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Socioeconomic deprivation and psychopathology: associations at the global and local level

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Socioeconomic deprivation and psychopathology:

associations at the global and local level

Leah Jones

A thesis submitted to the School of Psychology, Bangor University, in partial fulfilment

of the requirements of the degree of Doctorate in Clinical Psychology

May 2017

Declarations

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Acknowledgments

A big thank you to Mike Jackson, for allowing and encouraging me to pursue my own research interests, even when things weren't always going to plan.

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Most of all I would like to thank Chris Saville. Mi rwyt ti wedi bod yn wych. Diolch o galon.

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"As long as poverty, injustice and gross inequality persist in our world, none of us can rest."

Nelson Mandela

Summary

Socioeconomic deprivation is associated with negative health outcomes including mental health. This thesis explores associations between socioeconomic deprivation and psychopathology in adults, both globally, and locally, presented across three chapters.

A systematic review of literature published over the past ten years reporting on prevalence rates of psychopathology in adults experiencing homelessness is presented in Chapter 1. Thirty-one studies were included in the review, with a pooled sample of 53,299 individuals. Robust evidence of an association between homelessness and psychopathology was found, in studies conducted in Europe, North America, Australasia, Asia and Africa. Rates of psychopathology were found to be considerably higher than general population estimates, which is consistent with findings documented in a previous systematic review.

An empirical study, presented in Chapter 2, investigated associations between multiple types of deprivation, measured at the neighbourhood-level, and psychiatric admissions, across North Wales over a six-year period. Multiple deprivation was highly significantly associated with incidence of cases admitted, with areas of greater overall deprivation predictive of higher admissions. This relationship was stronger for people with psychosis-related conditions than for those with other mental health conditions.

Chapter 3 considers the results of both articles presented in the previous chapters, and provides a discussion of theoretical and clinical implications, as well as personal reflections regarding the research process and results.

Chapter 1: Literature Review

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Prevalence of psychopathology in adults experiencing homelessness: a systematic review

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Abstract

Purpose: To systematically review studies published between January 2007 and April 2017 reporting on prevalence of psychopathology in adults experiencing homelessness.

Methods: Web of Science, PsycINFO and PubMed were searched using keywords relating to homelessness and psychopathology.

Results: 31 studies conducted in North America, Europe, Australasia, Asia and Africa were included in the review, with a pooled sample of 53,299 individuals. Studies consistently report elevated psychopathology among adults experiencing homelessness, with considerably higher rates than reported in general population estimates. Study designs varied, with different homelessness definitions used for inclusion criteria, and various mental health assessment tools. In the methodologically superior studies, the prevalence range of psychopathology generally was 40-93%, with high rates of mood, anxiety, personality, psychotic, and substance-use disorders, as well as PTSD, and dual-diagnosis.

Conclusions: Experiencing homelessness - which typically appears to be a long-term, chronic state for the majority of individuals- is associated with psychological distress. Temporal precedence is not confirmed. Models of mental health and social care to best meet the needs of adults experiencing homelessness require further investigation.

The authors declare that they have no conflict of interest.

Keywords: homelessness, psychopathology, mental health, systematic review.

The United Nations attempted a global survey of homelessness in 2005, and estimated 100 million people were homeless, including those who were roofless (i.e. street homeless), and those who lacked a place of usual residence, e.g. sleeping in shelters, refuges, or 'sofa-surfing' [1]. In 2015, it was reported that 1.6 billion people lacked adequate housing [2]. In the USA over 1.5million people (one in 200) were reported to have accessed homeless shelters or emergency housing between 2008-2009 [3]. During the same 12-month period in England, over 75,000 persons were reported to be homeless (approximately one in 800) [4].

Causes of homelessness are complex and are hypothesised to result from interactions between individual and structural factors. Individual-level factors associated with homelessness include poverty, childhood adversity, family conflict, having been in the child welfare system, associations with criminal justice systems, and mental health and substance misuse problems. Structural factors include an absence of a safety net/support network, a lack of low-cost housing, and a lack of employment opportunities [3, 5].

There is a substantial literature reporting on inequalities experienced by homeless persons, with risks to personal safety and serious physical morbidity contributing to significantly increased mortality rates compared to the general population [6, 7]. Elevated rates of mental illness among persons experiencing homelessness in high-income countries are also well documented, with publications dating back a number of decades. In a systematic review published in 2008[5] the authors collated the findings of studies reporting on the prevalence of mental disorders among homeless adults in Western countries, with the final sample of 29 articles published between 1979 and 2005, involving 5684 individuals. The most common mental disorders were found to be alcohol (range 8%-58%) and drug (range 5%-54%)

dependence. The prevalence of a psychotic illness was found to be much higher than is generally reported in community estimates, ranging between 3% and 42%. Depression was found to have a high prevalence (range 0%-41%) as was personality disorder (range 2-71%).

In an earlier systematic review focusing on rates of schizophrenia alone in homeless persons, Folsom et al [8] estimated a weighted average prevalence of 11% (range 2-45%), compared to prevalence estimates of 1% in the general population. Homeless women (without children) were found to be twice as likely to be diagnosed with schizophrenia than men, and highest rates were found among those who were chronically (long-term) homeless. In a systematic review focused on psychopathology in young people aged 16-25 experiencing homelessness, Hodgson et al [9] found the prevalence of psychiatric conditions was greater than 48% (range 48%-98%), with conduct disorder, mood disorder, psychosis, PTSD, and ADHD particularly prevalent, with rates significantly higher than estimates of community samples.

The purpose of the current review is to provide an updated collation of the literature published over the past decade, reporting on psychopathology in adults experiencing homelessness. Studies conducted in non-Western countries are limited, and have been omitted from previous reviews; the current review is inclusive.

Methods

An electronic search of articles published in peer-reviewed journals between January 2007 and April 2107 was conducted via Web of Science, PsycINFO and PubMed. To capture relevant publications, search terms relating to homelessness (homeless*, roofless, shelter, hostel) were combined with terms relating to psychopathology (psych*, mental*, depress*, personality disorder, suicid*, trauma, anxiety, mood, schizophrenia, self-harm).

Titles and abstracts were initially screened. Studies were excluded if: they were not published in the English language; their focus was on children/youth; their focus was exclusively physical health; or if the target population was non-homeless or at-risk of homelessness. The remaining articles were read in full, and excluded if they did not meet the following inclusion criteria: reporting prevalence rates of mental illness / psychopathology in adults experiencing homelessness; with a clear description of how homelessness was defined. Information was collated regarding study location, sample size, age of participants (mean and/or range where available), percentage of males and females, study design, recruitment/sampling strategy, measures used, prevalence found, and how homelessness was defined, which can be seen in Table 1.

Insert Table 1

Results

Of the 5399 references initially returned in the searches 31 studies met inclusion criteria. Studies were conducted in a variety of countries: USA (n = 10), Canada (n = 4), Australia (n= 3), Japan (n = 3), UK (n = 2), Spain (n = 1), Greece (n = 1), Denmark (n = 1), Serbia (n = 1), Poland (n =1), Ireland (n = 1), Sweden (n = 1), Hungary (n = 1), Greece (n = 1), Hong Kong (n = 1), and Ethiopia (n = 1). One study compared prevalence in two different countries (USA and Poland). The majority of studies were cross-sectional (n = 24), with others being longitudinal (n = 2), or retrospective database studies (n = 5). The pooled sample size of all studies was 53,299 adults experiencing homelessness.

Definitions of homelessness

Homelessness was defined in a number of ways, with participant inclusion criteria varying between studies. The majority of studies (n = 23) included persons who lacked a fixed address, who were staying in homeless shelters/hostels/emergency housing, or who were unsheltered/street homeless. Two studies focused on street-homelessness alone (having spent at least the past 24-hours on the street), while six studies focused on persons living in shelters alone.

Prevalence of Psychopathology

Twenty articles reported the prevalence of homeless adults experiencing any psychiatric condition, with rates ranging from 27% [23] to 93% [18, 22], and with 60% of the studies reporting rates higher than 50% [10,12,14,15,17,18,19, 22,25,37,38,40]. Fourteen articles reported rates of psychotic illnesses (including schizophrenia and psychosis), with prevalence ranging from 4%[26] to 53%[31]. The majority of studies

reported levels between 10%-20%[12,1422,25,34,35,38,40], with four articles reporting higher prevalence (36%[30], 41%[17], 48%[36], and 53%[31]), and two reporting lower prevalence (4%[26] and 5%[33]).

Sixteen articles reported rates of mood disorder (i.e. depression), with prevalence ranging from 6% [30] to 82% [32]. Five reported prevalence above 40% [14,32,36,38,39], with seven reporting levels at 20% or below [12,20,25,26,27,30,34] and the remaining five falling between 22% [25] and 34% [33]. Prevalence of anxiety disorders was measured in ten studies, with rates ranging from3% [26] to 62% [14], with four reporting prevalence at or above 20% [14,22,35,36] and six reporting rates at or below 11% [12,15,26,30,33,40].

Post-traumatic stress disorder (PTSD) was reported in five studies, with current prevalence ranging from 16%[15] to 26%[31]. One article reported lifetime estimates of PTSD, with 79% of the study participants meeting criteria [36]. Two articles reported participants' histories of trauma, with one article reporting a history of trauma in 51% of the sample [23], and the authors of the other study reporting that 98% of participants had experienced at least 1 lifetime trauma, 93% reporting two or more, and with participants on average reporting six lifetime traumatic events [36].

Four studies assessed for personality disorder, with high variance in findings, with prevalence ranging from 4% [26] to 92% [14] (remaining studies prevalence: 17% [30] and 20-23%[25]). Bipolar disorder was reported in four articles, with prevalence estimates at 11% [27], 13% [15,39], and 30% [38]. Obsessive-compulsive disorder was reported in one study [36], with a prevalence of 19%. Substance misuse (alcohol and drugs) was assessed in twenty studies, with prevalence ranging from 14% [26] to 77% [37]. The majority of articles report estimates above 50% [14,15,17,18,21,23,33,35,36,37].

Suicidality was reported in a small number of articles. One study, conducted in Ethiopia, found 42% of participants had a current wish to die, with 15% of the sample reporting having made a suicide attempt within the past month [17]. Another study, conducted in England, found 55% of the participants had made a lifetime suicide attempt and 68% had intentionally self-harmed [32]. Lower estimates were reported in a study conducted in Japan [28], with 12% of the sample reporting a current wish to die, 3% having made suicide attempts in the past two weeks, and 18% reporting lifetime suicide attempts. In a cohort study conducted in Scotland, investigating death by self-harm in a large representative sample of homeless adults, the authors found a hazard ratio of 3.3 for homeless adults compared to matched non-homeless controls [24].

Varying approaches to assessing mental health were utilised in different studies, ranging from self-reporting of any previous diagnoses, reviewing case notes in shelters, screening questionnaires, reviewing hospital records, and full diagnostic interviews. Methodologically superior studies were classified as those involving full diagnostic interviews using DSM-IV criteria, or reviews of official medical records, where diagnoses would have been made by suitably qualified professionals [10,12,14,17,19,22, 25,26,27,31,32,33,35,36,37,39,40]. Table 2 displays prevalence rates reported in all studies included in the review, compared to those reported in the methodologically superior studies, and compared to general population estimates.

Comorbidity and dual-diagnosis

Five articles report rates of dual diagnosis (concurrent substance misuse and another mental illness), with rates ranging from 18% [11] to 42% [30]. Comorbid mental illnesses were also reported in five studies, with estimates ranging from 21% [12] to 72% [19]. However, studies have used the terms 'dual-diagnosis' and

'comorbidity' interchangeably, with the majority of the 'comorbid' estimates including rates of substance misuse/addiction combined with at least one other psychiatric condition, which is reported as 'dual diagnosis' in other studies.

Table 2
Prevalence ranges from studies included in the review and population estimates

	Prevalence range in homeless samples	Prevalence range in methodologically superior studies	General Population Estimates
Any mental illness	27-93%	40-93%	26%***
Psychotic Disorder	4-53%	4-53%	1%*
Mood Disorder	6-82%	15-55%	2-7%*
Anxiety Disorder	3-62%	3-63%	1-5%**
Personality Disorder	4-92%	4-92%	5-10%*
PTSD	16-26%	20-26%	2-3%*
Substance use Disorder	14-77%	14-70%	2-16%*
Dual-diagnosis	18-42%	18-27%	<1%*

*Fazel et al [5]
** Spitzer at al [41].
***Kessler at al [42]

Demographic differences

The majority of studies included both male and female participants, however, the proportion of males far outweighed females, with men accounting for 60%-95% of samples, with most samples being at least 70% male. Only three articles reported prevalence rates for males and females separately within their studies, with mixed findings. In a study of hospital utilization in Sweden [10] consisting of 1704 homeless persons (and 5000 age-matched controls), 52% of homeless women, compared to 46% of men, were found to have a mental illness, with 22% of homeless women compared to 11% of men diagnosed with a psychotic illness; comparable levels of substance misuse (41% women, 42% men) were reported. The authors also note that young homeless females are at highest risk of mental illness, with a risk ratio of 20.88 compared to age-matched controls. In a retrospective ten-year database analysis project conducted in

Denmark [25], utilizing the Danish Homeless Register and Danish Psychiatric Central Register, 62% of homeless men and 58% of homeless women were reported to have a mental illness, with men diagnosed with higher rates of psychosis (14% compared to 12%) and substance misuse (49% compared to 37%), and women diagnosed with higher rates of mood (23% compared to 20%) and personality disorders (22% compared to 17%). In a smaller study (N=95) in California with a convenience sample recruited through adverts in shelters 36% of males compared to 20% of females self-reported a mental illness [13]. Studies conducted in non-Western settings had particularly low levels of females in their samples (all reporting 10% or less).

The majority of articles reported their sample's mean or modal age or range. The lowest mean age of participants was reported by a study of death by intentional self-harm conducted in Scotland [24], which reported the mean ages of men and women separately. Men in the study had a mean age of 33 years and women 30 years. Only one other study reported the mean age of men and women separately [25], with homeless men in a large national register-based cohort study in Denmark having a mean age of 40 years ($\pm$12) and women 37($\pm$12). Most studies' samples had a mean age between 33 and 49 years. Four of the five studies conducted in Asia reported participant ages, with means of 54($\pm$12) [26], 61($\pm$12) [28], and 64.9($\pm$10.2) in studies in Japan, and the study conducted in Hong Kong reporting a modal age range of 51-65 [40].

Length of homelessness

Studies quantified duration of homelessness differently with some reporting total accumulated lifetime homelessness, and others describing the length of the current episode. Chronicity of homelessness was also defined differently, for example: an 'unaccompanied individual who has been either continuously homeless for more than a

year, or had at least four episodes of homelessness in past four years [38]; has been homeless at least nine of the past 24 months [23], or homeless for at least two years continuously [17]. Of the studies which quantified duration of homelessness, the majority included higher proportions of persons who met criteria for chronic homelessness, as opposed to short-term, temporary homelessness.

In studies conducted in the USA, length of homelessness varied between samples. For instance, one study reported participants had been homeless an average of 4 years [14]; another study reported a mean of 7.5 years (±6.2) for females and males 8.3 (±6.5) [16]; another [38] reported participants had been homeless for an average of seven years (±6.9, range 1-40); while another reported cumulative lifetime homelessness of ten years (±8) [23].

Studies conducted in Europe also reported high rates of chronicity, with lifetimes homelessness of 6.4 years (±6.5) reported in a study conducted in England [32]; over 60% of participants of a study in Poland being homeless over three years [37]; over a third of participants homeless for over five years in a study conducted in Serbia [34]; and 50% of participants in a study in Greece being homeless over two years [12].

In a study conducted in Ethiopia involving persons who were street homeless alone, 65% of the sample had been homeless for over two years [17]. In Japan, participants had been homeless on average 3.5 years (±4, rage 0-20) [26].

Temporality

Most studies were cross-sectional, and only three reported on whether mental illness preceded or followed becoming homeless. In one study conducted in Australia, 15% of participants with mental illness reported they were unwell before becoming homeless [20]. In another Australian study 79% of participants met criteria for lifetime

PTSD, with onset prior to homelessness in 59% of cases, on average 5 years previously [36]. The researchers conducting the study in Ethiopia asked participants what was the main reason for them becoming homeless; 8% reported mental illness had a primary causal role.

Discussion

The current systematic review of psychopathology in adults experiencing homelessness globally, reporting on a pooled sample of 53,299 individuals, provides robust evidence of a link between homelessness and psychopathology. Rates of mental illness were found to be considerably higher than general population estimates, consistent with findings documented in a previous systematic review [5], with high rates of substance use disorders, mood disorder, anxiety disorder, psychotic disorder, personality disorder, PTSD, comorbid mental illnesses and dual diagnosis.

Ranges of prevalence reported across studies were large for a number of conditions. For example, personality disorder had a range between 4-92%, mood disorder a range of 6-82%, psychosis a range of 4-53%, and substance use disorder 14-77%. Studies used various assessment tools, ranging from self-report measures, screening questionnaires, and formal diagnostic clinical interviews, with assessors ranging from a lone researcher assessing each participant, to a group of clinicians formally assessing and diagnosing. When considering the methodologically superior studies, where formal assessment tools were used and administered by mental health professionals, the ranges of psychopathology narrowed somewhat for a number of conditions. For instance, the range of mood disorder reduced from 6-82% to 15-55%, which can be interpreted as a more reliable estimate. The range of personality disorder remained the same, as did ranges for psychotic and anxiety disorders (3-62%). Ranges of substance use disorder reduced somewhat (14-70%). The range of PTSD reported was not particularly large when considering all studies, but narrowed from 12-26% to 20-26% when considering superior studies alone.

A relationship between both variables is substantiated; however, evidence of a causal pathway is unclear. In the limited number of studies that gathered information

regarding temporal relationship of mental illness and homelessness, the findings were mixed. Two of the three studies found only a minority of participants were experiencing mental ill-health before experiencing homelessness, while one study assessing lifetime prevalence of psychopathology found over half participants had been unwell prior to becoming homeless.

Being male is more strongly associated with homelessness, which is likely due to additional support services for women (particularly women and children) at risk of homelessness. In articles which reported mean ages separately for men and women, homeless women were younger. There were also some differences reported in rates of mental illness between the genders, however, results were not consistent, with one reporting higher overall rates in women [10] and the other reporting higher rates in men [25].

There were also differences found by area in which studies were conducted. The average age of homeless samples in Asia were notably higher than all other areas, with mean ages of samples above 60 years in a number of studies, compared to typical mean ages of 30-50 years in other areas. This is possibly a cultural issue, with people in Japan in particular appearing to be cared for by family, and becoming homeless at a later age when their family members have died [29]. Low rates of substance use were reported in studies conducted in Eastern Europe, with the authors speculating that drugs are less available and more expensive in Poland [37] and Serbia [34], and therefore less prevalent within the homeless population.

Homelessness appears to be a chronic condition, with the majority of the pooled sample of participants remaining homeless for a number of years. It is concerning that rates of homelessness, locally in the UK, are rising. In 2016, 4134 persons were unsheltered in England on a given night, which was an increase of 16% compared to the

previous year, and more than twice the rate found in 2010 [43]. However, improvements have been reported in the USA, with a considerable decrease in homelessness observed between 2007 and 2014, from 750,000 to 578,000 individuals [44]. 'The State of Homelessness in America 2105' report [44] produced by the National Alliance to End Homelessness, explains that targeted federal funding addressing homelessness was at an all-time high- $4.5 billion- in 2015, funding a variety of programmes, with a deliberate shift in focus to permanent housing solutions (i.e. permanent supportive housing and rapid re-housing). However, they highlight an affordable housing crisis, and urge Government to invest in affordable housing, as homelessness assistance programmes alone cannot eradicate homelessness.

Limitations of the studies reviewed

Most of the studies included in the review were cross-sectional, therefore the temporal sequencing of homelessness and psychopathology is unclear. Many studies also relied on opportunity samples, recruiting via adverts in particular shelters, and may not be representative of other homeless individuals.

Only a small number of studies reported rates of psychopathology in men and women separately, therefore caution is needed when drawing inferences from these results. It is also important to note that prevalence estimates may be conservative, as individuals who are particularly unwell would not be able to consent to participate in research studies, and their data therefore not included. To overcome this issue, more database analysis/cohort studies are needed.

Clinical implications and recommendations for future research

Mental ill-health is one of many risk factors to becoming homeless and the vulnerability to mental ill-health by persons experiencing homelessness is unquestionable. Longitudinal studies are needed to help clarify the temporal sequence. Better monitoring statistics are also needed, for reliable estimates of both homelessness and psychopathology/health status, as was described in the large cohort study conducted in Denmark, reporting on a sample of 32,711 homeless adults over a ten-year period [25]. Future research is also needed to evaluate the best models of care for persons experiencing homelessness and psychopathology. Programmes designed to address the complex needs of persons experiencing homelessness at an interdisciplinary level are warranted, integrating economic, social, medical, and psychiatric needs.

There is a dearth of research reporting on psychopathology of adults experiencing homelessness in non-Western countries. Although the current review included five studies from Asia and one from Africa, with similar findings to studies conducted in the West, it is important that research continues to develop to provide a more global perspective, particularly to mental health and homelessness in low and middle-income countries, where there may be less state support and emergency accommodation for homeless individuals, unlike the majority of the samples represented in the current review, whom had access to shelters.

Individuals experiencing homelessness are vulnerable to psychological distress. Estimates of prevalence of psychopathology can help inform policy, social care, and psychiatric service development.

Table 1
Summary of studies included in the review

Article Number, Authors and Year	Area/Country	N	Age	Gender	Design	Sampling Method	Measures	Prevalence	Comments	Homelessness definition
10. Beijer & Andreasson, 2011	Stockholm, Sweden	1704	20-92, mean 43	80% male	Hospital care utilization of homeless people in contact with Social Welfare Office for the Homeless	Database info-healthcare consumption (Swedish Patient Register), Demographics (Statistics Sweden)	Hospital records, ICD-10 diagnostic criteria	Mental illness: 52% homeless women, 46% men; compared to 3% and 4% controls. Psychosis: 11% homeless men and 22% women, compared to 1% controls. Alcohol and drugs-related diagnoses: 41% women, 42% men, compared to 0.5% and 2% controls.	Age-matched control group (N= 5000) Younger homeless women at highest risk of mental disorder (risk ratio 20.88 compared to control women).	No fixed address- temporary housing, sleeping rough, or living in shelters / institutions.
11. Chambers et al., 2014	Toronto, Canada	522	-	100% women	Cross-sectional	Random sample from homeless shelters and meal programmes, over 12 months, representative sample	Interviews: 12-item Short-Form Health Survey; Addiction Severity Index.	41% considered to have a mental health problem 18% concurrent mental health and substance use disorder	42% of women had dependent children, 58% did not. Women with children had better overall health (including mental health), lower substance use.	Living within the last 7 days in a shelter, public place, vehicle, abandoned building, or staying with someone else
12.Chondraki, Madianos, Dragioti & Papadimitriou, 2014	Athens, Greece	254	51±13	74% male	Cross-sectional	Random sample recruited via soup kitchens / day services and hostels.	Interview: Mini Psychiatric Diagnostic Interview; demographics	56% males and 59% females met criteria for DSM-IV psychiatric condition: 16% mood disorder;	Of the clinical cases, 39% in contact with and being treated by psychiatrist.	A person does not own a home and lives in a shelter or in a home of a relative or

								information; help-seeking behaviours.	13% psychotic disorder; 11% anxiety disorder. 21% comorbidity. 18% drug or alcohol dependent.		friend temporarily, does not rent a home in a conventional setting, or who lives outdoors.
13. Chong et al., 2014	LA, California, USA	95	49±13range 20-72	74% male	Cross-sectional	Convenience Sample recruited via ads in shelters	Demographics questionnaire, interview re health status and medication review	32% reported a psychiatric disorder (36% of males, 20% of females). 25% reported feeling well on the study day.	43% reported regularly seeing a primary care provider; 35% of persons with psychiatric condition were taking medication.	Self-reported as homeless
14. Connolly, Cobb-Richardson & Ball	New York, USA	60	18+, mean 41.9, sd 9.8	68% male	Cross-sectional	Convenience sampling in two drop-in centres	Structured clinical interview for Axis I Disorders (CAS-CV, DSM-IV) Structured Clinical Interview II personality questionnaire (SCID-PQ) Positive and Negative Syndrome Scale (PANNS)	62% substance dependence 20% psychotic disorder 55% one or more mood disorder 62% one or more anxiety disorder 92% cluster A personality disorders (paranoid, schizoid) 83% cluster B (antisocial, borderline, narcissistic, histrionic) 68% cluster C (avoidant, dependant, obsessive-compulsive).	Average of 1.4 previous psychiatric hospitalisations. 43% current psychiatric treatment. 40% previous substance abuse treatment. Drop-in centres used provided psychiatric services Prevalence are 'lifetime criteria'	Met state of federal definitions of chronic homelessness', no stable address Small sample. One assessor. No history taken, so consequence of cause cannot be answered.

							Average of 5.8 diagnoses (SD= 3,2)		
15. Creech, Johnson, Borgia, Bourgalt, Reduhan & O'Toole, 2015	Virginia, USA	352	52±10	95% male	Cross-sectional	Opportunity sample of homeless veterans accessing a care programme	Interview re demographics, reason for homelessness, health care needs, self-report of previous psychiatric diagnoses, and substance use.	Any mental health problem: 67% Depression: 36% PTSD: 16% Bipolar: 13% Anxiety: 11% History of substance abuse: 58%	Veterans believed to make up 14% of US homeless population. 52% chronic homeless, 48% first time.	Unsheltered, staying in emergency accommodation, or staying with family or friends without contributing to the household.
16. Edens, Mares & Rosenheck, 2011	USA	756	Mean age male 46.3 (SD=8.4) female 43.4 (SD= 9.1)	76% male	Longitudinal supported housing intervention	All persons receiving supported housing intervention across 11 sites in the USA invited to participate in the evaluation (61% consented and completed).	Medical Outcomes Study Short Form (mental health and medical conditions); Brief Symptom Inventory; a subjective quality of life scale; Addiction Severity Index; demographics info	Self-report lifetime mental illness 83% women, 73% male; substance use 68% women, 73% men. 4 times national rate of depression, 18 times national rate of schizophrenia	Males and females similar in mental health and substance use. 2-year follow-up, sig increase in housing, and improvements in mental health (both men and women), but no changes in substance use.	Chronically homeless, defined as an unaccompanied homeless individual with a disabling condition, continuously homeless for a year or more, or at least four episodes of homelessness in past three years.
17. Fekadu et al., 2014	Addis Ababa, Ethiopia	217	33±13 range: 18-78	90% male	Cross-sectional	Screening and assessment by psychiatric nurses	Diagnostic interview; Kessler 10-Item measure of mental distress; Alcohol Use Disorder Identification Test; Psychosis assessed by behavioural manifestation of symptoms.	Psychosis: 41% Any mental disorder (excluding those with psychosis): 74% Alcohol use disorder: 60% Suicidality: Persistent wish to die: 42%	No welfare/state support available 41% reported family reasons led to homelessness, 36% reported economic reasons,	Street-homelessness; having spent at least 24 hours prior on the street. Chronically homeless sample: 65%

Study	Location	N	Age	Gender	Design	Sampling / Setting	Measures	Findings	Additional findings	Definition of homelessness
								Persistent suicidal thoughts: 22% Suicide attempt in past month: 15%	8% reported mental illness was main reason for homelessness.	homeless over 2 years.
18. Ganesh, Campbell, Hurley & Patten, 2013	Calgary, Canada	166		82% male	Cross-sectional	Opportunistic, in North America's largest homeless shelter. Representing transitional and drop-in clients (sleep on mats allocated on a drop-in basis).	AUDIT for substance use; K10 (mood and anxiety); DAST-20 (psychoactive drug use); PSQ (psychotic symptoms); MDQ (bipolar disorders); PHQ (depressive disorder)	93% screened positive for at least one mental illness, with 100% of these reporting no previous psychiatric diagnosis or treatment substance misuse 51% Psychotic illness 66% Emotional disturbance 65% Suicidal or self-harm ideation in past 2 weeks: 33%	Self-report screening questionnaires, not interviews. Higher rates than interview-based studies. Further assessment of the individuals needed for diagnostic criteria.	Self-reported as homeless
19. Gazdag & Braun, 2015	Budapest, Hungary				Cross-sectional	Opportunity sampling in three homeless shelters	Interview: SCID-I SDCI-II (DSM)	86% sample had diagnosable disorder (most common: personality disorder and alcohol dependence in males, anxiety disorders in females). 72% comorbidity. 37% of the 86% currently receiving psychiatric care.	Found that criminal behaviour in not more frequent among homeless persons who have mental illness.	People living in homeless shelters.
20. Johnson & Chamberlain, 2011	Melbourne, Australia	4921	52% under 35, 28% 35-44, 20% 45+	69% male		Review of case notes of two agencies working with homeless,	Whether or not it was documented in case files that individuals had:	Lifetime prevalence 31% (not including substance issues as mental health conditions).	Pathways to homelessness: Family relationship	People sleeping rough, staying temporarily with family or friends, living in

						and 'at risk' of homelessness persons	Approached the agency seeking mental health support; The individual was in, or had been in a psychiatric facility; The case notes identified mental health issue.	15% had mental health issues prior to homelessness.	breakdown (46%); Housing crisis (19%); substance abuse (17%). Mental health a factor for those who were unwell prior, but not the main cause for the majority of homeless persons.	boarding houses, or using emergency accommodation.
21. Kertesz et al., 2013	Birmingham, Alabama, USA	200	45±10	60% male	Cross-sectional	Random sample, to match community wide census data on gender, race and location	Self-report of physical and mental health needs	54% self-report addiction; 46% self-report mental illness; 51% reported an unmet need of mental health care	84% report unmet dental need; 57% unmet medication need.	Chronically homeless or recently unsheltered.
22. Krausz et al., 2013	Three urban centres in British Columbia, Canada	500	37.9 (SD=11)	61% male	Cross-sectional	Purposeful sampling to recruit a diverse sample; intensive outreach campaign	Clinical interview- MINI-PLUS Neuropsychiatric Interview (based on DSM-IV); Demographics Questionnaire; National Survey of Homeless Assistance Providers and Clients	93% met criteria for at least one mental disorder or episode of mental illness; 83% met criteria for substance dependence; 57% met criteria for a current anxiety disorder; 28% agoraphobia; depression 20%; PTSD 20%; psychosis 15%.	63% reported having a regular medical practitioner*; 34% reported they had not received a service they needed in past 12 months.	Living on the streets or in a homeless shelter.
23. Levitt, Culhane, DeGenova, O'Quinn &	Manhattan, New York, USA	1093	47±11 (chronically	90% male CH	Cross-sectional	Approached all persons sleeping unsheltered	Interview, self-report	CH: 51% history of repeated trauma 36% lifetime mental illness	67% were CH Age when first homeless: no	Unsheltered homelessness: (street homeless; slept

Bainbridge, 2009			homeless, CH) 44±12 (not chronically homeless, NCH)	86% NCH		in the district, 30% of those approached declined to participate		67% lifetime substance misuse 28% lifetime both NCH: 52% history of repeated trauma 27% lifetime mental illness 61% lifetime substance misuse 19% lifetime both	diffs in group (mean 35 years) Cumulative duration of lifetime homelessness: CH: 10±8 NCH: 5±5	without shelter the previous night) Chronically unsheltered: sleeping without shelter at least nine of the previous 24 months.
24. Morrison, 2009	Greater Glasgow, Scotland	6323	33 male 30 female	65% male	Retrospective database analysis	Cohort study; local authority and health service data accessed.	Mortality rates	Death by Intentional self-harm hazard ratio of homeless compared to matched non-homeless controls: 3.3	Data on homeless adults in contact with local authority, and gender and age-matched controls; National Health Service records re mortality.	Persons having no accommodation, overcrowded or dangerous accommodation, lack shelter of any kind.
25. Nielsen, Hijorthoj, Erlangsen & Nordentoft, 2011	Denmark	32711	Mean age at first contact 40±12 men and 37±12 for women	62% male	National register-based cohort study (Danish Homeless Register and Danish Psychiatric Central Register)	Database analysis over 10-year period; complete homeless shelter population of Denmark	Psychiatric disorders (ICD-10 criteria)	Registered psychiatric disorder: 62% men, 58% women; Substance abuse diagnosis: 49% men, 37% women Schizophrenia spectrum disorder: 14% men, 12% women; Personality disorder: 20% men, 23% women. Mood disorder: 17% men, 22% women.	Standardised mortality ratios also calculated. All Danish residents have a Civil Registration Number (CRN, a unique ID). Contact with services (homelessness and psychiatric) recorded, with CRN used to link data.	Persons who are either living in or have a history of staying in a homeless shelter during study period.
26. Nishio et al., 2015	Nagoya, Japan	114	54±12 range: 20-78	93% male	Cross-sectional	Opportunity sampling	Clinical interview/assessme nt by psychiatrists,	Diagnosed with a mental illness: 42%; Psychosis: 4%	Average length of homelessness 3.5 years ±4.4,	Persons who lack housing (including

								Mood disorder: 18% Anxiety Disorder: 3% Personality Disorder: 4% Substance-related disorder: 14%	range under 1-20 years.	primary residence at night being in shelters or transitional housing).
27. Notaro, Khan, Kim, Nasaruddin & Desai, 2013	Champaign County, Illinois	122 homeless (2157 controls)	-	-	Review of medical records of entire patient population over 5 years	Medical records of homeless and non-homeless control group accessing a free clinic	Diagnoses on medical records	Homeless adults: Depression 20.5% Anxiety 20.5% Bipolar 10.7% (Controls: 20%, 13.8%, 4.7%).	Control group cannot be generalised to 'general population' as authors do, as they were people without health insurance, so a biased sample/deprived.	Recorded as homeless on records- no further info.
28. Okamura, Ito, Morikawa & Awata, 2014	Tokyo, Japan	423	61±12	93% male	Cross-sectional	Opportunity sampling via non-profit organisation	WHO Five- Well-Being Index; Interview assessing depression and suicidality over past two weeks.	In past two weeks, 12% reported recurrent wish to die; 7% recurrent thoughts of suicide; 5% made suicide plans; 3% suicide attempts. 18% lifetime suicide attempts, 29% current depression		Street homeless or staying in shelters or welfare homes. 20% street homeless, 80% indoors
29. Okamura, Takeshim, Tachimori, Takiwaki, Matoba & Awata, 2015	Tokyo, Japan	210	Mean 64.9	-	Cross-sectional, questionnaire-based.	Opportunity sampling of people accessing services of homelessness organisation, living in shelter.	Questionnaire re pathway to service, daily activities, health and psychological variables; WHO-Five Well-Being Index;	34% mental illness (based on records, not interview, so could be inaccurate)	Data analysed as those with and without mental illness. More than half both groups had poor family ties, lack of desire to help others, and lack	No fixed address, staying in homeless shelters.

						Organisation founded in largest slum in Tokyo.	Mental Illness reported by staff member based on medical info from referring party		of attachment to region. No sig differences between groups on age, education, daily activities.	
30. Pascual et al., 2008	Barcelona, Spain	560	38±13	72% male	Database analysis, 4-year study period	Utilisation of psychiatric emergency services	Hospital records-routine admissions database	Psychosis 36% Mood 6% Anxiety 4% Personality Disorder 17% Drug use 15%	Free Health Service to natives and immigrants, regardless of legal, social or economic status	Lacks a fixed, regular and adequate night-time residence; primary night-time residence that is a shelter; or a public or private place not designed for sleeping.
31. Palepu et al., 2012	Vancouver, Canada	497	Mean 40.8 (SD=11)	73% male	Cross-sectional	Recruited through various homeless shelters, drop-in centres, outreach teams.	Clinical Interview re demographics, mental health (DSM-IV criteria), suicidality, substance use, quality of life.	Psychotic disorder: 53% PTDS: 26% Panic Disorder: 21% Manic episode: 20% Multiple mental disorders: 48% 29% daily substance use 47% less than daily use 24% no substance use in past month	Compared mental health symptoms between daily substance users and non-daily users; daily use associated with greater psychopathology.	'Absolutely homeless or precariously housed'
32. Pluck, Lee & Parks, 2013	Sheffield, England	80	Mean 35.2 (SD=9.2)	84% male	Cross-sectional, interview.	Opportunistic sample, adults attending homeless shelters, charitable meal services, and	Semi-structured interview for background info and demographics; probable lifetime major depression (DSM-IV criteria); Deliberate Self-Harm Inventory;	55% reported past suicide attempts; 41% reported past non-suicidal self-injury (overlap between both); 82% probable lifetime depression	One interviewer. Those with past self-harm, compared to those who had not, were more likely to have a previous	Lacking a secure tenancy, accessing services for homeless adults, and self-describing as homeless.

						medical services for the homeless	Severity of Dependence Scale; Alcohol Use Disorders Identification Test	68% positive for NICE defined self-harm (with or without suicidal intent).	psychiatric hospital admission, and had commenced more classes of drugs since becoming homeless. Those who had self-harmed were significantly younger when they became homeless (5 years younger).	
33. Prinsloo, Parr & Fenton, 2010	Dublin, Ireland	38	46 (SD not reported)	100% male	Cross-sectional	Opportunistic sample within emergency hostel for single homeless men aged over 26	Structured Clinical Interview for DSM-IV Axis 1 Disorders (SCID-I).	Current and past prevalence determined. 82% had current Axis I diagnosis: Alcohol dependence 53%; Depressive disorder 34% Anxiety disorder 11% 5% psychotic disorder 89% lifetime diagnosis (of which 32% had one, 58% had two or more.	Small sample. 64% reported having children. 32% previous psychiatric hospital admission. Lower psychosis than other studies.	Residents of an emergency hostel.
34. Sarajlija, Jugovic, Zivaljevic, Merdovic & Sarajlijla, 2014	Belgrade, Serbia	104	48.2 ±13 range = 19-74	74% male	Cross-sectional	Convenience sample within only homeless shelter in Belgrade.	Serbian translations of: SF-36 (including physical and mental health measurement); Beck Depression Inventory-II; socio-	27% history of suicide attempts; 36% met criteria for psychiatric disorder (depression 15%, psychosis 10%). Lifetime illicit drug use 12%; Illicit drug	No official data or estimates of homelessness in Serbia. 35% reported homelessness of over five years; 33% homeless	Persons needing urgent social care (i.e. shelter and protection).

								demographic questionnaire.	use within previous 12 months 4%.	less than one year.	
35. Spicer, Smith, Conroy, Flatau & Burns, 2105	Sydney, Australia	253	19-81, mean 41	100% male	Longitudinal	Convenience sample of men receiving support of seven homeless services across city	Clinical interview, Kessler Psychological Distress Scale, Self-Report of previous diagnoses by a professional, Severity of Dependence Scale, PTSD Checklist-Civilian Version, Psychosis Screener, demographics questionnaire.	71% reported one or more psychiatric diagnoses by a professional (with 25% reporting one, 21% reporting 2 or more and 26% reporting 3 or more). Most common substance use (51%), followed by anxiety (34%) and mood disorder (33%). 50% currently reporting high or very high distress, 20% screened positive for PTSD, 11% screened positive for psychosis in last 12 months.	Baseline, 3 and 12-month follow-up. At 12-month follow-up, no sig changes in psychological distress or alcohol dependence, nor positive screening for PTSD or psychosis.	Self-reported, accessing homelessness services.
36. Taylor & Sharpe, 2008	Sydney, Australia	70	18-73, mean 38, sd 10.8	71% male	Cross-sectional, interview	Random sampling in homelessness services across the city (convenience sample)	Diagnostic Interview: Composite International Diagnostic Interview; Mini Mental State exam; Depressions, Anxiety, Stress Scale; Psychosis Screening Questionnaire; South Oaks Gambling Screen	48% screened positive for psychosis 64% alcohol dependent/hazardous drinking 70% substance use 40% 'extremely high' depression, anxiety and stress 19% met criteria for OCD 98% experience at least 1 trauma in lifetime	PTSD, onset prior to homelessness in 59%, average 4.9years before. 81% reported being homeless was a traumatic experience. Representative sample, capturing different types of homelessness.	Inadequate access to safe and secure housing. 3 levels of homelessness identified and included: primary (living on the streets); secondary (moving frequently from temporary shelter to another);

							ICD-10 and DSM-IV criteria	93% two or more average 6 traumatic experiences 71% childhood trauma *79% lifetime prevalence of PTSD. 27 times higher than general population.		tertiary (living in boarding houses)
37. Toro, Hobden, Durham, Oko-Riebau & Bokszczanin, 2014	Poland (two cities) and Detroit (and surrounding county), USA.	419	Poland mean age: 46.7; US: 42.3 Modal age in US: 30-39 (30%), modal age in Poland: 50-59 (32%).	74% male	Cross-sectional	Probability sampling for a representative sample of homeless adults in both areas, via shelters, emergency housing, soup kitchens.	Diagnostic interview Schedule (DSM-III-R); Brief Symptom Inventory.	Either Mental Illness or Substance abuse: US 85%, Poland 57% Mental illness: US 35%, Poland, 19% Mood disorder: US 30%, Poland 16% Psychosis: US 11%, Poland 4% Substance abuse: US 77%, Poland 46% Alcohol abuse: US 60%, Poland 45% Drugs: US 56%, Poland 6% Dual diagnosis: US 27%, Poland 8%.	Key differences between both samples: Polish sample sig older; length of homelessness episode sig longer in Polish sample (61% more than three years, only 20% of US sample); Free health service in Poland, harder to access in US.	Accessing soup kitchens (US only), staying at shelters, emergency housing. People sleeping on the streets were not included as it was estimated they represent less than 1% of homeless population, and therefore not representative.
38. Weber, Thompson, Schniege, Peifer & Farrell, 2013	Colorado, USA	300	47±10 range 20-74	85% male	Cross-sectional	Opportunity sample of all persons accessing day shelter during on particular day	Questionnaire designed for the study regarding prevalence of disease, insurance availability, and perceived access to care.	53% self-reported serous mental health diagnoses: depression 49% bipolar disorder 30% schizophrenia 14% Substance use reported by 49%	Average length of homelessness 7 years (±6.9, range 1-40 years), first episode of homelessness on average age 37 (±13) Of those with serious mental	Chronically homeless: Unaccompanied individual who has either been continuously homeless for a year or more, or had at least four episodes of

Author	Location	N	Age	Gender	Study design	Sampling	Measures	Mental illness findings	Notes	Homelessness definition
									health issues, 39% reported health insurance	homelessness in past four years (federal government's definition)
39. Whitbeck, Armenta & Welch-Lazoritz	Omaha, Nebraska; Pittsburgh, Pennsylvania; Portland, Oregon) USA	156	39±10 range 19-54	100% women			Composite International Diagnostic Interview (DSM-IV-TR)- a subset of modules. Diagnostic Interview for DSM-IV personality disorders.	Past month: 40% at least one disorder PTDS: 20% Major depressive episode: 44% Bipolar: 13% Substance use disorder: 10% Lifetime: 85% at least one disorder PTSD: 42% Major Depressive Episode: 50% Bipolar: 23% Substance use disorder: 72%	Similar prevalence across three sites at different times of the year.	Women living in shelters and women accessing free meals self-identifying as homeless.
40. Yim, Leung, Chan, Lam &Lim, 2015	Hong Kong	79	Modal age 51-65 (54%)	94% male	Cross-sectional	Random sample selected from records of organisations serving the homeless population	Structured Clinical Interview for DSM-IV Axis-I Disorders; Mini-Mental State Examination.	Presence of any mental illness: 71% Mood disorder: 30% Anxiety disorder: 10% Psychotic illness: 10% Alcohol abuse: 25% Substance abuse: 25% Psychiatric comorbidity: 23%	High % of males Reason for homelessness: 71% financial problems. Most severely unwell not included in the sample, as they could not consent.	Persons sleeping or having slept in a public place, street, shelter, abandoned building, or places not intended to be dwellings. Outdoor living: 71%

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Chapter 2: Empirical Paper

British Journal of Psychiatry Submission Guidelines

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2 Thornicroft GJ. *Shunned: Discrimination Against People with Mental Illness.* Oxford University Press, 2006.

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Admissions to psychiatric units in North Wales: associations with geographical area and levels of multiple deprivation.

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Abstract

Background: Deprivation measured at the neighbourhood level has been shown to be associated with psychopathology, particularly psychosis, and mostly in urban areas.

Aims: To investigate associations between area-level multiple deprivation and psychosis- and non-psychosis related psychiatric admissions, in a largely rural area.

Method: A complete dataset of all psychiatric admissions over a six-year period within Wales' largest health board was obtained and modelled with census data reporting on small-area-level multiple deprivation statistics.

Results: Areas differed significantly in terms of number of cases admitted for inpatient psychiatric care. Multiple deprivation measures were significantly predictive of admissions for psychosis-related conditions and other mental health conditions.

Conclusions: In a rural area, increased deprivation is strongly associated with greater incidence of psychiatric admissions, with the effect stronger for persons with psychosis-related conditions.

Declaration of interest: None.

Considerable empirical attention has been given to the elucidation of individual-level risk factors in developing mental illness. For example, there is a well-established positive relationship between individuals' socioeconomic position and their mental health (e.g Lorant, Deliege, Eaton, Robert & Philippot, 2003; Muntaner, Eaton, Miech & O'Campo, 2004; Hudson, 2005). A growing literature is also reporting on risk factors at the societal level. The advancement in analytical techniques have made the investigation of nested data structures (e.g. individuals nested within groups/areas) more reliably interpretable. Using modern and sophisticated modelling techniques, a number of studies have found mental ill-health to be associated with economic deprivation (e.g. Fone, Dunstan, Lloyd, Williams, Watkins & Palmer, 2007).

Significant positive associations between deprivation measured at the neighbourhood-level and incidence of psychosis have also been found in a number of studies, conducted in the Netherlands (Vas Os, Dreissen, Gunther & Delespaul, 2000), England (Croudace, Kayne, Jones & Harrison, 2000; Kirkbride, Fearon, Morgan, Dazzan, Morgan, Murray, et al., 2007; Kirkbride, Morgan, Fearon, Dazzan, Murray & Jones, 2007; Kirkbride, Jones, Ullrich & Coid, 2014; Bhavsar, Boydell, Murray & Power, 2014), Scotland (Allardyce, Gilmour, Atkinson, Rapson, Bishop & McCreadie, 2005), and Ireland (Omer, Kirkbride, Pringle, Russell, O'Callaghan & Waddington, 2104). Associations between deprivation and other psychiatric conditions have also been found (e.g. for depression, Galea, Ahern, Nandi, Tracy, Beard et al., 2007; substance misuse and neurotic disorders, Chaix, Leylan, Sabel, Chauvin, Rastam, Kristersson et al., 2006). However, the majority of these studies have been conducted in predominantly urban areas, and typically involve investigating the impact of neighbourhood deprivation on either psychosis-related conditions, or other non-psychosis-related conditions, such as mood disorders, and not both. It is also unclear whether the same patterns exist in rural

areas, especially given the well documented link between psychosis and urbanicity (Vassos, Pedersen, Murray, Collier & Lewis, 2012)

In the present study, our aim was to add to the limited literature reporting on area-level deprivation and psychiatric admissions, particularly in rural areas, including psychosis and non-psychosis related conditions. Specifically, we were interested in three questions:

1. Do neighbourhoods differ in terms of incidents of admissions to psychiatric units?

2. Are area-level measures of deprivation associated with admissions?

3. Are the same associations found for people with psychosis-related conditions compared to those with other, non-psychosis-related, conditions?

4. Do these associations vary based on the type of deprivation?

We hypothesised that areas would differ in terms of cases admitted to psychiatric units, with areas of greater deprivation associated with increased admission incidence. Directional hypotheses regarding whether associations would be the same for people with psychosis-related conditions compared to other conditions, or regarding deprivation subdomains, were not made, given a lack of previous research.

Methods

The Research Ethics and Governance Committees at Bangor University and Betsi

Cadwaladr University Health Board (BCUHB) approved the study protocol.

Setting

BCUHB is a health board in North Wales consisting of six local authorities:

Gwynedd, Anglesey, Conwy, Denbighshire, Flintshire and Wrexham. BCUHB was

established in 2009 and provides a service to a population of approximately 694,000

people across the six local authorities, making it the largest health board (by

population) in Wales. North Wales is a largely rural area, with the mountainous interior

of Snowdonia National Park, and a more densely populated cost. When considering

population density, the whole of Wales can be classified as sparsely populated, with an

average of 140 people per square kilometre. Generally, in North Wales, there is a shift in

rurality when travelling from West to East, with 0% of the population of Anglesey in the

West living in large towns, compared to 70% in Wrexham in the East (Welsh

Government, 2008).

Area-level characteristics

Lower-layer Super Output Areas (LSOA) were designed and implemented by the

Office for National Statistics to improve the reporting of small area statistics. Each LSOA

includes a minimum population of 1000 and a maximum of 3000 people, with a mean of

1500. There were 1909 LSOAs in Wales during the most recent census (2011), with 423

within BCUHB. The Welsh Index of Multiple Deprivation (WIMD; Welsh Government,

2014) is an official measure of relative deprivation for small areas in Wales. The WIMD

provides a measure of overall deprivation, and helps identify small areas where there

are highest concentrations of several different subtypes of deprivation, LSOAs are ranked by level of deprivation, from most to least deprived.

The multiple deprivation index was constructed from a weighted sum of each deprivation subdomain score, with the weights, according to Welsh Government, reflecting the importance of the domain as an aspect of deprivation. The weights of each domain, as well as further detail regarding how each domain was measured, are as follows (WIMD, 2014):

- Income: 23.5%; proportion of people receiving income-related benefits / Working and Child Tax Credits / with income less than 60% of the median in Wales / Asylum Seeker.

- Employment: 23.5%; percentage of people of working age who are unemployed (including involuntary exclusion, being unable to work due to ill-health and those actively seeking employment).

- Health: 14%; indicators of limiting long-term illness, death rates, cancer incidence, and low birth weight, as a measure of poor health.

- Education: 14%; educational disadvantage measured by a lack of skills and qualifications, low educational attainments at various Key Stages, and rates of repeat absenteeism.

- Geographical access to services: 19%; measuring households' inability to access a range of necessary services for day-to-day living, including average times to travel to food shops, GP surgeries, schools, library, pharmacy, post office, and leisure centre.

- Community safety: 5%; experiences of crime and fire, as well as perceptions of safety whilst in the public area locally, as measured by police and fire records.

- Physical environment: 5%; factors deemed to have an impact on residents' well-being and quality of life, with measures of air concentration, air emissions, proximity to waste disposal and industrial sites, and flood risk.

- Housing: 5%; measuring a lack of adequate housing, including physical condition (households living without central heating), living conditions and availability (overcrowded households/bedroom measure).

Study Cohort

The study's inclusion criteria were: a) adults, aged 18 and over; b) admitted as an inpatient to a psychiatric unit during period of investigation, from April 2010 - May 2016; c) resident in BCUHB, based on the post code associated with their patient records. Patients were excluded from the sample if they had an organic illness (e.g. dementia, brain injury), or if the admission was substance-related, based on the ICD 10 diagnoses recorded for the relevant admission. A high proportion of patients admitted to psychiatric units are admitted on multiple occasions; individuals' first admission during the study period alone were included.

Individual-level data

BCUHB stores patient information electronically, recording demographic information as well as details regarding contact with services (e.g. diagnosis, length of stay). Anonymised data relevant to the research questions were extracted from the electronic patient records, including: age, gender, diagnoses on admission and discharge, dates of admission and discharge, number of previous admissions, and postcodes.

Based on patients' postcodes, we calculated the number of residents from each LSOA who were admitted during the study period. We stratified our cases based on gender (male or female) x age-band (18-24, 25-34, 35-49, 50-64, 65+, as used in the census) x type of illness (coding cases as either having a psychosis-related or non-psychosis-related diagnosis), resulting in patients belonging to one of 20 strata (e.g. male, 18-24, psychosis; female, 50-64 non-psychosis). Stratum within LSOA became the unit of measurement, as opposed to individual cases, with a total of 8460 observations (20 stratum per 423 LSOA). Census estimates of population stratified by age and gender were obtained in order to model demographic differences between areas.

Statistical Analyses

Data were analysed with R software (R Core Team, 2013) packages 'lme4' (Bates, Maechler, Bloker & Walker, 2015), 'MuMIn' (Barton, 2016), 'spaMM' (Rousset & Ferdy, 2014) and 'gglopt2' (Wickhman, 2009). Given the non-independent nested structure of the data, a multilevel modelling approach was adopted. Multilevel/mixed models do not require data to be independent and model both fixed and random effects. The distribution of the incidence across small areas was not normally distributed, and generalised linear mixed effects modelling, with a Poisson distribution, was the most appropriate technique, similar to previous studies (e.g. Bhavsar, Boydell, Murray & Power, 2014).

First, a null model was fitted, with logged population of the relevant stratum coded as an offset (*i.e.*, the coefficient was fixed to 1) and random intercepts of gender, age category, and type of diagnosis. Otherwise identical models were then fitted adding terms for:

Model 1: Deprivation;

Model 2: Type of diagnosis (psychosis-related or non-psychosis-related);

Model 3: Deprivation and type of diagnosis;

Model 4: Deprivation, type of diagnosis and their interaction.

Models were compared using Aikake Information Criteria (AIC) in order to choose the best fitting model. The Akaike information criterion (AIC) is a measure of the relative quality of statistical models, directly comparing the goodness-of-fit of models from the same dataset, with lower numbers representing better fit. This was repeated for the eight subscales of the WIMD, in order to identify whether the relationship between incidence and deprivation was similar for all types of deprivation.

The total number of cases meeting study criteria was 11,019. Cases were categorised as either having a diagnosis within the psychosis spectrum or all other mental health conditions excluding psychosis, based on ICD 10 codes. Table 1 displays information regarding admissions.

Table 1
Information regarding admissions

	N	% male	Mean length of stay	Median length of stay	Modal length of stay	Total bed days
Psychotic illness	3921	60%	47	18	7	185,841
Non-Psychotic illness	7098	42%	21	7	1	153,018
Total	11,019	-	-	-	-	338,859

* Length of stay in days

Results

Figure 1 displays deprivation rank at LSOA level (ranked from most to least deprived), cases of psychosis-related admissions at the LSOA level, and cases of non-psychosis-related admissions at the LSOA level. Table 2 displays the AIC for each model. For each of the models, fit improved with each stage, with one exception: the best fit for the Physical Environment subdomain was the model without the interaction effect of deprivation and type of illness (Model 3).

Results of the final models are summarised in Table 3. In the model of overall deprivation, higher deprivation was very significantly predictive of admissions and non-psychotic admissions were more common than psychotic admission. A significant interaction effect of type of diagnosis and deprivation was also found, with the effect of deprivation being a stronger predictor of psychosis-related than non-psychotic admissions.

Regarding deprivation subdomains, very similar results to overall deprivation were found in Income, Employment, Health, Education, Community Safety and Housing models. In the Physical Environment model, the intercept was highly significant, as was type of diagnosis, with a reduced but still statistically significant main effect of the deprivation subdomain. However, there was no significant interaction effect of physical environment and type of illness, suggesting this subdomain does not differentially affect people depending on their diagnosis. The Access to Services model displayed significant main and interaction effects at each stage, however, the direction of the relationship between the deprivation subdomain and the outcome, and the interaction between the subdomain and type of illness, was in the opposite direction to all other models: areas of poor access to services had lower levels of admission, especially for psychosis.

Figure 2 displays a plot of psychosis and non-psychosis cases by multiple deprivation rank across BCUCB, showing more admissions of non-psychosis-related cases, with greater multiple deprivation (lower WIMD rank) associated with increased admissions, generally, but with a stronger association for the psychosis-related cases, i.e. as deprivation increases psychosis-related admissions increase at a steeper rate. Figure 3 displays a plot of cases by multiple deprivation rank for each local authority separately. Four of the six local authorities showed the same pattern of results. In Flintshire, cases of psychosis and non-psychosis conditions increased in areas with higher deprivation, however, the affect appears to be stronger for those with non-psychosis-related conditions. On the Isle of Anglesey, a different pattern of results emerged, with cases of psychosis-related conditions increasing in areas of greater deprivation, but with cases of non-psychosis-related conditions increasing as deprivation decreased.

Figure 1
Spatial representation of cases of psychosis-related and non-psychosis related conditions at the LSOA level, and LSOA deprivation rank.
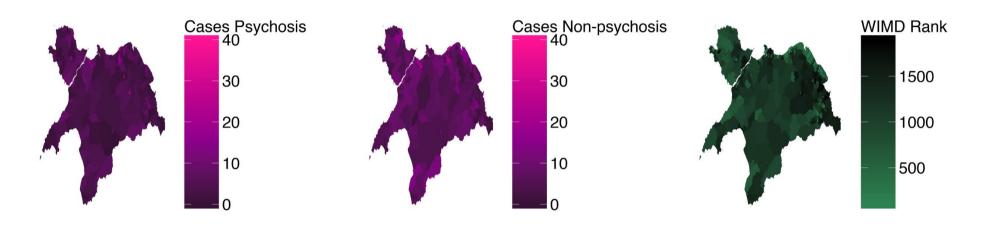
Table 2
Model building goodness-of-fit AIC statistic.

	Deprivation (overall)	Income	Employment	Health	Education	Access to Services	Community Safety	Physical Environment	Housing
Null model	17588	17588	17588	17588	17588	17588	17588	17588	17588
Type	17582	17582	17582	17582	17582	17582	17582	17582	17582
Deprivation subdomain	17476	17472	17455	17483	17507	17557	17454	17580	17522
Type + Deprivation	17469	17466	17448	17477	17500	17551	17447	**17573**	17516
Deprivation *Type	**17444**	**17446**	**17430**	**17450**	**17484**	**17547**	**17410**	17576	**17497**

Table3
Final model results for multiple deprivation and deprivation subdomains separately.

	Overall Deprivation	SE	Income	SE	Employment	SE	Health	SE	Education	SE	Access to Services	SE	Community Safety	SE	Physical Environment	SE	Housing	SE
Intercept	-5.29***	.11	-5.29***	.11	-5.29***	.11	-5.29***	.11	-5.29***	.12	-5.29***	.12	-5.28***	.12	-5.29***	1.28	-5.29***	.12
Type	-0.59***	.03	-0.59***	.03	-0.59***	.03	-0.59***	.03	-0.58***	.03	-0.56***	.03	-0.61***	.03	-0.55***	.02	-0.58***	.03
Deprivation	-0.25***	.03	-0.26***	.03	-0.36***	.08	-0.24***	.03	-0.22***	.03	0.15***	.03	-0.26***	.03	-0.11**	.03	-0.20***	.03
Type* Deprivation	-0.14***	.03	-0.14***	.03	-0.13***	.03	-0.15***	.03	-0.12***	.03	0.07*	.03	-0.18***	.03	n/a	n/a	-0.14***	.03

Note: Deprivation rank: lower scores representing greater deprivation; Psychosis-related coded as 0, no-psychosis-related coded as 1; * $p < .05$; ** $p < .01$; ***$p < .001$

Figure 2
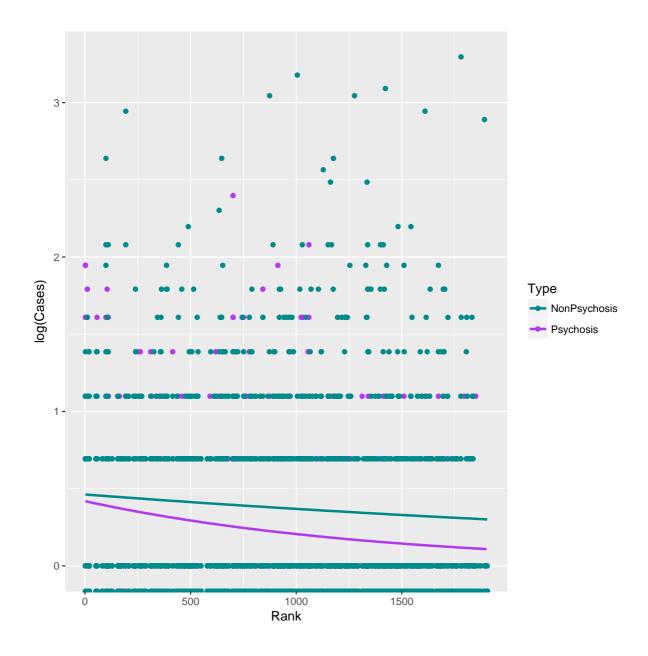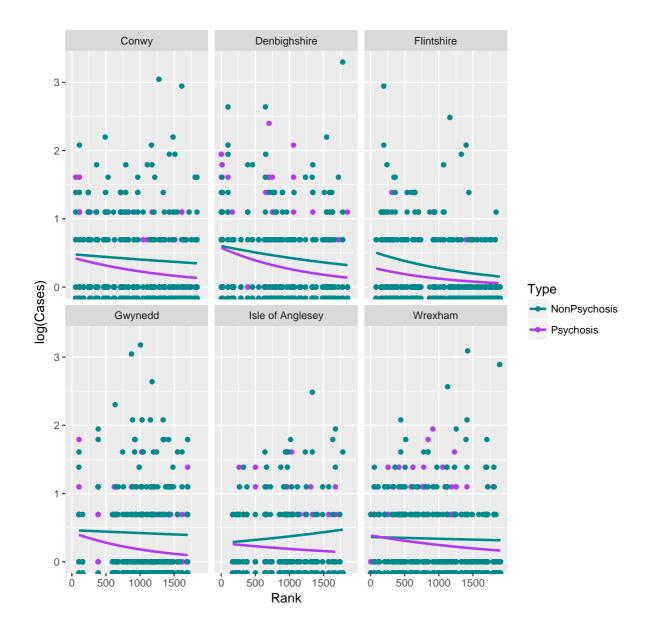
Plot of logged cases by rank across BCUHB.

Figure 3
Plots of logged cases by rank for each Local Authority separately.

Discussion

Main Findings

Using a complete dataset of admissions to psychiatric units across Wales' largest Health Board over a six-year period, linked with comprehensive multiple deprivation data at the small-area level, we found that:

- areas differ significantly in terms of incidents of admissions to psychiatric units, i.e. visible heterogeneity in cases admitted per LSOA, with clusters of cases in certain areas;

- multiple deprivation was highly significantly associated with cases admitted, with areas of greater overall deprivation predictive of higher admission incidence;

- this relationship was stronger for people with psychosis-related conditions than for those with non-psychosis-related conditions;

- deprivation subdomains generally followed the same pattern as overall multiple deprivation, except for geographical access to services (greater rurality) which was associated with lower admissions.

That areas differ in terms of incidence and that multiple deprivation at the neighbourhood-level is significantly predictive of psychiatric admissions was consistent with our hypotheses. Regarding deprivation subdomains, the same overall pattern of results was found, with two exceptions. Deprivation of physical environment (measures of air concentration, air emissions, proximity to waste disposal and industrial sites, and flood risk) was predictive of higher admissions; however, unlike the other models, this relationship was not different depending on type of diagnosis, suggesting deprivation of physical environment did not differentially impact people depending on different diagnosis category.

Deprivation of geographical access to services, as measured by travel times to various services deemed necessary for day-to-day living, was significantly associated

with admissions, and impacted those with a psychosis-related condition more strongly; however, the directionality of the effect was different, with higher deprivation predicting lower admissions. Greater deprivation of geographical access to services does, however, represent greater rurality. An association between urbanicity and psychosis has long been established, with multiple studies finding an effect of increased urbanicity (as measured by population size or population density) predicting greater incidence of psychosis. In a meta-analysis of the association, combining estimates from a number of studies, Vassos et al (2012) estimated the risk of schizophrenia in the most urban context at 2.37 times higher than in the most rural context. The results remained stable irrespective of: classification of psychosis (i.e if outcome measurement involved a diagnosis of schizophrenia, or psychosis more broadly); method of measuring urbanicity (i.e. population density or population size); or whether exposure to urbanicity was at birth and upbringing or at onset of illness. The majority of previous studies investigating associations between deprivation and psychopathology have been conducted in predominantly urban areas. Our findings, in a predominantly rural area, may be indicating a similar effect, with greater rurality potentially being protective. However, it is also important to consider whether, in fact, people who are furthest away from services are being missed, and not receiving a service they may need.

It appears that those with a psychosis-related condition who are admitted to psychiatric inpatient units are disadvantaged on multiple levels. They are experiencing an often severe and enduring illness, requiring longer hospital stays, and are particularly vulnerable to the impact of multiple subtypes of deprivation, being more strongly affected by increased deprivation than individuals with other non-psychosis-related conditions.

Cases of non-psychosis conditions generally increased in more deprived areas (albeit at lower rates than for psychosis-related conditions) however, in one local authority- the Isle of Anglesey- cases of admissions increased in areas of lower deprivation. This is an unexpected finding and the current data do not provide a definitive explanation as to why this effect was observed. It is possible that practices within mental health services on the Isle of Anglesey are different, leading to a different pattern of admissions. It is also possible that environmental factors have resulted in higher rates of admission for non-psychosis conditions in less deprived areas. Anglesey is an island to which many people chose to relocate/retire, particularly from England. One hypothesis is that people relocating, to less deprived areas, may become psychologically distressed, and have a smaller support network (if at all) to contribute to their care, resulting in a greater need for inpatient care.

There has been much variation in conceptualisation and measurement of deprivation within the literature, making it difficult to directly compare findings. For instance, social fragmentation (measured by single person households; e.g. Vas Os et al., 2000) and a focus on economic deprivation alone have been investigated (e.g. Burns & Esterhuizen, 2008; Read, 2014); however, the same overall pattern has been found, with greater deprivation associated with increased psychopathology. In a recent study using a very similar deprivation measure (the Index of Multiple Deprivation for England) Bhasvar et al (2014) found neighbourhood-level deprivation significantly predicted psychosis incidence in an urban area in the UK. However, when analysing deprivation subdomains separately, the authors found that only Crime, Education and Employment were significantly associated with incidence, and not material deprivation measures (income and housing), suggesting that social disorganisation and threat, as opposed to poverty per se, were the critical risk factors, in an urban area.

In a cross-sectional postal-questionnaire study conducted in a different area of Wales (Caerphilly) the authors found poor mental health status (as measured by the five-item Mental Health inventory) was significantly associated with area-level income deprivation (based on household income estimates), particularly in areas where there was poor social cohesion (defined as having trust, reciprocity, and strong social bonds within the local social structure, as measured by an adapted version of the Social Cohesion Scale), with strong social cohesion within communities appearing to mitigate the adverse effects of area-level income deprivation on mental health (Fone, Dunstan, Lloyd, Williams, Watkins & Palmer, 2007).

Limitations

Individual-level deprivation measures were not available; therefore, it is not possible to ascertain whether or not individuals admitted to the units themselves were exposed to the neighbourhood-level 'risk' identified, i.e. the ecological fallacy. The inclusion of individual-level measurement as well as area-level would allow for person-environment interactions. It is also not possible to speculate regarding the direction of causality of the effects, i.e. whether social drift resulted in individuals who are psychologically distressed moving to live in particular areas, or whether they lived in these areas first; longitudinal cohort studies are needed to address this issue.

In the current study, all psychosis-related diagnoses were grouped together, and compared to all other mental health conditions which were also grouped together. In a recent ecological study of area-level incidence of psychosis in France, Szoke, Pignon, Baudin, Tortelli, Richard, Leboyer et al (2016) found different determinants for the different classifications of psychoses - affective v non-affective- and recommend they be

reported separately. It is possible that, by categorising all cases into two groups of conditions, we have missed subtleties in the data.

Implications and future research

Ecological studies can provide valuable insight into geographic inequalities, and can have important implications for policy making and allocation of resources within services, by highlighting risk factors at the population level. Preventative measures, including mental health promotion and interventions to reduce deprivation, can also be targeted at identified at-risk groups.

Future research could build on the current study by including individual level measures, to measure cross-level interactions. Individuals' trajectories from exposure to risk (i.e. deprivation) to being admitted for psychiatric inpatient care is not clear from the current data; future research could aim to identify the psychological mechanisms involved, which mediate the impact of deprivation on psychological distress. Replication of the results in other rural areas is necessary, for the results to be generalizable.

The observations reported do not necessarily imply causality; being exposed to multiple deprivation at a societal level may precipitate psychological distress, however, persons vulnerable to mental illness may drift to particular settlements. It is also possible that those with mental health diagnoses have been placed to live in certain areas. Longitudinal studies are needed to establish temporal precedence. Whichever the direction of causality, the current data suggest that environmental factors are strongly associated with mental health, and interventions targeted at improving the environment in deprived areas could potentially improve psychological outcomes.

Conclusions

The current study adds to the limited literature reporting on associations between multiple deprivation and admissions to psychiatric units, whilst adding significantly to the literature reporting on such data in a largely rural area. Neighbourhoods differ significantly in terms of incidents of admissions to psychiatric units. Higher levels of overall deprivation, as well as various derivation subtypes, are strongly associated with increased psychiatric admissions; this relationship is stronger for people with psychosis-related conditions.

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Chapter 3: Contributions to Theory and Clinical Practice

This thesis has attempted to develop our knowledge regarding the relationship between deprivation and psychopathology. Chapter 1 has provided an up-to-date systematic review of the literature reporting on the prevalence of psychopathology in adults experiencing homelessness globally. Chapter 2 describes an epidemiological study, of small-area-level multiple deprivation and psychiatric admissions across Wales' largest health board, in a predominantly rural area. In the current Chapter I will summarise the main findings, discuss contributions to theory and clinical practice, and make recommendations for future research.

Summary of thesis findings

Chapter 1 presents a systematic review of the literature, published over the past ten years (January 2007- April 2017), reporting on the prevalence of psychopathology in adults experiencing homelessness. 31 studies were included in the review, with a pooled sample of 53,299 individuals. Robust evidence of an association between homelessness and psychopathology was found, in studies conducted in Europe, North America, Australasia, Asia and Africa. Rates of mental illness were found to be considerably higher than general population estimates, which is consistent with findings documented in a previous systematic review (Fazel, Khosla, Doll & Geddes, 2008). High rates of Substance Use Disorder, Mood Disorder, Anxiety Disorder, Psychotic Disorder, Personality Disorder, Post-Traumatic Stress Disorder, and comorbid mental illnesses and dual diagnoses were consistently reported.

Evidence of a causal pathway remains unclear, given a dearth of longitudinal studies. In the limited literature reporting on precedence, the findings were inconsistent. Being male appears to be more strongly associated with homelessness, which is likely due to additional support services for women (particularly women and

children) at risk of homelessness. Homelessness appears to be a chronic condition, with the majority of the sample being homeless for a number of years.

The majority of the literature is reporting on prevalence rates in Western countries, which was the focus of the previous review (Fazel et al., 2008). The current review included studies conducted globally. However, only a small number were conducted in non-Western countries, highlighting a need for further research.

Homelessness can be conceptualised as the extremity of deprivation, with individuals experiencing homelessness being deprived of the most basic needs. Welsh Government defines deprivation as a lack of access to resource and opportunities which we might expect in our society (WIMD guide 2014). The empirical study described in Chapter 2 is an investigation of the associations between multiple deprivation and psychiatric admissions, locally, across North Wales.

In a largely rural area, using a complete dataset of admissions to psychiatric units across BCUHB over a six-year period, it was found that areas differ significantly in terms of incidents of admissions to psychiatric units, i.e. visible heterogeneity in cases admitted per small-area, with clusters of cases in certain areas. Multiple deprivation was highly significantly associated with the number cases admitted, with areas of greater overall deprivation predictive of more admissions. This relationship was stronger for people with psychosis-related conditions than for those with non-psychosis-related conditions.

The utilisation of a comprehensive measurement of multiple deprivation allowed investigation at the composite level of overall deprivation, as well as investigating the effects of each of the eight subdomain measures separately. The same overall pattern of results was found for the majority of the deprivation subdomains, with two exceptions. Deprivation of physical environment (measures of air concentration, air emissions,

proximity to waste disposal and industrial sites, and flood risk) was predictive of higher

admissions; however, unlike in the other statistical models, this relationship was not

different depending on type of diagnosis, suggesting deprivation of physical

environment did not differentially impact people depending of different diagnosis

categories. Deprivation of geographical access to services, as measured by travel times

to various services deemed necessary for day-to-day living, was significantly associated

with admissions, and impacted those with a psychosis-related condition more strongly;

however, the directionality of the effect was different, with higher deprivation

predicting lower admissions. This may be indicative of greater rurality being a

protective factor, however, it could indicate that individuals who are furthest away from

services are not receiving services they may need.

Contributions to theory

Although beset with methodological problems, attempts to geographically plot

the distribution of mental illness can be traced back as early as 1840 (Cline-Cohen,

1982), giving rise to the discipline of psychiatric epidemiology. In attempting to explain

the putative spatial distribution of mental illness, the 20th century saw a shift in interest

from physical environmental factors (e.g. climate and meteorological phenomena;

White, 1903) to the social environment, with researchers focusing on the social

architecture of urban areas (e.g. Schroeder, 1942), neighbourhood composition (social

class, ethnicity and ethnic density; e.g. Malzberg, 1940) and selective migration (e.g.

Odegaard, 1932). More recent epidemiological studies have plotted the spatial

distribution of mental illness, primarily focusing on psychosis-related conditions, and

primarily in urban areas, such as London (e.g. Bhavsar, Murray & power, 2014;

Kirkbride at al., 2007). The current thesis has developed our knowledge regarding the

spatial distribution of psychosis-related and other non-psychosis-related mental health conditions needing psychiatric inpatient care across rural North Wales.

It is now widely acknowledged that social factors have an impact on wellbeing. Our knowledge regarding the relationship between psychiatric admissions and multiple types of deprivation, when measured at the small-area/neighbourhood level, as opposed to individual-level measurement, has also been further developed, providing evidence to support theories of environmental impact on mental health. A number of theories have been proposed which highlight the importance of the environment on individuals' health (including mental health) outcomes, some of which are briefly described below.

John Bowlby, the pioneer of Attachment Theory (Bowlby, 1969), proposed that the environment – particularly in childhood – played a critical role in the development of psychological well-being. It was theorised that a secure base/attached figure allows infants to explore their environment in a stable state with the 'psychological protection' of the secure attachment. Thus, providing prototypes for future relationships, with a secure attachment style conducive to the formation and maintenance of intimate bonds, by promoting a sense of security and self-esteem, offering a basis on which to form secure, loving and lasting relationships.

Social network theory (Barnes, 1954) provided a way to conceptualise the structure of relationships within different social networks, proposing that the structure of the network its self was primarily responsible for determining the behaviour of individuals, by shaping available resources, access to opportunities, and consequently behavioural and emotional responses. Empirical data, gathered over a number of decades, have shown links between social networks (number of friends, relatives,

marital status, and affiliation with groups) and health, for instance, with evidence of

mortality being predicted by social networks (e.g Berkman, 1995).

Berkman and colleagues (2000) proposed a conceptual framework of social

relationships and health, with the perception of social support, social influence, social

engagement and attachment (to places and organisations), and access to resources and

material goods all proposed to influence health through various mechanisms, including:

attitudes and behaviours being reinforced by those within networks; shared norms

regarding health behaviours, e.g. smoking, alcohol and drugs consumption, diet,

treatment adherence; and experiences of abuse, trauma and violence within networks.

Social capital represents a resource, which is created when people cooperate in a

mutually beneficial way, within both formal and informal social networks (Cattell,

2001). Increased social capital which is accessed by many residents within a structure

(e.g. a neighbourhood, but not necessarily based on geographical proximity alone) has

been shown to lead to greater enjoyment of life, through participation in activities, in

organisation, and/or interactions with neighbours/others in the community. The effects

of poverty on individuals' health has been shown to be mediated by social capital, i.e. a

lack of social integration (Cattell, 2001).

An association between urbanicity and psychosis has long been established, with

multiple studies finding an effect of increased urbanicity (as measured by population

size or population density) predicting greater incidence of psychosis. In a meta-analysis

of the association, combining estimates from eight published studies, Vassos,

Penderson, Murray, Collier and Lewis (2012) estimated the risk of schizophrenia in the

most urban context at 2.37 times higher than in the most rural context, with a linear

relationship observed. The results remained stable irrespective of: classification of

psychosis (i.e. if outcome measurement involved a diagnosis of schizophrenia, or

psychosis more broadly); method of measuring urbanicity (i.e. population density or population size); or whether exposure to urbanicity was at birth and upbringing or at onset of illness. The authors conclude that this correlation does not imply causation, but that urbanicity is clearly a risk factor to the development of psychosis-related conditions. Social isolation, disintegration, and disconnectedness have also been shown to influence mortality (e.g. Cornwell & Waite, 2009).

It is clear that many environmental factors are involved in psychological adjustment and maladjustment, with the data described in Chapter 2 highlighting the significant predictive qualities of multiple deprivation on mental health outcomes. The majority of previous studies investigating associations between deprivation and psychopathology have been conducted in predominantly urban areas. Chapter 2 makes a unique contribution to the literature by providing an insight into these associations in a largely rural area.

Contributions to clinical practice

Inpatient psychiatric care is an integral part of the mental health care system in the UK, however, there is a paucity of empirical literature reporting on who accesses the service, what factors contribute towards being admitted to a psychiatric unit, and subsequent length of stay. In 2005, Bower and colleagues reported on an absence of clarity regarding the function of inpatient psychiatric care in the UK, and conducted a study to elucidate the nature and purpose of psychiatric units. The authors concluded that patients are admitted to psychiatric units because they pose a high risk of harm to themselves or to others; because they or their support network require respite; and/or because they have insufficient support available in the community. The service its self is reported to have multiple functions: to keep patients safe; assess their problems; treat

their mental illness; meet their basic care needs and provide physical healthcare; all of which are aimed to be achieved via containment, 24-hour staff presence, and providing treatment.

People with psychosis-related conditions have been shown to occupy a high proportion of bed days within psychiatric inpatient units in studies conducted in the USA (e.g. Huntley et al., 1998; Tullock et al., 2010), with the literature less well developed in the UK. The data described in Chapter 2 have shown us that, between 2010-2016, there were 11,019 psychiatric admissions across BCUHB, excluding all admissions relating to substance misuse, or organic illnesses such as dementia. Of these 11,019 admissions, approximately 35% were psychosis-related, and the other 65% were related to other mental health conditions (e.g. mood disorder and personality disorder). Of those with a psychosis-related condition, 60% were male and 40% female; of those with all other mental health conditions, 42% were male, with 58% female. Those with a psychosis-related condition's length of admission was considerably longer on average, at 47 days, compared to an average of 7 days for those with non-psychosis conditions, resulting in 55% of the total bed days during the study period being occupied by people with psychosis (185,841 of the 338,859 bed days).

In 2014, a Clinical Psychology service within psychiatric units across BCUHB was established, with a dedicated clinical psychologist based full-time at each site, for the first time in its history. When developing such a service, and designing interventions, it is important to understand the presenting difficulties of persons who present at the wards, and to have an estimation of the length of their stay. The data described in Chapter 2 is currently being disseminated within services locally, to help inform future developments.

These data also have wider implications, at the population level. Public Health Wales is the national public health agency in Wales. Part of NHS, its function is to protect and improve health and well-being, and reduce inequalities, for the whole of Wales. Health is a devolved power in Wales with Public Health Wales providing Welsh Government with advice and expertise. In a Welsh Government 'Measuring Inequalities 2016' document it was reported that, despite people in Wales living longer and spending more time in good health than they have done previously, there is still a big difference in life expectancy between the most and least deprived areas, with a gap of around nine years for men and seven for women, and a gap of 19 years for healthy life expectancy, with no signs of a reduction.

The 'Well-being of Future Generations (Wales) Act 2015' has set out a number of targets, one of which is working towards a more equal Wales. The 'Making a Difference' report (Public Health Wales, 2016) has highlighted ten key areas for action that are to be prioritised in Wales to enable considerable improvements to health and well-being and to reduce inequality, including: building resilience across the life-course and settings, by ensuring a good start in life for all; promoting mental well-being, preventing mental ill health, and preventing violence and abuse; addressing harmful behaviours such as smoking and alcohol consumption; promoting physical activity; promoting healthy diet and preventing obesity; reducing social inequalities such as unemployment; and ensuring safe and health-promoting environments (e.g. reducing pollution, improving quality of housing). The data described in Chapter 2 provide further evidence to support the need to intervene at a public health level, to reduce inequality and multiple deprivation, as a preventative measure, to promote well-being and mental health.

Recommendations for future research

Although it is clear that deprivation is associated with increased psychological distress, gaps in our knowledge remain, and further empirical investigations are warranted. Deprivation is, to some extent, a societal construct; being deprived of certain things in one culture or context may be perceived very differently in another, therefore cross-cultural studies including more diverse populations are a possible avenue to explore further.

Individuals' trajectories from exposure to risk (i.e. deprivation) to being admitted for inpatient care are not clear from the data presented. It is important to identify the psychological mechanisms involved, which mediate the impact of deprivation on psychological distress. Candidate factors suggested in previous research include self-efficacy, self-esteem and self-worth, all hypothesised to be necessary components in developing resilience and promoting positive affect. Studies including measurement at the individual and area-level would allow for cross-level interactions, which is needed to fully understand the relationship between area-level deprivation and psychological distress.

Given the empirical chapter of the thesis has described data from a largely rural area, a natural step forward would be to widen the catchment area of the study, to include other health boards within Wales to investigate the effects across a larger, more diverse landscape.

Reflections

The systematic review reported in Chapter 1 was an update of a previous review, published in 2008, summarising all publications reporting on the prevalence of psychopathology in adults experiencing homelessness published up to 2006. However,

the previous review had included studies conducted in Western Countries alone. I have

an interest in mental health more globally, and although I appreciate the rationale for

keeping such a review focused to studies conducted in a certain geographical area,

where similar societal structures may be in place, I felt strongly that studies conducted

outside of the typical Western catchment area should not be excluded. Only a small

number of studies which were included in the review were conducted in different

settings, however, the data reported on provide a valuable insight. Particularly

interesting was that the average age of adults experiencing homelessness in Asia is

considerably higher than in Europe, the USA, and Australasia. The authors speculate

that this is because of a different cultural norm, where families are more likely to co-

habit, and care for each other, with individuals becoming homeless at a much older age

as their family members who had previously cared for them have died.

A substantial amount of data obtained from the electronic patient records across

BCUHB was excluded from analyses for Chapter 2. I was initially uncomfortable with

excluding such a wealth of data, enthusiastically wanting to also include data on those

admitted with substance-related conditions in the analyses and article. However, this

would have been deviating away from the initial research questions proposed and

approved by the supervision team and ethics panels (and is another thesis in itself,

potentially).

When researching deprivation, becoming familiar with the various measures of

deprivation used in different studies, one particular variable triggered discomfort, and

provoked much self-reflection in an attempt to understand my emotional response.

Social fragmentation, which represented deprivation and was found to be a significant

predictor of psychological distress (Ivory et al., 2011), is measured in part by the

number of single-person households within an area. During the study period, I had

myself become one of these single-person household statistics. I experienced a succession of emotional responses, initially feeling defensive and (irrationally) critical of such a measure, followed by confusion as to why I would be concerned with being associated such a statistic. Particularly given such a strong affinity to, and pride in, being raised in an environment which would be classed as deprived in a number of different ways. The reflection process continues, and is yet to be resolved.

The results presented in both articles, highlighting such vulnerability to psychological distress by people experiencing greater socioeconomic deprivation, elicit a range of emotions. That so many people, especially in developed countries, continue to experience homelessness, I cannot comprehend. It is incredulous that, in high income courtiers, people live, chronically, in such impoverished conditions. It also saddens me that, locally in North Wales, there is such inequality. However, I am also pleased and proud to have been able to research these topics and disseminate the findings, making a (small) contribution to the field.

Excellent supervision has been vital to the completion of the current thesis. Although I have undertaken multilevel modelling statistical analysis with nested data structures in the past, all previous analyses had been conducted using SPSS software. After days, possibly weeks, of attempting to run the complex models for the empirical research described in Chapter 2 in SPSS, I eventually had to concede, and had a crash-course in a completely unfamiliar, and initially daunting, package- R (R Core Team, 2013). This would not have been possible without the personal tutoring and support gratefully received.

Conclusions

The current thesis has important theoretical and clinical implications. It has highlighted the considerable vulnerability to psychological distress experienced by individuals experiencing homelessness; a finding which appears to be universal. More locally, across North Wales, we have a better understanding of who presents at psychiatric inpatient units and the length of their stay. Individuals, to whom we provide mental health services, function as part of a wider social context. The current thesis has highlighted the impact of multiple deprivation domains, measured at the neighbourhood level, on psychological well-being. It is imperative that, as clinicians, we consider the wider context within which service users function, and include such variables in our formulations and care and treatment plans. Information presented in this thesis can also contribute towards local service planning and mental health promotion at the populating level.

<h1 style="text-align:center">References</h1>

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Appendices

1. IRAS form

2. Study protocol

3. NHS REC approval letter

4. R & D approval letter

5. Word count details

Appendix 1: IRAS form

Appendix 2: Study protocol

Appendix 3: NHS REC approval letter

Appendix 4: R & D approval letter

Appendix 5: Word count details

Main substance of thesis:

Thesis summary: 216

Chapter 1:   3701

Chapter 2:   3607

Chapter 3:   3173

Total of the main substance of the thesis: 10,697

Tables, figures, references and appendices:

Chapter 1:

References: 1294
Tables, Figures and Appendices: 3394

Chapter 2:

References: 639
Tables, Figures and Appendices: 313

Chapter 3:

References: 468

Total of the tables, figures, references and appendices of thesis: 6,108