REVIEW ARTICLE

Cities and Mental Health

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SUMMARY

Background: More than half of the global population currently lives in cities, with an increasing trend for further urbanization. Living in cities is associated with increased population density, traffic noise and pollution, but also with better access to health care and other commodities.

Methods: This review is based on a selective literature search, providing an overview of the risk factors for mental illness in urban centers.

Results: Studies have shown that the risk for serious mental illness is generally higher in cities compared to rural areas. Epidemiological studies have associated growing up and living in cities with a considerably higher risk for schizophrenia. However, correlation is not causation and living in poverty can both contribute to and result from impairments associated with poor mental health. Social isolation and discrimination as well as poverty in the neighborhood contribute to the mental health burden while little is known about specific interactions between such factors and the built environment.

Conclusion: Further insights on the interaction between spatial heterogeneity of neighborhood resources and socio-ecological factors is warranted and requires interdisciplinary research.

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Urbanization is one of the main health-relevant changes humanity is facing in our time, and will be facing in the coming decades (1). Today more than 50 percent of the global population is living in cities; by 2050, this rate will increase to nearly 70 percent with more than 50 percent of the urban population living in cities of over 500 000 inhabitants (2). With growing urbanization, more and more people are exposed to risk factors originating from the urban social (e.g. poverty) or physical environment (e.g. traffic noise), contributing to increased stress, which in turn is negatively associated with mental health. By contrast, cities provide better access to health care, employment, and education. The balance between those factors that are deleterious and those that are protective for mental health calls for a better understanding of the interaction between city living and mental health.

Methods

We performed a selective literature review that synthesizes the current evidence for urban population mental health. We mainly included meta-analyses and quantitative studies presenting evidence from rural-urban or inner-urban differences in mental disorders. Qualitative studies were excluded as well as studies in which mental health was used to predict other outcomes. Results are interpreted based on the theories by Stokols (3), Galea et al. (4), and Gruebner et al. (5) with particular consideration of socio-ecological environments and their associations with mental health.

Results

Rural-urban differences in mental health

The risk for some major mental illnesses (e.g. anxiety, psychotic, mood, or addictive disorders) is generally higher in cities (e.g. 6). Studies on anxiety disorders (including posttraumatic stress disorder, distress, anger, and paranoia) found higher rates in urban versus rural areas in several Latin American and Asian countries (7–10). The same was true for psychotic disorders (e.g. schizophrenia) in China (11) and in large urban areas in Germany (12, 13). In a Danish study, the risk for schizophrenia was more than twofold for individuals who had spent their first 15 years in a major city versus those who had grown up in rural areas (14) (see the Table for a selective summary). Epidemiological studies further confirmed that the risk for schizophrenia was higher in people who grew up in cities (versus rural areas), thereby exhibiting a dose-response relationship:

The more time spent in an urban environment as a child, the higher the risk for schizophrenia as an adult (15–23).

Likewise, mood disorders were observed more frequently among residents of large cities in Germany (12). In contrast, rural residents in China were more likely to have depressive disorders (8, 24). This was also true in a study on common perinatal mental disorders (depression and substance use) in women in Vietnam (25). Addictive disorders (for instance excessive use of massive multiplayer online role-playing games [MMORPG]) was mainly found among young adult university graduates living alone in urban France (26). In contrast, rural residents were more likely to have alcohol dependence than were urban residents, as shown in a study in China (8).

Inner-urban differences and mental health

Urban social environments:

Social risk factors for mental health in cities include

- concentrations of low socio-economic status (SES) (e.g. education levels, income),
- low social capital (e.g. social support, efficacy),
- or social segregation (e.g. perceived minority status, ethnic group membership) (27–34).

SES is by far the most studied risk factor and has been consistent in its association with mental health. For example, living in poor or deprived neighborhoods is associated with greater risk of poor mental health (e.g. depression, schizophrenia) versus living in richer neighborhoods (27, 29, 33, 35–40, e1–e4). The association between familial liability and mental illness was stronger in more deprived neighborhoods, with neighborhood variables mediating urbanicity effects in Turkey (38). In another study, adverse conditions associated with very poor neighborhoods in slums were associated with mental health disorders in India (39). Persons within disadvantaged areas may have more difficulties building and sustaining supportive social relationships and may have increasing susceptibility to mental illness. Evidence also exists for socially disorganized neighborhoods in which people feel insecure and frequently experience violence (e1, e2), contributing to increased trauma exposure with related consequences for mental health (40, e3, e4).

However, it is important to keep in mind that correlation is not causation. Selective migration may lead to worse population health in those neighborhoods that movers leave behind and to better health at the destination, as movers often have better health status (e5, e6).

Research also indicated a reciprocal effect, that is, people who had poor health or who experienced difficult life events (e.g. relationship breakdown, job loss) were more likely to move to more deprived areas versus others (e7, e8), e.g., due to low, affordable rents. For example, increased schizophrenia risk was reported for living in an urban environment five years after disease onset (14). However, this effect did not fully explain increased schizophrenia rates in inner cities, because numerically, effects of urbanization early in life were somewhat larger, suggesting at least two mechanisms: First, growing up in cities has an effect on illness risk, and second, higher amounts of people with health problems move to urban areas (17).

Living in socially deprived neighborhoods itself may have a heritable component (ranging from a 65% elevated variance in a sibling study to 41% in a twin study) (e9). The authors assume that genetic susceptibility for schizophrenia predicts subsequent residence in individuals with schizophrenia. They found that effects of population density on schizophrenia risk disappeared when known familial risk factors were accounted for, and assumed that in relatives of schizophrenia subjects, familial or specifically genetic risk factors are associated with cognitive functions, which causally contribute to living in poverty (e9). However, such familial and even genetic risk factors may be independent of cognitive style and rather include visible minority status.

Indeed, schizophrenia risk is substantially increased in migrants, not only in the first generation exposed to transitional stressors, but also in subsequent generations (e10). Moreover, psychosis rates are particularly high when patients belong to a visible minority (e.g., people from West Africa and the Caribbean in London, Moroccans in Den Haag) (34) and when the ethnic density in the neighborhood is low. These findings suggest that social exclusion and discrimination play an important role in the development of schizophrenia (e11).

In turn, neighborhoods characterized by higher social support and collective efficacy may buffer perceived stress through support networks promoting mental health (e12, e13). In addition, neighborhood social support networks may also contribute to social norms and practices that have been found to be protective for substance use disorders or suicide attempts (30–32).

Living in neighborhoods characterized by residential ethnic segregation is associated with greater risk of depression and anxiety, versus living in less segregated neighborhoods (29, e3, e14). Our research group investigated the differential contribution of poverty and minority status at the community level on individual-level mental health, controlled by individual-level differences in SES and migration in an inner city population in Berlin, Germany (27) *(Figure)*.

We found that individual-level mental distress in migrants was associated with community-level poverty, independent of individual-level SES, in that, roughly, a 10% increase in the percentage of residents receiving public welfare in the neighborhood corresponded to an increase of 8 points on the GHQ-28 (General Health Questionnaire).

We noted that the effect of poverty was more pronounced in migrants versus native citizens, in that a 10% increase in the proportion of residents with a migration background accounted for an additional 5 points on the GHQ-28. Our observations suggest that

TABLE

Studies on the effect of urban exposure on mental health*[1]

Reference	Exposure factor	Outcome	Effect size	95% CI [Lower level; upper level]
Peen et al. (2010) (6)	Urban vs. rural	Any disorder*[2]	1.38 (OR)	[1.17; 1.64]
	Urban vs. rural	Mood disorder*[2]	1.39 (OR)	[1.23; 1.58]
	Urban vs. rural	Anxiety disorder*[2]	1.21 (OR)	[1.02; 1.42]
	Urban vs. rural	Substance use disorder*[2]	1.31 (OR)	[0.97; 1.78]
Vassos et al. (2012) (15)	Continuous urbanicity index	Schizophrenia	2.38 (OR)	[2.01; 2.81]
Pedersen & Mortensen (2001) (14)	Per 15 years lived in capital city vs. rural area	Schizophrenia*[3]	2.75 (RR)	[2.31; 3.28]
	Per 15 years lived in capital suburb vs. rural area	Schizophrenia*[3]	1.69 (RR)	[1.43; 1.99]
	Per 15 years lived in provincial city vs. rural area	Schizophrenia*[3]	1.71 (RR)	[1.41; 2.06]
	Per 15 years lived in provincial town vs. rural area	Schizophrenia*[3]	1.32 (RR)	[1.13; 1.54]
Mortensen et al. (1999) (23)	Place of birth: Capital vs. rural area	Schizophrenia*[3]	2.40 (RR)	[2.13; 2.70]
	Place of birth: Capital suburb vs. rural area	Schizophrenia*[3]	1.62 (RR)	[1.37; 1.90]
	Place of birth: Provincial city vs. rural area	Schizophrenia*[3]	1.57 (RR)	[1.36; 1.81]
	Place of birth: Provincial town vs. rural area	Schizophrenia*[3]	1.24 (RR)	[1.10; 1.41]
Cantor-Graae & Selten (2005) (e10)	First generation migrants vs. natives	Schizophrenia	2.7 (RR)	[2.3; 3.2]
	Second generation migrants vs. natives	Schizophrenia	4.5 (RR)	[1.5; 13.1]
	First and second generation migrants vs. natives	Schizophrenia	2.9 (RR)	[2.5; 3.49]
Veling et al. (2008) (34)	Immigrant vs. Dutch in urban area of low ethnic density	Psychotic disorder*[3]	2.36 (IRR)	[1.89; 2.95]

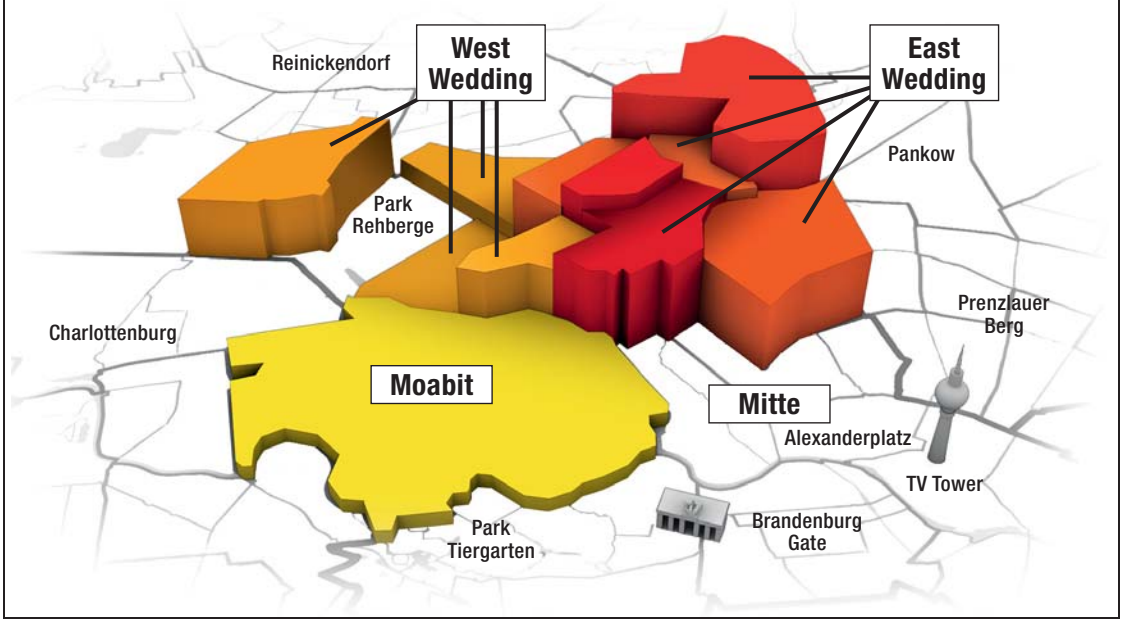
*[1]Selective summary results of studies using meta analyses (6, 15 ,e10) or large population sizes (>1.75 million) (14, 23);
Provincial cities had more than 100 000 inhabitants and provincial towns more than 10 000 inhabitants (14, 23).
We also included one study that looked at psychotic disorders among immigrants in The Hague, Netherlands (34), to cover inner urban differences in mental health.
*[2]Unadjusted; *[3]adjusted;
CI, confidence interval; IRR=Incidence rate ratio; OR= Odds ratio; RR=Risk ratio

the high level of mental distress in migrants was largely driven by community-level SES, beyond the effects of individual resources, emphasizing the need for targeted interventions (27).

There is also cumulative evidence that urban residents belonging to a minority group including those with a migration background carry an increased risk for depression and psychosis (e15–e18). Remarkably, social support among minorities appears to be an important protective factor, while having visible minority status as a resident in neighborhoods with low numbers of ethnic minorities ("lower ethnic density") was associated with increased rates of e.g. schizophrenia (34). Such effects may well be due to increased discrimination in segregated neighborhoods and are supported by neurobiological studies emphasizing the role of social isolation stress in the development of mental disorders (e11, e19).

Urban physical environments: Similar patterns can be found for the urban physical environment that compared to rural areas may contain

FIGURE



Mental distress (mean GHQ-28 scores) as a function of local poverty levels (beyond individual SES), as defined by the percentage of residents receiving public welfare, in 11 local neighborhoods in the inner city borough of Berlin (Mitte).
The percentage of residents receiving public welfare is depicted in yellow (low) to red (high) color-coding (range: 18% to 45%), and mean levels of mental distress (Mean GHQ-28 scores = 18.53, standard deviation = 4.79, range 10.7 to 26.3) are shown as column heights in each local neighborhood.
GHQ, General Health Questionnaire; SES, socio-economic status

- higher rates of pollution (e.g., air, water),
- noise pollution (e.g., traffic)
- specific urban designs (e.g. tall buildings that may be perceived as oppressive),
- or more physical threats (e.g., accidents, violence),

thereby likely increasing stress levels with negative effects on mental health (5, e20–e25). Research indicates that urban air, water, and noise pollution can have substantial effects on the mental health of urban populations. For example, living close to major streets or airports increases exposure to traffic noise and pollution and is associated with higher levels of stress and aggression (e20, e26–e28).

Adjusted by SES, age, and type of residential area, one study in Germany found that those who were highly annoyed by road traffic, had a 1.8-fold (women) and 2.5-fold (men) increased risk for impaired mental health (e29). Urban light exposure may further influence the circadian rhythm and change sleeping patterns with known consequences for mental well-being (e30).

Urban design exhibits associations with population mental health (4, e22, e23, e31–e41). For example, greater access to green space and better walkability was

associated with less depression and enhanced physical activity that may promote health (e32–e34). Furthermore, the recreational aspects of well-maintained urban green and blue spaces are apparently associated with the mental well-being of urban populations (e33, e42, e43). Urban green and blue features additionally have the capability to buffer urban heat island effects and to reduce heat stress (e44). Moreover, urban street canopy can reduce the "oppressive" effects of tall buildings (e22, e23).

In addition, urban density (as opposed to sprawl) has been associated with better mental health as it comprises better access to resources (e.g. parks, playgrounds, health-, and social care) (e45).

In contrast, less green space may indicate more traffic noise and worse access to neighborhood resources, which may lead to low housing rents attracting low SES groups. Work in the field of environmental justice may offer more insights into these relationships and may help further promote mental health in urban areas.

Future challenges

Urban neighborhoods play a particular role in shaping urban population health due to their unique socio-ecological environments constituting both risk and health promoting factors (6, 12, 36, e46). Six key challenges and opportunities for future research directions need to be addressed:

First: there remains much we need to know about the functional relationships between city living or upbringing and mental health problems in urban populations (19–22, 37, e47–e49). Research would benefit from more longitudinal studies facilitating the analysis of causal relationships between the duration of exposure to inner-urban socio-ecological factors and mental health.

Second: we do not know much about the associations of neighborhood resources (e.g. green spaces) with different dimensions of mental health. Although studies have looked into different mental health outcomes, they have not been systematically assessed within the same contexts, that is, whether e.g. green spaces are associated with similar effects across mental health dimensions.

Third: we also do not know much about socio-demographic differences in the relationship between access to neighborhood resources and mental health (19). Socio-demographic groups may not have similar access to these resources and may be disproportionately distributed benefiting e.g. more affluent populations, which is increasingly recognized as an environmental justice issue (e50). Including these issues in the context of urban mental health may help for more sustainable distributions of balanced resources.

Fourth: our understanding of moderators (e.g. social or ethnic segregation) to help explain differences between groups in mental health is also limited (27, 28, 30). In this context, breaking up social and ethnic segregation and discrimination appears to be warranted to improve living conditions and reduce social isolation. Furthermore, both heterogeneous and homogeneous neighborhoods (e.g. low SES) may have negative associations with individual level mental health such that respective effects can only be assessed in multilevel-adjusted research studies. In addition, we do not know whether the risk of mental health problems is reduced in people if they think they have the option to move away.

We also do not know much about the spatial heterogeneity in the association of neighborhood resources with mental health across urban neighborhoods. High unemployment rates in one neighborhood may have an effect also on adjacent neighborhoods (30). For example, high unemployment rates are associated with higher substance abuse (e51) and may affect drug use in neighboring parks or facilities, even though unemployment (or substance use) rates are low there.

Fifth: our knowledge on synergies between interventions is limited, so that we do not know much about the mental health effects of policies that were not specifically designed for improving mental health of urban populations (e.g. introducing street trees, reduced-traffic areas). Systematic evaluations of interventions that have worked in other settings and their effects on urban mental health are still scarce in the literature, especially in developing cities of resource poor countries (e52, e53).

Sixth: interdisciplinary research between architecture, city planning, epidemiology, geography, neurosciences, and sociology are crucial to better understand to which extent urban socio-ecological environments affect population mental health. Such an approach may also identify populations who lack the "urban advantage" and who are at risk for psychopathology.

Conclusions

A series of studies exhibit interaction between urbanicity, the socio-ecological environment, and mental health (19, 27). Research would benefit from more longitudinal studies focusing on both rural-urban and inner-urban causes and distributions of mental health.

More in-depth knowledge about different dimensions of mental health disorders across diverse socio-demographic groups might shed light on the distributions of these disorders and guide us in better developing health promoting urban designs. Knowledge on moderators from the socio-ecological environment, on the spatial heterogeneity of neighborhood resources, and their associations with mental health within and across neighborhoods will help to elucidate the mechanisms linking urban environments to mental health.

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Supplementary material
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