than if it were completely random. A proper analysis should take this hierarchy of residents within areas into account, as is the case for multilevel techniques.[29] Only Duncan and coworkers used these techniques in their study on area effects on mental disorders.[28]

This study examines the distribution of mental disorders among residents of boroughs with varying degrees of deprivation in Amsterdam, the Netherlands. It further assesses whether this distribution can be explained by the socioeconomic position of residents entirely or that additional differences exist between areas of varying deprivation, because of either selective migration or causation. Inthe analyses, multilevel techniques are used to take the hierarchical nature of the data into account, people being nested within urban areas.[28 29]

KEY POINTS
- Mental disorders have a higher prevalence in deprived urban areas and among people of low socioeconomic status (SES).
- Explanations for this higher area prevalence may be negative contextual effects or a concentration of low SES people.
- This study shows little evidence for contextual effects resulting in a poor mental health in deprived urban areas.
- The concentration of people of low socioeconomic status with mental disorders in deprived areas indicates a higher need for mental health services.

Methods

Data on mental health, individual SES, and area deprivation were collected on Amsterdam, the Dutch capital with about 700 000 inhabitants. Amsterdam is a highly urbanised city. Mental health services have been organised in five regions within the city.

INDIVIDUAL DATA

Respondents came from a random sample of the Amsterdam municipal population register (n = 8335), stratified by age (16–34, 35–64, and 65+ years) and borough. Registration of residents in this register is obligatory. Trained interviewers were able to interview 5121 of them (61.4%) about their mental and physical health, and their socioeconomic background. Details of the survey have been reported elsewhere.[30 31]

Mental disorders

These were assessed by the GHQ, 12 item version (GHQ-12).[32–34] The GHQ is a self report questionnaire aiming at the detection of functional psychiatric disorders among residents in community settings.[32 34] Its questions refer to the occurrence of unusual and unpleasant mental phenomena and to the impairment of normal functioning. The 12 item version was chosen because it can easily be used among lower educated people and because it is rather insensitive for somatic disorders.[32 34] These have already been shown to concentrate in deprived Amsterdam boroughs.[35 36]

The prevalence of mental disorders was defined as the percentage of respondents who gave one of the two least favourable answers to two or more GHQ 12 items. This is the usual cut off point in community surveys.[32–34] Hodiamont and coauthors report a sensitivity and specificity for psychiatric "caseness" of the Dutch GHQ-12 of 68% and 74% respectively, using this cut off point.[33] They confirmed and eliminated caseness by the Present State Examination, a standardised psychiatric interview.[37] In the following sections, "mental disorders" will be used as the equivalent of an increased GHQ-12 score.

SES of respondents

This was measured by its traditional indicators, income, occupational status, and educational level.[38] Income concerned household income, adapted for the number of persons who depended on it. Occupational status concerned the present occupational level of people,[39 40] or, if none, their main activity. A similar coding was previously used by Joshi and Sloggett in their study on mortality differences in England and Wales.[41] Educational level concerned the highest degree earned.[42] In addition, we assessed whether other individual socioeconomic and demographic characteristics jointly explained the area differences in mental health. These were derived from a study of Lewis and Booth on UK regional differences in mental health,[43] with small adaptations to the data available: occupational level, family type, employment status, and presence of any chronic physical limitation.

AREA DATA

Composite measures of area deprivation, like the British Jarman index,[44] are not available in the Netherlands. Moreover, we wanted to examine the additional effect of living in a deprived area, above individual SES. This means that the socioeconomic measures at the individual and area level should cover similar domains. Otherwise, residual area effects could simply be caused by different underlying concepts.[41] We further wanted to focus on material aspects of area deprivation because these probably have the largest impact on the health of a community.[22] Therefore, area deprivation was assessed by means of three established indicators that focus on income, and work: registered income,[35 45] household income below minimum,[36] and unemployment

rate.[35 45] Registered income is the mean income after taxation in 1989, for persons aged 25–64 years.[46] Household income below minimum concerns the proportion of people reporting an income at the Dutch social minimum or below. This indicator has previously been shown to represent the main principal component from a factor analysis on a number of measures of area deprivation in Amsterdam.[36] Unemployment concerns the proportion of people aged 16–64 years and available for work, who were looking for work.[36] The last two indicators are aggregated measures from the survey mentioned above. In addition to measures of material deprivation, we used the standardised mortality ratio as a general measure of their health consequences. This concerned the overall mortality among residents aged 1–64 years, in the period 1986–1991.[35 36] All indicators were collected for 22 socioeconomically homogeneous parts (boroughs) of the city of Amsterdam and standardised for age and sex, to obtain unbiased estimates.[35 47]

ANALYSIS

We analysed whether the prevalence of mental disorders in deprived urban areas, as defined by the GHQ-12, was higher and whether this higher prevalence could be explained by the individual SES of the residents concerned. Firstly, we computed the prevalence of mental disorders for three groups of boroughs with increasing deprivation (least/intermediate/most; 7/8/7 boroughs), crude and adjusted for age, sex, and their interactions (14 categories). Next, we assessed whether individual SES explained these area differences in the prevalence of mental disorders. We therefore added the measures of individual SES to logistic models that already contained age, sex, and their interactions and a measure of area deprivation.

The analyses were all performed using multilevel techniques, because of the hierarchical nature of the data: residents are nested within areas, which are assumed to have an impact on the mental health of their residents. Multilevel models account for this clustering of individual data by area. Furthermore, cross level interactions were assessed—that is, variations by area deprivation in the relations between mental health and individual characteristics.[29 48 49] For instance, the cumulation of socioeconomic problems in a deprived urban area might have an additional negative impact on mental health for people of low SES but not for people of high SES.

In all multilevel logistic regression models used, the random components of variances were assessed both at the individual and at the area level. The size of the area level random variance (between borough variation) is expressed relative to the overall random variance, as is necessary in such logistic models.[29] Random variances at the individual level were assumed to be approximately binomially distributed; no evidence of extrabinomial variance at this level was found. The equality of the random variance at area level by area deprivation was separately checked by inspection of covariances between the area level intercept and the indicators of area deprivation. Models were fitted using the most accurate procedure available,[29] —that is, using a predictive quasi-likelihood procedure in combination with a second order Taylor expansion series.

The analyses were repeated excluding those born outside the Netherlands (987 respondents; mainly Surinameses, 23.2%; Moroccans, 18.3%; and Turks, 12.0%) to control for potential cross cultural biases concerning the GHQ-12. Subjects with missing values on an independent variable were retained in all analyses by creating an indicator variable for each missing value category.

Results

A total of 4892 respondents completed the GHQ; these were divided almost equally over the three tertiles of area deprivation. Of these respondents, 32.3% had an increased GHQ-12 score (95% confidence intervals (CI): 31.0, 33.6). (Adjusted for the stratified sampling scheme by a weighting to the Amsterdam population, this prevalence is 33.0%.) Concerning all measures of area deprivation, the prevalence of mental disorders was higher in the more deprived parts of the city, with statistical significance ($p<0.05$). Differences are largest

Table 1 Prevalence of an increased score on the General Health Questionnaire, 12 item version, by tertile of Amsterdam boroughs, grouped by deprivation

Measure of area deprivation	*Number of respondents*	*(Percentage in population)‡*	*Increased score on GHQ*	
			Crude (%)	*Adjusted for age/sex (%)§*
Registered income				
Least deprived	1315	(30.2)	30.6*	30.5*
Intermediate	1762	(35.8)	31.1	31.2
Most deprived	1851	(34.0)	34.7	34.7
Household income below minimum				
Least deprived	1799	(30.2)	28.1***	28.3***
Intermediate	1277	(37.0)	34.4	34.1
Most deprived	1816	(32.9)	35.0	35.0
Unemployment rate				
Least deprived	1407	(31.1)	29.6†	29.6†
Intermediate	1669	(34.9)	31.6	31.7
Most deprived	1816	(34.0)	35.0	35.0
Standardised mortality				
Least deprived	1647	(31.3)	29.0†	29.2†
Intermediate	1975	(37.5)	34.2	34.0
Most deprived	1270	(31.2)	33.7	33.7

Significance levels χ^2 statistic): *p<0.05; †p<0.005; ***p<0.001. ‡Percentages may not add to 100 because of rounding up. §Adjusted for age and sex to the Amsterdam population.

Table 2 Odds ratios (and 95% confidence intervals) comparing the prevalence of an increased score on the General Health Questionnaire for tertiles of Amsterdam boroughs, grouped by deprivation; crude, adjusted for age and sex, and additionally adjusted for various indicators of individual socioeconomic status

Measure for area deprivation	*Odds ratio for an increased score on the GHQ* — *Crude*	*Adjusted for age/sex**	*Adjusted for age/sex, occupational status†*	*Adjusted for age/sex, income‡*	*Adjusted for age/sex educational level§*	*Adjusted for age/sex, variables used by Lewis and Booth*[39]*¶*	*Adjusted for age/sex, occupation,† income,‡ and education§*
Registered income							
Least deprived	1	1	1	1	1	1	1
Intermediate	1.02 (0.81, 1.27)	1.02 (0.83, 1.27)	1.01 (0.83, 1.24)	0.95 (0.78, 1.16)	0.99 (0.80, 1.23)	0.95 (0.77, 1.16)	0.95 (0.78, 1.15)
Most deprived	1.16 (0.93, 1.46)	1.17 (0.95, 1.45)	1.09 (0.89, 1.34)	0.98 (0.80, 1.20)	1.11 (0.89, 1.37)	1.01 (0.82, 1.24)	0.95 (0.78, 1.16)
Household income below minimum							
Least deprived	1	1	1	1	1	1	1
Intermediate	1.35 (1.12, 1.62)	1.32 (1.10, 1.59)	1.27 (1.06, 1.52)	1.21 (1.01, 1.46)	1.32 (1.11, 1.58)	1.23 (1.02, 1.49)	1.18 (0.98, 1.42)
Most deprived	1.38 (1.16, 1.64)	1.37 (1.15, 1.62)	1.24 (1.05, 1.48)	1.13 (0.95, 1.35)	1.32 (1.12, 1.56)	1.16 (0.97, 1.39)	1.09 (0.91, 1.30)
Unemployment rate							
Least deprived	1	1	1	1	1	1	1
Intermediate	1.10 (0.89, 1.36)	1.10 (0.90, 1.35)	1.08 (0.88, 1.32)	1.01 (0.83, 1.23)	1.07 (0.87, 1.31)	1.02 (0.83, 1.25)	1.00 (0.82, 1.21)
Most deprived	1.25 (1.01, 1.55)	1.26 (1.03, 1.54)	1.16 (0.95, 1.41)	1.03 (0.85, 1.26)	1.20 (0.97, 1.47)	1.06 (0.87, 1.30)	1.00 (0.83, 1.22)
Standardised mortality							
Least deprived	1	1	1	1	1	1	1
Intermediate	1.27 (1.04, 1.55)	1.25 (1.03, 1.52)	1.19 (0.99, 1.43)	1.11 (0.92, 1.33)	1.21 (0.99, 1.47)	1.12 (0.92, 1.35)	1.07 (0.90, 1.28)
Most deprived	1.26 (1.01, 1.57)	1.25 (1.01, 1.54)	1.16 (0.94, 1.42)	1.02 (0.84, 1.25)	1.22 (0.98, 1.51)	1.04 (0.85, 1.28)	1.00 (0.82, 1.22)

The least deprived tertile of boroughs is used as the reference category in all models.
*Adjusted for age, sex, and their interactions.
†Present occupation in five levels; if no job; unemployed and looking for work, student, long term disabled, housekeeping, and retired.
‡Income in five levels, adapted for the number of people that depend on it (1 or more); compare with table 3.
§Highest degree earned in four levels: primary school, lower secondary school, higher secondary school, post-secondary education.
¶Present or last occupation in five levels, employment status (yes/no), family type (single/single parent/couple), and presence of any chronic physical limitation (yes/no).

for the area indicator "household income below minimum". Table 1 shows the prevalences, crude and adjusted for age and sex.

Most of the area differences can be explained by individual SES, as is shown by odds ratios (OR) approaching unity after adjustment for individual SES (table 2). This especially applies to the combination of the three individual SES measures, occupational status, income, and educational level. After adjustment for this combination of SES measures, no statistically significant area differences remain for any of the four area indicators. Residual differences between areas of varying deprivation are largest for the area indicator "household income below minimum". In this case, adjusted ORs (95% CI) for the intermediate and most deprived tertile of boroughs are 1.18 (0.98, 1.42) and 1.09 (0.91, 1.30), respectively (approximate[29] p value for inclusion of area deprivation: 0.13, likelihood ratio statistic). For the other three area indicators, all ORs are very close to 1. Adjustment for income, and for occupational level combined with family type, employment status and presence of any chronic physical limitation (the variables used by Lewis and Booth,[43] slightly adapted), yields a smaller reduction of area differences. Adjustment for occupational status and educational level reduces the size of the area differences only slightly. No statistically significant cross level interactions are found between any indicators of low SES and of area deprivation (results not shown).

The random components of the variances at the individual and area level confirm the existence of only small area effects. In the intercept only model, variation at the area level comprises 2.9% of all random variation (standard error: 1.5%; age/sex adjusted 2.6% and 1.5%, respectively). Introduction of area deprivation further reduces the relative size of random variation at the area level; an additional reduction is reached by inclusion in the model of the individual SES measures. Random variation at the area level does not differ by area deprivation in a statistically significant way either.

Exclusion from the logistic regression analysis of respondents born outside the Netherlands yields slightly larger crude differences between the tertiles of area deprivation, but these can similarly be explained by individual SES.

The prevalence of mental disorders is higher among low SES people for all three individual measures. Differences between socioeconomic strata are largest for household income (table 3), which also explained most of the area differences. The association of household income with mental disorders varies slightly by sex, but this has no impact on the explanatory power of household income for area differences. Separate results by sex are therefore not presented.

Discussion

It has been hypothesised that contextual factors of socioeconomically deprived urban areas contribute to the occurrence of mental disorders above individual factors. The results of our study give hardly any support to such

Table 3 Occurrence of an increased GHQ-12 score by household income level, and odds ratios and 95% confidence intervals (OR, 95% CI) predicting an increased score, for men and women

	Number (%)†*	*Crude OR (95% CI)*	*Adjusted for age/sex‡ OR (95% CI)*
<Dfl1400, 1 person	654 (13.9)	3.13 (2.35, 4.18)	3.17 (2.36, 4.27)
Dfl1400–1900, 1 person	690 (12.1)	2.01 (1.50, 2.68)	2.21 (1.63, 2.99)
Dfl1900–2750, 1 person	750 (15.5)	1.53 (1.15, 2.05)	1.67 (1.24, 2.24)
Dfl2750–4000, 1 person	568 (13.1)	1.49 (1.10, 2.02)	1.54 (1.13, 2.10)
>Dfl4000, 1 person	385 (10.0)	1	1
<Dfl1400, ⩾2 persons	42 (1.0)	2.51 (1.30, 4.87)	2.40 (1.23, 4.70)
Dfl1400–1900, ⩾2 persons	312 (9.8)	2.50 (1.79, 3.49)	2.24 (1.60, 3.15)
Dfl1900–2750, ⩾2 persons	286 (7.6)	2.05 (1.45, 2.89)	1.96 (1.38, 2.78)
Dfl2750–4000, ⩾2 persons	324 (8.9)	1.53 (1.09, 2.16)	1.38 (0.98, 1.95)
> Dfl4000, ⩾2 persons	299 (8.2)	1.17 (0.82, 1.68)	1.09 (0.76, 1.58)

*Number of interviewed people; income was unknown on 582 respondents.
†Percentage in the Amsterdam population; percentages do not add to 100 because of rounding up.
‡Adjusted for age, sex, and their interactions.

additional contextual effects if less serious mental disorders are included and the hierarchical data structure is accounted for. The prevalence of mental disorders is higher in deprived parts but this can be explained almost entirely by the SES and sex of the residents concerned, especially by their income. Thus, people with for instance a low income have a similar risk of mental illness in a deprived and in a prosperous borough (but of course, more of them live in a deprived borough).

Selection bias resulting from differential non-response of certain groups in deprived areas might theoretically explain our results. However, examination of the non-response makes this explanation unlikely. Differences in response rates between boroughs were small (Cohen's W[50] = 0.088), and neither varied significantly for another seven variables that were known for the entire sample (sex, age, country of birth, year of settlement in Amsterdam, marital status, family type, and month of interview).[30 31]

The prevalence of mental disorders in our study is high, 32.3%. It means that many minor disorders are included that might be affected by area deprivation to a lesser extent. Still, Lewis and Booth found a similar prevalence (31%) in their study on differences in mental health across the UK on the basis of a score of 5 and over on the GHQ-30. Furthermore, in our data, using a much higher cut off point for the GHQ-12, 5 and over, yields very similar results. In that case, the resulting prevalence is 13.8% (CI: 12.8, 14.8). The differences by area deprivation are then slightly larger, but the explanatory power of individual SES is almost identical. For instance, age/sex adjusted ORs for the most deprived areas vary from 1.19 to 1.49 for the four measures of area deprivation, versus from 1.17 to 1.37 in table 2. Adjusted for income, educational level, and occupational status combined these ranges are from 0.94 to 1.18, and from 0.95 to 1.09, respectively (all: $p>0.05$).

Individual SES explains most of the higher prevalence of mental disorders in more deprived boroughs, which implies that adverse contextual factors in deprived boroughs hardly contribute to a higher prevalence of mental disorders. If present, such a contribution might occur via both of the aforementioned geographical processes—that is, selective migration of diseased people to deprived areas or causation of mental diseases by contextual factors in these areas.[1 12 22] Our data did not allow us to discriminate between them, but our negative finding indicates that probably neither of them occurs. It also implies that the results of Duncan and coworkers[28] are confirmed by the present, more powerful, study. The availability of cheap housing in relatively unattractive deprived areas probably explains the concentration of low SES people in these areas. The higher prevalence of mental disorders among these people is well known,[16–20] though its causes still need clarification.[16]

The almost identical results on the Dutch born subgroup implicate that our results are probably valid cross culturally. First of all, they show that area differences cannot be explained by a concentration of immigrants in deprived boroughs. Weyerer reached a similar conclusion for psychiatric admission rates in the city of Mannheim.[5] However, he even found that differences were mainly attributable to German born residents, whereas in our study differences for Dutch born and other residents are almost similar. Furthermore, the similarity of our results with regard to Dutch born and non-Dutch born residents shows that a cultural bias of the GHQ does not influence our results in an important way.

Our results on area effects in mental health contrast with some of the studies on physical health. For instance, Haan *et al* studied mortality in a nine year follow up in Oakland, California, USA.[51] They found residual mortality differences between deprived and non-deprived areas (defined by a number of census variables like unemployment, low income, low educational level, uninsured, etc), after controlling for individual education, employment status, and income. Curtis found a similar result for self reported morbidity in some parts of London.[52] However, Benzeval could not replicate this result for a number of morbidity measures[53]; Jessop also could not replicate Curtis's result in Essex.[54] Studies at the UK national level show that regional and local differences with regard to mortality,[41] and the use of alcohol and tobacco,[23] can be explained almost entirely by individual characteristics. Also for the entire UK,[27] however, some area differences remain after adjustment for individual SES, both for survey measures of general health,[24 55] and for long term limiting illness as reported in the UK census of 1991.[25] Finally, Ecob found area effects in the Glasgow conurbation for a waist-hip ration and reaction time, but not for four other measures of health.[49] The last five studies used multilevel techniques.

Even without the existence of additional area effects, the age and sex adjusted area differences found indicate that additional means may be needed for an adequate prevention and treatment of the mental disorders in deprived urban areas. Yearly contact rates with the regional ambulatory mental health services, derived from the same survey, can give some indications for this. With regard to household income below minimum, for instance, age adjusted rates were 1.7% in the least deprived tertile of boroughs, and 3.0% in the most deprived tertile ($p<0.05$, χ^2 test; weighted to

the Amsterdam population: 2.2% and 3.7%, respectively). Thus, area differences could be even slightly larger without such an unequal utilisation of care (which is not accounted for in the Dutch remuneration system). Secondly, however, relative differences by degree of deprivation are much larger for treated mental disorders than for untreated mental disorders. This may also apply to urban-rural differences in general.[4 15]

As far as we know, our study is the first large one that entirely focuses on urban differences in mental health including less serious mental disorders. Therefore, its results need confirmation, especially from other urban areas with a similarly large socioeconomic variationbetween areas,[56] to allow the assessment of any mental health effects resulting from living in a socioeconomically deprived urban area.

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