

VU Research Portal

Is the prevalence of psychiatric disorders associated with urbanization?

Peen, J.; Dekker, J.J.M.; Schoevers, R.A.; ten Have, M.; de Graaf, R.; Beekman, A.T.F.

published in

Social Psychiatry and Psychiatric Epidemiology
2007

DOI (link to publisher)

[10.1007/s00127-007-0256-2](https://doi.org/10.1007/s00127-007-0256-2)

document version

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

citation for published version (APA)

Peen, J., Dekker, J. J. M., Schoevers, R. A., ten Have, M., de Graaf, R., & Beekman, A. T. F. (2007). Is the prevalence of psychiatric disorders associated with urbanization? *Social Psychiatry and Psychiatric Epidemiology*, 42(12), 984-989. <https://doi.org/10.1007/s00127-007-0256-2>

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

E-mail address:

vuresearchportal.ub@vu.nl

ORIGINAL PAPER

Jaap Peen · Jack Dekker · Robert A. Schoevers · Margreet ten Have · Ron de Graaf · Aartjan T. Beekman

Is the prevalence of psychiatric disorders associated with urbanization?

Received: 23 April 2007 / Accepted: 3 September 2007 / Published online: 25 September 2007

Abstract *Objectives* In many countries, the total rate of psychiatric disorders tends to be higher in urban areas than in rural areas. The relevance of this phenomenon is that it may help in identifying environmental factors that are important in the pathogenesis of mental disorders. Moreover, urban preponderance suggests that the allocation of funds and services should take urbanization levels into account. *Method* The Netherlands Mental Health Survey and Incidence Study (NEMESIS) used the Composite International Diagnostic Interview (CIDI) to determine the prevalence of DSM-III-R disorders in a sample of 7,076 people aged 18–64. The sample was representative of the population as a whole. The study population was assigned to five urbanization categories defined at the level of municipalities. The association between urbanization and 12-month prevalence rates of psychiatric disorders was studied using logistic regression taking several confounders into account. *Results* The prevalence of psychiatric disorders gradually increased over five levels of

urbanization. This pattern remained after adjustment for a range of confounders. Comorbidity rates also increased with level of urbanization. *Conclusion* This study confirms that psychiatric disorders are more common and more complex in more urbanized areas. This should be reflected in service allocation and may help in identifying environmental factors of importance for the aetiology of mental disorders.

Key words population survey – psychiatric epidemiology – mental disorders – urbanization

Introduction

In many countries, the rate of psychiatric disorders tends to be higher in urban areas than in rural areas [1–7]. In our recent meta-analysis of population surveys of urban–rural differences over the last 20 years [5], rates for psychiatric disorders in general and rates for mood, anxiety and substance use disorders were found to be higher in urban areas. However, there are differences between countries/continents and even between studies within countries. Population surveys of the last decades from the US for instance, show that there is no clear trend in urban–rural differences between rates for any disorder [8–10]. Blazer et al. [8] found that major depressive disorders were twice as prevalent in urban areas. However, this was not confirmed in recent studies [9, 10]. In the National Comorbidity Survey, Kessler et al. [9] only found evidence of a greater probability of comorbidity (>two disorders) in the very large cities compared to the countryside. The recent NCS Replication study also found no significant urban–rural differences [10]. The differences in the results between countries and within countries are probably due—at least in part—to the different use of diagnostic instruments, sample selection and to variations definitions of urbanization. Most studies use an urban–rural dichotomy, but some

J. Peen, MS (✉) · J. Dekker, PhD · R.A. Schoevers, MD, PhD
JellinekMentrum Mental Health Institute Amsterdam
P.O. Box 75848
1070 AV Amsterdam, The Netherlands
Tel.: +31-20/5905-105
Fax: +31-20/5905-092
E-Mail: jaap.peen@mentrum.nl

J. Peen, MS · J. Dekker, PhD
Dept. of Clinical Psychology
VU University
Amsterdam, The Netherlands

M. ten Have, PhD · R. de Graaf, PhD
Netherlands Institute of Mental Health and Addiction
Utrecht, The Netherlands

A.T. Beekman, MD, PhD
Dept. of Psychiatry
VU University Medical Centre
Amsterdam, The Netherlands

A.T. Beekman, MD, PhD
GGZ Buitendamstel
Amsterdam, The Netherlands

studies have more categories, adding useful information. For instance, the recent multi-country ESEMeD study in Europe (Belgium, Netherlands, France, Germany, Italy, Spain) [11], using a division of the urban category into medium-size cities and metropolitan areas versus rural areas, revealed interesting differences between medium-size cities and metropolitan areas. In France, for instance, rates for psychiatric disorders in medium-size cities were found to be significantly higher than those in rural areas, while rates in metropolitan areas were not significantly different from rural areas. In this study we also want to specify the relationship between urbanization and the prevalence of psychiatric disorders. In the Netherlands, we are able to present prevalence rates divided into five categories of urbanization [12], which reflect an ordinal measure of increasing population density. Using this measure we will be able to reveal if there is an urban-rural gradient of gradually rising rates that follows the level of urbanization. Possible urban-rural differences might be partly explained by differences in demographic features [11, 13, 14], so prevalence rates controlled for a range of demographic characteristics will also be presented. In this way we will be able to find if there are robust remaining urban-rural differences. If so, the level of urbanization may be a useful indicator for the allocation of funds for services.

Methods

■ Sampling and procedure

The Netherlands Mental Health Survey and Incidence Study (NEMESIS) was based on a multi-stage, stratified, random sampling procedure [15, 16]. A sample of 90 municipalities was established, using urbanization and adequate distribution over the 12 Dutch provinces as stratification criteria. The second step was to establish a sample of private households taken from post office records. The number of households selected in each municipality was determined by the size of its population. The third step was to choose which individuals to interview. The selected households were first sent a letter of introduction, and then contacted by telephone. Households with unlisted numbers or no telephone (18%) were visited in person. In each household, the member with the most recent birthday was selected, on condition that he/she was between 18 and 64 years of age and sufficiently fluent in Dutch to be interviewed. To establish contact, the interviewers made a minimum of 10 phone calls or visits to a given address at different times of the day and week. In the initial data collection phase, 7,076 respondents were interviewed (response rate 69.7%). The participants in the survey constituted a good reflection of the Dutch population of 1996 in terms of gender, marital status, and urbanization [16]. Only the 18–24 age group was significantly under-represented and therefore the data were post-stratified by sex, age (9 categories), marital status (married/not married) and urbanization (5 categories). For each of the 182 strata a weighting factor was calculated using the formula:

$$w_{(asmu)} = (N_{asmu}/n_{asmu}) * (n/N),$$

where

$w_{(asmu)}$ = weighting factor for persons in NEMESIS with age a, sex s, marital status m and urbanicity u

N_{asmu} = number of persons in the Netherlands with age a, sex s, marital status m and urbanicity u

n_{asmu} = number of persons in NEMESIS with age a, sex s, marital status m and urbanicity u

n = total number of respondents in NEMESIS

N = total population in the Netherlands

■ Diagnostic instrument

Psychiatric disorders were assessed using DSM-III-R criteria. The instrument used was the Composite International Diagnostic Interview (CIDI) [17]. The Dutch version of the CIDI [18] is a fully computerized psychiatric interview. The CIDI can be used by trained lay interviewers. The CIDI is known to have high inter-rater and test-retest reliability [19].

The following DSM-III-R diagnoses were recorded in the NEMESIS dataset: mood disorders (depression (296.20–296.34), dysthymia (300.40), bipolar disorder (296.41–296.70)), anxiety disorders (panic disorder (300.01; 300.21), agoraphobia (300.22), simple phobia (300.29), social phobia (300.23), generalized anxiety disorder (300.02), obsessive-compulsive disorder (300.30)), psychoactive substance use disorders (alcohol (305.00) and drug abuse (305.20–305.92) and alcohol (303.90) and drug dependence (304.00–304.90), including sedatives, hypnotics and anxiolytics), eating disorders (anorexia (307.10), bulimia (307.51)), schizophrenia and other non-affective psychotic disorders (295.00–295.70).

Twelve-month prevalence rates of disorders and comorbidity prevalence rates were used to calculate the percentage of cases with respectively one, two, three, or four or more diagnoses. In calculating comorbidity prevalence rates the DSM-III-R exclusion rules were not applied.

■ Demographics

The five categories of urbanization used in the study are based on the 'address density' [12] used by Statistics Netherlands, which represents the degree of concentration of residents. To establish this measure, the number of addresses in the immediate vicinity is determined for every address (of a residence, business or organization) in the Netherlands. An address here is a postal address, i.e. individual house/flat number + street name, town and postcode. The area address density is calculated using a grid of squares measuring 500 × 500 m each. The address density for each address in a square is then determined as the number of addresses in the square in which the address is located, plus the number of addresses in the twelve squares of which the centres are 1 km from the centre of the square in which the address is situated. The area address density for a municipality is determined by taking the average for the address density of all the individual addresses in a municipality.

The mean address densities are categorized as follows (in accordance with Statistics Netherlands): not urbanized (<500 addresses/km²), not very urbanized (500–1,000), moderately urbanized (1,000–1,500), highly urbanized (1,500–2,500), very highly urbanized (>2,500).

■ Statistical analyses

Weighted demographic characteristics according to the degree of urbanization (5 categories) were compared using chi-square tests. Demographic figures and prevalence rates were weighted through post-stratification for sex, age (9 categories) and marital status (married/not married). To test for urban-rural differences in prevalence rates, linear trend analysis was performed on the five categories of urbanization (see demographics). We only presented prevalence rates of diagnostic (sub-)categories with a prevalence of 2% or higher, to assure that there was sufficient power to test urban-rural differences.

Logistic regression [20] was used to compute unadjusted odds ratios as well as odds ratios adjusted for gender, age (5 categories), educational level (4 categories), household (net) income (3 categories), occupational status (5 categories), and household composition

Table 1 Demographic characteristics of the NEMESIS sample ($n = 7,076$; percentages weighted by sex, age and marital status)

	Degree of urbanization					χ^2 -test
	Urbanized Very highly	Urbanized Highly	Urbanized Moderately	Urbanized Not very	Urbanized Not	
Gender						
Male	52.3	48.4	50.4	50.4	52.0	0.250
Female	47.7	51.6	49.6	49.6	48.0	
Age						
18–24 years	15.2	14.7	13.5	12.6	14.9	0.000
25–34 years	31.0	26.6	25.8	22.5	25.0	
35–44 years	23.8	23.1	24.1	24.5	25.0	
45–54 years	17.6	20.4	21.9	23.2	21.1	
55–64 years	12.4	15.1	14.8	17.2	14.0	
Educational level						
Primary, basic vocational	6.7	6.4	5.5	6.3	6.8	0.000
Lower secondary	31.0	34.4	35.8	40.4	41.2	
Higher secondary	24.6	30.1	31.9	28.4	31.7	
Higher professional, university	37.7	29.2	26.8	24.9	20.3	
Household income (net)						
Lowest 25% (\leq fl 2,200)	29.6	25.4	25.8	22.1	19.2	0.000
Mean 50% (fl 2,201–4,400)	48.0	49.9	50.2	48.7	47.4	
Highest 25% ($>$ fl 4,400)	22.3	24.7	24.0	29.2	33.4	
Household composition						
Lives with parent(s)	4.6	6.7	10.2	10.4	11.9	0.000
Lives alone	32.1	21.4	13.8	11.3	9.5	
Single-parent family	5.5	3.7	3.2	2.8	2.7	
Lives with partner (with or without children)	53.5	66.9	71.3	75.0	75.2	
Lives with other(s)	4.2	1.4	1.5	0.5	0.8	
Occupational status						
Homemaker	11.8	17.5	16.7	18.8	18.5	0.000
Student	10.7	7.3	6.8	6.5	5.1	
Employed	62.3	61.5	64.9	60.9	65.8	
Disabled/unemployed	8.7	6.4	5.5	7.1	5.6	
Retired/others	6.5	7.2	6.1	6.7	5.0	

(5 categories). Linear trend analysis was used to test for urban–rural differences in both unadjusted and adjusted odds ratios.

The analyses were performed using STATA [21].

Results

Demographics

Table 1 shows the demographic characteristics (weighted) of the sample according to degree of urbanization.

The very highly urbanized category was younger ($P < 0.001$), more educated ($P < 0.001$), had a higher household (net) income ($P < 0.001$), and were more likely to be living alone ($P < 0.001$) and be disabled/unemployed ($P < 0.001$). Since these demographic characteristics, and gender, are often related to the risk of psychiatric disorder, the presented odds ratios will be adjusted for these confounders.

Prevalence rates

Table 2 presents the prevalence rates according to the level of urbanization.

The prevalence of one or more disorders increased linearly with the level of urbanization (see last line in

Table 2). Trend analysis showed a significant urban–rural trend ($P < 0.001$). The relationship to urbanization was clear for the category of mood disorders ($P < 0.001$). This pattern was also found specifically for major depression ($P < 0.001$). However, the prevalence of dysthymia was not related to urbanization.

The prevalence of the category of anxiety disorders also showed a significant urban–rural trend ($P = 0.002$). Looking at the separate anxiety disorders, there was also a significant difference for the categories of social phobia. There was no significant urban–rural trend for the categories of panic disorder and simple phobia.

There was a significant urban–rural trend for rates of substance use disorders ($P < 0.001$). In addition, there were significant trends in all subcategories of substance use disorders. Most rates of substance use disorders did indicate a ‘gap’ between the three most urbanized categories and the two least urbanized categories.

Comorbidity

For patients with at least one diagnosis, the association between the number of comorbid disorders and urbanization is presented in Table 3.

Overall, there was a significant positive relation between urbanization and the number of diagnoses

Table 2 Twelve-month prevalence of psychiatric disorders among adults (18–64 years) in the Netherlands by degree of urbanization (percentages weighted by sex, age and marital status)

DSM-III-R diagnosis	Degree of urbanization										P for trend
	Very highly urbanized n = 1,242		Highly urbanized n = 1,497		Moderately urbanized n = 1,541		Not very urbanized n = 1,611		Not urbanized n = 1,185		
	% (SE)	n of cases	% (SE)	n of cases	% (SE)	n of cases	% (SE)	n of cases	% (SE)	n of cases	
Mood disorders*	10.4 (0.9)	129	8.9 (0.7)	133	7.3 (0.7)	112	6.2 (0.6)	100	5.3 (0.7)	63	0.000
Major depression (296.20–296.34)	7.9 (0.8)	98	6.8 (0.7)	102	5.4 (0.6)	84	4.9 (0.5)	78	3.6 (0.5)	43	0.000
Dysthymia (300.40)	2.8 (0.5)	35	2.5 (0.4)	38	2.2 (0.4)	34	2.6 (0.4)	41	2.3 (0.4)	27	0.469
Anxiety disorders**	14.4 (1.0)	179	13.7 (0.9)	205	11.5 (0.8)	178	11.4 (0.8)	184	10.8 (0.9)	128	0.002
Panic disorder (300.01;300.21)	2.5 (0.4)	31	2.7 (0.4)	40	2.1 (0.4)	33	1.9 (0.3)	31	1.7 (0.4)	20	0.069
Simple phobia (300.29)	7.9 (0.8)	98	7.7 (0.7)	115	6.6 (0.6)	102	7.0 (0.6)	112	6.0 (0.7)	72	0.069
Social phobia (300.23)	6.4 (0.7)	79	5.0 (0.6)	75	4.2 (0.5)	64	4.1 (0.5)	67	4.2 (0.6)	49	0.007
Substance use disorders	11.2 (0.9)	139	9.3 (0.8)	139	11.2 (0.8)	173	6.6 (0.6)	107	5.8 (0.7)	69	0.000
Substance abuse disorders	5.8 (0.7)	72	6.0 (0.6)	90	6.1 (0.6)	95	2.8 (0.4)	46	3.5 (0.5)	42	0.000
Substance dependence disorders	5.7 (0.7)	71	3.5 (0.5)	53	5.3 (0.6)	82	4.0 (0.5)	64	2.6 (0.5)	31	0.006
Alcohol abuse (305.00)	4.9 (0.6)	61	5.6 (0.6)	84	6.0 (0.6)	93	2.6 (0.4)	42	3.5 (0.5)	42	0.003
Alcohol dependence (303.90)	5.1 (0.6)	63	3.1 (0.5)	47	4.2 (0.5)	65	3.4 (0.5)	55	2.3 (0.4)	27	0.007
One or more DSM-III-R-diagnoses***	28.0 (1.3)	347	24.5 (1.1)	366	24.2 (1.1)	373	20.5 (1.0)	330	18.6 (1.1)	221	0.000

*Includes major depression, dysthymia and bipolar disorder

**Includes panic disorder, simple phobia, social phobia, agoraphobia, generalized anxiety disorder, obsessive compulsive disorder

***Includes mood disorders, anxiety disorders, substance use disorders, schizophrenia and other non-affective psychotic disorders, and eating disorders

($P = 0.026$). The percentage of four or more diagnoses was highest in the most urbanized category. However, the percentage of three diagnoses was highest in the second most urbanized category. Overall, the percentage of detected cases with two or more diagnoses is highest in the most urbanized categories.

■ Adjustment for confounders

In addition to unadjusted Odds Ratios, we calculated ORs adjusted for sex, age, education, household income, occupational status and composition of the household (Table 4).

The adjusted ORs show whether urbanization remains related to prevalence rates after adjustment for the influences of competing determinants. The relative difference between unadjusted rates and adjusted rates in order of size was -2% for anxiety disorders, $+13\%$ for total prevalence rates, $+20\%$ for mood disorders and $+34\%$ for substance abuse disorders. If

we consider a difference greater than 10% as important [22] then these differences are important, with the exception of the difference for anxiety disorders. However, after these adjustments, urbanization was still positively related to the prevalence of one or more disorders and to the prevalence of the separate categories of mood disorders, anxiety disorders and substance use disorders. Although the range of the odds ratios for the five categories of urbanization was generally narrower after adjustment, the trend analysis still indicated highly significant urban–rural trends for all main diagnostic groups (all $P < 0.005$).

Discussion

The distinction between five categories of urbanization did show that differences in prevalence rates are considerable, particularly between the very highly urbanized municipalities on the one hand and the

Table 3 12-Month psychiatric comorbidity percentage among cases (12-month prevalence) in the Netherlands by degree of urbanization (percentages weighted by sex, age and marital status)

Number of diagnoses (%) of people with one or more DSM-III-R-diagnoses	Degree of urbanization					χ^2 -test
	Very highly urbanized % (n)	Highly urbanized % (n)	Moderately urbanized % (n)	Not very urbanized % (n)	Not urbanized % (n)	
1 diagnosis	61.6% (232)	59.9% (214)	69.3% (243)	70% (216)	67.8% (146)	Chi ² = 25.6
2 diagnoses	19.8% (76)	21.8% (80)	14.8% (53)	16.2% (51)	22.2% (49)	F = 1.94
3 diagnoses	7.6% (31)	10.3% (40)	7.6% (29)	7.1% (24)	6.3% (15)	P = 0.026
4 or more diagnoses	11.0% (42)	8.1% (29)	8.2% (30)	6.7% (21)	3.8% (8)	
% Comorbidity of cases	38.4% (149)	40.1% (149)	30.7% (112)	30.0% (96)	32.2% (72)	
Total	100% (381)	100% (363)	100% (355)	100% (312)	100% (218)	

Table 4 Odds ratios by degree of urbanization, based on the 12-month prevalence of psychiatric disorders among adults (18–64 years) in the Netherlands (adjusted for gender, age, education, household income, social and occupational status and household composition)

Degree of urbanization	Mood disorders			Anxiety disorders			Substance abuse disorders			One or more DSM-III-R-diagnoses		
	Adj. odds-ratio	95% BI	Unadj. odds-ratio	Adj. odds-ratio	95% BI	Unadj. odds-ratio	Adj. odds-ratio	95% BI	Unadj. odds-ratio	Adj. odds-ratio	95% BI	Unadj. odds-ratio
Very highly urbanized	1.75	1.25–2.45	2.1	1.47	1.13–1.91	1.44	1.74	1.23–2.47	2.33	1.56	1.27–1.93	1.77
Highly urbanized	1.66	1.20–2.31	1.71	1.41	1.10–1.81	1.3	1.49	1.05–2.11	1.72	1.4	1.15–1.73	1.42
Moderately urbanized	1.32	0.94–1.85	1.32	1.13	0.87–1.46	1.06	1.78	1.26–2.50	1.81	1.31	1.07–1.60	1.27
Not very urbanized	1.30	0.93–1.82	1.22	1.22	0.95–1.57	1.13	1.10	0.77–1.58	1.14	1.25	1.02–1.53	1.16
Not urbanized	1.00	–	1.00	1.00	–	1.00	1.00	–	1.00	1.00	–	–
<i>P</i> for trend	0.000		0.000	0.002		0.002	0.001		0.000	0.000		0.000

non-urbanized municipalities. The most urbanized category had a prevalence rate for one or more disorders that was 77% higher than the least urbanized category. After adjustment for demographic differences, the prevalence rate was still 56% higher, showing that demographic differences only partly explain the urban–rural difference. Not only did the prevalence rates show a positive relation with urbanization, comorbidity rates did also as the percentage of detected cases having two or more diagnoses was highest in the most urbanized categories. Furthermore, the distinction between five categories of urbanization revealed that, for most diagnostic groups, there is a linear trend of rising prevalence rates according to degree of urbanization.

Before discussing the significance of these results for mental health services, we should know how survey data and utilization data relate. There are no utilization data available for all Dutch inhabitants relating to the degree of urbanization. However, we learnt from the NEMESIS survey that the proportion of people with a psychiatric disorder attending mental health services did not differ between rural and urban communities [23]. This implies that utilization rates will have approximately the same urban–rural ratio as the prevalence rates found in this study, since they are 77% higher in urban areas compared to rural areas, while the proportion of cases with comorbidity is also higher. This higher utilization figure puts a strain on the mental health services in urban areas since the distribution of funds does not generally keep up with the need for services. The consequences are, for instance, longer waiting lists and pressure to keep treatments and admissions short. When the availability of services is limited, the quality of care has to be monitored closely. An indirect way of coping with higher demand for mental health care in strongly urbanized areas is to put extra effort into prevention activities. Ideally, maintaining a match between the provision of services and demand for mental health care would be the best option since, in the case of under-provision, other social institutions and society will have to bear the ‘costs’. Urbanization may therefore be a useful indicator for allocating mental health funds and services.

When comparing our findings from NEMESIS with the Dutch figures from the European ESEMeD 2000

study [11], we suppose that the sample sizes primarily account for the difference between the findings. While our study has 7,076 respondents (17% of whom are from strictly rural municipalities), the Dutch part of ESEMeD comprised only 2,371 respondents (5% of whom were from rural municipalities). Furthermore, people over 65 were included in ESEMeD, while our sample only covers people in the range 18–64 years. These differences may explain why, contrary to our findings, no significant urban–rural differences were found in ESEMeD for the Netherlands.

Comparison with surrounding countries shows that Great Britain [13, 14], France [11] and Germany [11, 24] also have urban–rural odds ratios above one which are, however, not always significant. On the other hand, the findings for the neighboring country of Belgium were strikingly different [11] as the rate for any disorder was significantly higher than total urban rates. This is an exceptional finding in the field, which should caution us against generalizing results.

A limitation of this study is that homeless people were not included in the sample. Nor were people staying in psychiatric hospitals. These factors result in the underestimation of prevalence rates for the most urbanized municipalities in particular. So when generalizing these results we have to keep in mind that the real urban–rural difference is actually slightly more pronounced.

NEMESIS was the first large national representative population study of psychiatric morbidity in the Netherlands [15, 16]. This study opened up the opportunity to adjust for a range of confounders. There were urban–rural trends in unadjusted prevalence rates, and this relationship remained after adjustment for these confounders. Generally, ratios were lowered by adjustment, but the trends remained significant. It is difficult to give an unequivocal explanation for the robust urban–rural differences found in the Netherlands. The two main hypotheses used in the field are the “breeder hypothesis” and the “drift hypothesis” [25]. The first hypothesis is that people in highly urbanized communities suffer from psychiatric syndromes because of environmental stressors, such as a lack of social cohesion, restricted living space, over-stimulation, low-quality housing and the higher prevalence of criminality [26–28]. The

second explanatory hypothesis—the “drift hypothesis”—assumes that selective migration may take place, resulting in a concentration of the mentally ill in more urbanized environments. Although concentrations of, in particular, schizophrenic patients in deprived inner-city areas have often been documented [29, 30], evidence concerning the drift process within cities is sparse [31]. The number of available studies, and therefore evidence, about urban–rural drift is also sparse [32, 33]. In summary, the literature provides some evidence for the breeder hypothesis, but there is no evidence available for urban–rural drift processes, possibly due to the low number of studies.

Conclusion

By presenting five categories of urbanization, this study was able to specify further the relationship between urbanization and the prevalence of psychopathology in the Netherlands. In summary, the study confirms that psychiatric disorders are both more common and more complex (comorbidity) in more urbanized areas. This should be reflected in service allocation. The urban–rural differences found may be related to environmental risk factors, although drift processes cannot be ruled out.

References

- Dohrenwend BP, Dohrenwend BS (1974) Psychiatric disorders in urban settings. In: Caplan G (ed) *American handbook of psychiatry*. Basic Books, New York, pp 424–447
- Marsella AJ (1998) Urbanization, mental health, and social deviancy. A review of issues and research. *Am Psychologist* 53(6):624–634
- Mueller DP (1981) The current status of urban-rural differences in psychiatric disorder. An emerging trend for depression. *J Nerv Ment Disease* 169(1):18–27
- Neff JA (1983) Urbanicity and depression reconsidered. The evidence regarding depressive symptomatology. *J Nerv Ment Disease* 171:546–552
- Peen J, Schoevers RA, Beekman AT, Dekker J (2007) The current status of urban-rural differences in psychiatric disorders (Submitted)
- Verheij RA (1996) Explaining urban-rural variations in health: a review of interactions between individual and environment. *Soc Sci Med* 42(6):923–935
- Webb SD (1984) Rural-urban differences in mental health. In: Freeman H (ed.) *Mental health and the environment*. Churchill Livingstone, London, pp 227–249
- Blazer D, George LK, Landerman R, Pennybacker M, Melville ML, Woodbury M, Manton KG, Jordan K, Locke BZ (1985) Psychiatric disorders: A rural/urban comparison. *Arch Gen Psychiatry* 42:651–656
- Kessler RC, McGonagle KA, Zhao B, Nelson CB, Hughes M, Eshleman S, Wittchen H-U, Kendler KS (1994) Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States: results from the national comorbidity survey. *Arch Gen Psychiatry* 51:8–19
- Kessler RC, Chiu WTA, Demler OM, Walters EEM (2005) Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the national comorbidity survey replication. *Arch Gen Psychiatry* 62:617–627
- Kovess-Masfety V, Alonso J, de Graaf R, Demyttenaere K (2005) A European approach to rural-urban differences in mental health: the ESEMeD 2000 comparative study. *Can J Psychiatry* 50(14):926–936
- den Dulk CJ, Stadt H van den, Vliegen JM (1992) Een nieuwe maatstaf voor stedelijkheid: de omgevingsadressendichtheid (A new criterion for degree of urbanization: the local address density). *Maandstatistiek van de Bevolking* 7:14–27
- Paykel ES, Abbott R, Jenkins R, Brugha TS, Meltzer H (2000) Urban-rural mental health differences in great Britain: findings from the national morbidity survey. *Psychol Med* 30(2):269–80
- Weich S, Twigg L, Lewis G (2006) Rural/non-rural differences in rates of common mental disorders in Britain: prospective multilevel cohort study. *Br J Psychiatry* 188:51–57
- Bijl RV, Ravelli A, Zessen G van (1998) Prevalence of psychiatric disorder in the general population: results of The Netherlands mental health survey and incidence study (NEMESIS). *Soc Psychiatry Psychiatr Epidemiol* 33:587–595
- Bijl RV, Zessen G van, Ravelli A, de Rijk C, Langendoen Y (1998) The Netherlands mental health survey and incidence study (NEMESIS): objectives and design. *Soc Psychiatry Psychiatr Epidemiol* 33:581–586
- Robins LN, Wing J, Wittchen H-U, Helzer JE, Baber TB, Burke J, Farmer A, Towle LJ (1988) The composite international diagnostic interview: an epidemiologic instrument suitable for use in conjunction with different diagnostic systems and in different cultures. *Arch Gen Psychiatry* 45:1019–1077
- Smeets RMW, Dingemans PMAJ (1993) Composite international diagnostic interview (CIDI), Version 1.1. World Health Organization, Amsterdam
- Wittchen HU (1994) Reliability and validity studies of the WHO-Composite International Diagnostic Interview (CIDI): a critical review. *J Psychiatric Res* 28(1):57–84
- Altman DG (1991) *Practical statistics for medical research*. Chapman & Hall/CRC, Boca Raton
- StataCorp (2003) *Stata Statistical Software, release 8.1*. Stata, College Station, Texas
- Rothman KJ, Greenland S (1998) *Modern epidemiology*. Lippincott-Raven, Philadelphia, pp 255–257
- Bijl RV, Ravelli A (2000) Psychiatric morbidity, service use, and need for care in the general population: results of The Netherlands Mental Health Survey and Incidence Study. *Am J Public Health* 90:602–607
- Dekker J, Peen J, Smit F, Schoevers RA (2006) Prevalence of psychiatric disorders in relation with urbanization in Germany (Submitted)
- Verheij RA, Mheen HD van de, Bakker DH de, Groenewegen PP, Mackenbach JP (1998) Urban-rural variations in health in the Netherlands: does selective migration play a part? *J Epidemiol Commun Health* 52:487–493
- Dalgard OS, Tambs K (1997) Urban environment and mental health. A longitudinal study. *Br J Psychiatry* 171:530–536
- Halpern D (1995) *Mental health and the built environment*. Taylor & Francis, London
- Pedersen CB, Mortensen PB (2001) Evidence of a dose-response relationship between urbanicity during upbringing and schizophrenia risk. *Arch Gen Psychiatry* 58:1039–1046
- Faris R, Dunham H (1939) *Mental disorders in urban areas*. University of Chicago Press, Chicago
- Giggs JA, Cooper JE (1987) Ecological structure and the distribution of schizophrenia and affective psychoses in Nottingham. *Br J Psychiatry* 151:627–633
- Dauncey K, Giggs J, Baker K, Harrison G (1993) Schizophrenia in Nottingham: lifelong residential mobility of a cohort. *Br J Psychiatry* 163:613–619
- Moorin RE, Holman CDJ, Garfield C, Brameld KJ (2006) Health related migration: Evidence of reduced ‘urban-drift’. *Health Place* 12(2):131–140
- Pedersen CB, Mortensen PB (2006) Are the cause(s) responsible for urban-rural differences in schizophrenia rooted in families or in individuals? *Am J of Epidemiol* 163(11):971–978

Copyright of *Social Psychiatry & Psychiatric Epidemiology* is the property of Springer Science & Business Media B.V. and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.