

Population-based indices for the funding of mental health care: a review and implications

Population-based indices of needs have an influence on mental health care funding. Over the last 30 years, a number of needs indices have been developed that utilise sociodemographic and service utilisation data to calculate a proxy indicator of population-based need. This approach is used because indicators of socio-economic disadvantage expressed as weighted deprivation show a strong relationship with mental health morbidity. In this paper, we review the existing indices, illustrate the application of these indices using east London as an example, and consider the methodological and conceptual limitations of these indices. Although none of the current indices provide a definitive picture, commissioners and providers may find them to be a useful source of contextual information, which may be useful in combination. In England, this is particularly relevant in the light of the increased liberalisation of commissioning services and changes in the funding process.

Identifying populations at risk of mental illness, and therefore in need of services, is central in the process of planning and commissioning mental health services. Ideally, services should be distributed appropriately to population requirements. By identifying those in greatest need, both from an individual and a population perspective, limited resources could be most efficiently directed (Goodman & Haugland, 1994).

In the UK, mental health was one of the previous government's priority areas (Department of Health, 2004a). As such, it made a commitment to ensuring access to treatment according to local needs and for the key function of primary care groups to plan, commission and monitor local health services to meet identified local needs (NHS Executive, 1991). The *National Service Framework for Mental Health* (Department of Health, 1999) set out a number of new funding allocations to support mental health development. It stated that resources should be allocated in line with population-based need for services. Put simply, this implies that the provision of mental health services should match the needs of the population. Therefore, the question arises: how are population-based mental health needs assessed?

It is well established that the risk factors associated with poor health, and mental illness in particular, are linked to social deprivation (Thornicroft, 1991; Jarman *et al*, 1992; Smith *et al*, 1996; Glover, 1999). As a result, measures of mental health care need and deprivation are closely linked. Deprivation may have two effects; first, it may influence the prevalence of mental illness due to factors such as migration and social drift. Second, it may impact on the severity of mental illness, including the likelihood of relapse and the level of social support in the community (McCrone & Jacobson, 2004).

The relationship between research-based mental health prevalence figures – expressed demand for services and actual needs for care – has not reached academic consensus (Elphick, 2009). This issue has been highlighted in *New Horizons* (Department of Health, 2009), which emphasises the gaps in the evidence and research around agreeing measures to better understand the mental health needs on a population level). There are strong socio-economic and sub-cultural determinants of the prevalence and complexity of mental health problems of differing sorts. The complexity of mental health problems and difficulty in achieving good outcomes from treatment is also correlated with measures of

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EVALUATION

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deprivation. Thus, there are not only more cases, but each of those cases is more complex. As a result, there is a tendency to underestimate population needs in the most deprived areas (Elphick, 2007).

Population-based indicators of mental health needs provide an important function, primarily because of the influence that they have on the allocation of funds to primary care trusts (PCTs) (McCrone *et al*, 2006), however, they also provide a method of monitoring and promoting equity in the provision and use of services, and addressing inequalities in health (Womersley & McCauley, 1987; Majeed *et al*, 1994). The aims of this paper are threefold:

1. to describe the most commonly-used indices of deprivation and measures of need that relate to population-based mental health
2. to illustrate the application of these indices using east London as an example
3. to consider the limitations of these indices in the light of changing funding processes.

Mental health needs and deprivation indices

To follow is a brief overview of the population-based indices of mental health needs in the UK. Included are details regarding the development and application of each index.

The Underprivileged Areas score (UPA; Jarman 1983; 1984)

One of the earliest examples of population-based needs assessment was the Underprivileged Areas (UPA) score. The development of the UPA stemmed from concerns that there were variations in primary health care needs based on geography in particular, that in urban areas problems were greater, and the resources to deal with them were inadequate. The process of determining primary health care needs was based on general practitioners' perceptions of factors that they believed had the greatest impact on their workload. From a survey of GPs, these factors were mapped against census data to locate areas with the greatest concentration. Eight factors were identified, the proportion of the population who were:

1. elderly and living alone
2. children under five
3. unskilled workers
4. from overcrowded households
5. living at a changed address that had changed in the last year
6. living in a household where the head was born in the New Commonwealth or Pakistan
7. unemployed
8. households containing lone parents.

UPA scores range from -50 to +70. The average score, by definition, is zero, a positive score equates with deprivation. The five per cent of wards (discrete areas) with scores of 30 or above were defined by the government as being 'deprived areas' and patients from these areas registered with a GP attracted a deprivation payment.

York Index (Carr-Hill *et al*, 1994a; 1994b)

The University of York was commissioned to 'produce a formula for allocating resources for psychiatric services that reflects the relative utilisation that would result in an area if some standard level of resources and standard clinical practices were in force, given the socio-economic circumstances in the area' (Smith *et al*, 1996; p308), thereby improving the sensitivity of the formula for allocating funds to regional health authorities according to need.

A range of demographic factors were examined, primarily from 1991 census data, as well as all inpatient episodes in England (HESonline, 2010). Using multilevel modelling techniques, an index of need was generated that included the:

- proportion of households headed by a lone parent
- proportion of dependants with no carer
- proportion of people born in the New Commonwealth
- proportion of people of pensionable age
- standardised mortality ratio for those aged below 75
- proportion of adults who are permanently sick.

It was the intention of the York Index to explain variations in psychiatric inpatient use among small areas known as 'synthetic wards' (comprising approximately 10,000 people); a high score on the Index indicated a higher level of psychiatric need. The Index was used by the Department of Health as the basis for distributing funding from 1995 to 2003.

Mental Illness Needs Index (MINI; Glover *et al*, 1998; Glover *et al*, 2004)

The Mental Health Needs Index (MINI) was also designed to aid resource allocation, as well as planning for mental health services. It was developed by identifying population characteristics that explained variations in the prevalence of hospital admissions in small areas, originally across the north east Thames Region, and subsequently applied nationally. Potential predictors were drawn from the 1991 census data and a model was produced using multivariate analysis. The original MINI was most applicable to mental illnesses that may, from time to time, need hospital treatment

(Glover *et al*, 1998). Calculations for the updated version (MINI2000) are derived from data relating to 1998 (Glover *et al*, 2004).

The population characteristics found to be associated with mental ill health included the number of people or households per area who were:

- single/widowed/divorced
- permanently sick
- unemployed
- without a car
- living in a household that was not self-contained
- living in a hostel/lodging house.

The MINI is calculated as the predicted admission rate for an area divided by the predicted admission rate for England for working age adults. Therefore, an area with demographic characteristics indicating an admission rate higher than the national average would have a MINI score greater than 1. For example, a needs index of 1.9 suggests that there will be 90% more illness in an area than the national average (Glover & Dean, 2007).

Psychiatric Needs Index (PNI; Department of Health, 2004b)

The PNI replaced the York Index as the index for the allocation of funds to PCTs. The index is based on models of utilisation of health care and comprises socio-economic and health-related variables. There are two different groups of variables included in these models:

1. standard variables derived from small area statistical modelling of utilisation
2. additional morbidity variables designed to capture some of the effect of unmet need.

The mental health need factor is calculated using an additive process for combining variable scores. The factors include:

- comparative mortality under the age of 65
- the proportion of people over 60 who are claiming Income Support
- the housing domain of the Indices of Multiple Deprivation (IMD)
- a psycho-social morbidity index. Higher scores on this index indicate greater levels of mental health need.

Indices of Multiple Deprivation (IMD; Office of the Deputy Prime Minister, 2004; Department for Work and Pensions, 2008)

Originally developed by the Office of the Deputy Prime Minister and later modified by the

Department for Work and Pensions, the Indices of Multiple Deprivation (IMD) measures seven domains of deprivation separately and then combines these to give an overall score for each district in England. The domains are:

1. income deprivation
2. employment deprivation
3. health deprivation and disability
4. education, skills and training deprivation
5. barriers to housing and services
6. living environment deprivation
7. crime.

For each domain there is a weighted average score and a weighted average rank. All of these summary scores can be ranked for the purposes of analysis (Office of the Deputy Prime Minister, 2004).

Local Index of Need (LIN; McCrone *et al*, 2006)

In 2003, the London Development Centre for Mental Health commissioned the London Health Observatory and the Institute of Psychiatry to develop indicators for mental health service activity across London, while adjusting for socio-demographic need, ie. to understand how much of hospital activity within London is based on the socio-demographic profile of the local populations. One of the key objectives was to construct an index without using utilisation as a proxy for need. A principal component analysis of socio-demographic variables identified in previous research to be indicators of need produced four distinct factors. These factors contained a number of socio-demographic variables, including crime rates, large ethnic minority populations, and high unemployment rates.

A composite index was constructed by producing a weighted average factor for each score for each local authority in England. A weighted sum of these factors was used to produce a single index. The mean LIN score is equal to zero, with a positive LIN indicating a local authority with higher than average needs.

Summary

There are clearly a number of similarities in the development of the indices, for example, all indices, bar the LIN, utilise census and hospital admissions data. However, as shown in **Table 1**, overleaf, although some socio-demographic factors are common, many identify different social indicators as influential in the measurement of population-based mental health needs.

Table 1 Main socio-demographic variables included in the calculation of population-based needs indices

Socio-demographic variable	Population-based index					
	UPA	York Index	MINI	PNI	IMD	LIN
Deprivation				•	•	
Elderly	•	•		•		•
Children	•					•
Ethnicity	•	•				•
(Un)employed	•		•		•	•
Long-term sick		•	•			•
Housing	•		•	•	•	•
Education/skilled	•				•	•
Crime						•
Single parents	•	•			•	
Mortality		•		•		

The application of indices to east London

Here we show how the indices may be applied to east London as an example. We selected east London because it is at the low end of most needs indices (and would therefore be substantially affected by a funding scheme that strictly follows such indices) and because the relevant data is available to us. We highlight how the methods used to calculate population-based needs by the various indices can result in different conclusions.

Estimates of the prevalence of serious mental illness vary substantially across areas and according to specific disorders; however, a substantial body of evidence indicates that rates of serious mental illness in London are particularly high. For example, London has significantly higher rates of admissions for schizophrenia (99.8 per 100,000 compared to 72.6 per 100,000), and notably higher rates of adults detained in hospital under the *Mental Health Act 1983* (HM Government, 1983) (60.8 per 100,000 compared to 36.1 per 100,000) than the national average (Jenkins *et al*, 1997). Data from the National Centre for Health Outcomes Development (2008) of the proportion of all patients with schizophrenia, bipolar affective disorder and other psychoses in a GP registered population also indicate that prevalence rates of psychosis in London are higher than the national average (0.87% v 0.71%). Furthermore, epidemiological data from the *ÆSOP* study (Kirkbride *et al*, 2006), which collected prospective comprehensive survey data of clinically relevant first onset psychotic syndromes over a two-year period in three cities (London, Nottingham and Bristol), suggests that rates of psychosis are twice as high in inner-city London as elsewhere.

The east London area comprises four boroughs; City of London, Hackney, Newham and Tower Hamlets. Data indicate GP registered prevalence rates of psychosis of 1.16%, 1.06% and 0.90% for, City and Hackney, Tower Hamlets and Newham respectively (National Centre for Health Outcomes Development, 2008). These areas are ranked as having the fifth, eighth and 31st highest prevalence rates out of the 152 national areas. The area is exclusively inner-city urban, with high levels of immigration and socio-economic deprivation. Ethnicity data (Office for National Statistics, 2002) indicate that the east London area has the largest black and minority ethnic (BME) population (49%) in the UK. The BME population nationwide is eight per cent. Recent data suggest that incidences of psychoses are twice as high for BME sub-groups compared with white British individuals living in east London (Kirkbride *et al*, 2008). Correspondingly, a meta-analysis of 40 studies found that the incidence of schizophrenia associated with immigrant status was, on average, nearly three times greater than for native populations (Cantor-Graae & Selton, 2005).

Table 2 (opposite) provides details of the ranked scores for each of the indices described above. Lower numbers translate to higher levels of mental health need or deprivation. Although the boroughs of east London are often rated as some of the most deprived or 'needy' in England, there is still variation. For example, Hackney is rated highest by the IMD and LIN, second by the UPA and PNI and third by the York Index. Yet the MINI identifies seven boroughs with greater mental health needs.

We now provide a brief overview of the limitations of these indices that may help explain such variation.

Limitations of mental health needs indices

The term 'need' implies a feature that can be objectively assessed. Although the term has an intuitive appeal, it mixes at least three separate aspects:

1. the identification and quantification of a problem
2. the assumption that an effective intervention exists to change the problem
3. the estimate of how much of that intervention is required to achieve the desired change.

The last aspect can then be translated into costs and specify the necessary funding. Thus, the term is conceptually flawed and all needs indices should be interpreted with great caution when they are used to justify funding levels (Priebe *et al*, 1999). As with the assessment of individual need, the assessment of population needs produces different outcomes, depending on the methodology employed. For example, using deprivation indices would indicate greater need in urban areas, conversely, if scarcity of provision was the key criteria, rural areas would demonstrate greater need (Asthana *et al*, 2009).

Indices of population-based need typically include service utilisation as a proxy for need and then identify significant predictors from this utilisation (McCrone *et al*, 2006). This is significant if utilisation does not reflect real need, as has been suggested (Sheldon *et al*, 1993; Cohen & Eastman, 2000). It could be argued that utilisation more accurately reflects availability, which in turn is an indicator of previous funding arrangements. This issue is compounded by the use of incomplete utilisation data; typically inpatient admission data, mainly because this data is more readily available.

As a result, indices fail to account for the level of care that may be provided to patients within primary health care or community-based settings. Additionally, needs indices commonly use numbers of discharges rather than bed occupancy as the dependent variable; this does not take into account the variation in length of stay in areas with greater average complexity, as well as greater prevalence.

The use of pre-existing secondary data (eg. census data) to generate an index (Rabkin, 1986) is common among the current approaches to calculating population-based needs. This is known as the social indicator approach. The underlying assumption being that it is possible to make useful estimates of the needs and social well-being of those in the community by analysing statistics on factors found to be highly correlated with need (Warhelt *et al*, 1977). This approach has been used to predict psychiatric morbidity and general psychiatry service utilisation (Jarman *et al*, 1992), but the validity and reliability of the models developed are sometimes difficult to establish (Cohen & Eastman, 1997).

Although secondary data items are a valuable source of information, the process suffers from a number of shortcomings. First, UK census data can be up to 11 years old. Situations can change, therefore any measure of need cannot be static – data must be updated regularly (Glover *et al*, 2004). For example, as a result of the development of the Thames Gateway and the Olympic site, east London is undergoing an unparalleled level of population change and growth. Census data collected in 2001 are substantially different to more recent population estimates such as those by the Greater London Authority (2008). Second, census data suffer from high levels of under-recording. This is of particular

Table 2 Ranked scores of population weighting indices of needs and deprivation (1 being the most deprived).

Borough	† UPA (N=33)	York Index (N=100)	PNI (N=148)	**MINI (N=354)	**IMD (N=354)	***LIN (N=148)
City	33	-3	*2	21	253	*1
Hackney	2	-3	*2	8	1	*1
Newham	4	-3	4	12	2	4
Tower Hamlets	1	-3	1	5	3	8

† UPA scores are for London boroughs only

-Rank for East London, City and Hackney Health Authority

*Data are combined for City and Hackney

**MINI and IMD refer to census area statistics wards

***LIN refers to local authorities in England

relevance to the most socially marginalised populations; typically the people who require higher levels of service contact. Therefore, the advantages of using secondary data, such as being cheap and routinely available, must be balanced against the care one must exercise in choosing the various social indicators from those that produce the closest statistical fit.

When considering candidate socio-demographic characteristics, it is also important to make a distinction between those measured at the level of an individual and those measured at an area level (McCrone & Jacobson, 2004). Assumptions made about individuals based on aggregate data are vulnerable to ecological fallacy; a phenomenon that occurs when an inference is made regarding an individual based on aggregate data for a group. This does not mean that identifying associations between aggregate figures is necessarily defective, nor that any inferences drawn about associations between the characteristics of an aggregate population and the characteristics of sub-units within the population are unrelated. However, the process of aggregating or disaggregating data may conceal the variations that are not visible at the larger aggregate level.

Some factors may operate at the population level as modifiers or determinants of exposure to individual level risk factors. For example, being poor in a rich neighbourhood may be worse than having the same income level as others in a poor neighbourhood, because of problems of social exclusion and lack of access to services and resources (Yen & Kaplan, 1999). This process may operate through relatively direct mechanisms, but may also involve aspects of individual lifestyle that are, in part, determined by the social context. The failure to take account of the importance of population context as an effect modifier and determinant of individual level exposures is called the '*individualistic fallacy*' (Diez-Roux, 1998) in which the major population determinants of mental health are ignored and undue attention is focused on individual characteristics.

It could also be argued that to describe an area as 'deprived' over-simplifies the reality of the situation. Although east London has high levels of deprivation, there are also distinct pockets of wealth. Indices typically calculate deprivation and need using only a limited amount of the data available and do not take into account the heterogeneity of the population. For example, calculations for the IMD are based on the most severe 10% of the population in any given area. In a review of findings on the association between

income distribution and population health, Wilkinson and Pickett (2006) conclude that a large majority of studies (70%) suggest that health is less good in societies where income differences are bigger. What makes a difference to health is more a matter of people's relative income and status in society than their absolute material living standards (Wilkinson, 1997).

Financial implications

Health care is funded through different sources and arrangements; the question is how to allocate it to different areas. Funds are currently allocated in a way that is intended to reflect differences in socio-demographic need. The development and use of formulas that take into account the needs of local populations is an attempt to do this. However, in the future there will be an increased liberty in the commissioning of services; indices may need to be disorder specific, eg. for psychosis or depression, or service type specific, eg. community mental health teams (CMHT) or inpatient provision. Indices will also need to be sufficiently sophisticated to capture the complex nature of mental health needs. This may be of particular relevance with the onset of Payment by Results (PbR), as this will completely change the way that mental health services are funded. PbR has three main components: national tariffs for treatments; codings or currencies for treatments according to resource use; and diagnosis and activity-based funding (Jacques, 2008). Although there are some concerns that the implementation will be difficult (Fairbairn, 2007), this process will replace the existing 'block contract payment' arrangements for services.

On 1 April 2008, the statutory duty on local authorities and PCTs to work together with their local partners to produce joint strategic needs assessments (JSNAs) came into effect. The purpose of the JSNA is to identify the unmet needs and inequalities in the local population and to provide a sufficiently broad joint evidence base for a locality. The aim is to increase joint working and co-operation among all partners leading to improved outcomes (Ward & Cosford, 2008). The use of population-based indices should be a key component for all stakeholders across England who are engaged in this process as a means of better understanding the mental health needs of local populations.

The Department of Health resource allocation system currently seeks to ensure that there is sufficient funding to provide equal access for equal need in all parts of the country, and to reduce avoidable health inequalities. Allocations are made

to PCTs on the basis of the relative needs of their populations through a weighted capitation formula. This formula is weighted to include each PCT's 'crude' population according to their relative need (age and 'additional need') for health care and the unavoidable geographical differences in the cost of providing health care (market forces factor). The development of the weighted capitation formula is overseen by the independent Advisory Committee on Resource Allocation (ACRA). ACRA makes recommendations on possible changes to the formula, prior to each round of PCT revenue allocations. However, ACRA acknowledges that the data about relative population needs to inform the resource allocation process is in major need of improvement (House of Commons Health Committee, 2009).

Conclusion

The measurement of population-based mental health need is a complex process, beset by conceptual and methodological problems. Measuring relative deprivation is a step forward from approaches that do not distinguish need from supply and demand, but relative deprivation cannot be used to specify precise need for mental health service planning (Stevens & Gillam, 1998). While current indices are useful and appropriate in specific circumstances, they are problematic in that some (MINI and PNI) are based on levels of utilisation (which may not reflect need); others (UPA and IMD) are not specifically intended to be indicators of mental health need. Furthermore, although indices of need can explain variations in socio-demographic profiles, reservations regarding the relationship between these factors and indicators of mental health need should be expressed (McCrone *et al*, 2006).

It has been suggested that there is no 'correct' method of needs assessment; selection of the 'best' individual method, or combination of methods, will depend on the overall aims adopted (Cohen & Eastman, 1997). Using a number of separate approaches will provide a range of perspectives that can shed light on different aspects of need. Bearing in mind the conceptual and methodological issues discussed in this paper, purchasers and developers of mental health services must be clear about what level or type of need they wish to assess. Limited resources may constrain the freedom of purchasers to demand sophisticated assessments of need. However, we propose that methodologically loose assessments of need are extremely limited in their usefulness.

Jarman (1983) suggests that it is important to distinguish between the problems of the population served (social factors) and those of the services provided (service factors) and to obtain independent measures of both. This process requires a valid and reliable measure of 'need', however, indicators of mental health needs often provide a partial picture. Recent developments, such as the LIN, have the advantage that they are not based on previous levels of utilisation or expenditure, and therefore have resulted in increased refinement and subsequent sensitivity. It is clearly important that the planning, commissioning and monitoring of services meet identified local needs, however current indices lack sophistication. Commissioners, therefore, lack good quality data on the mental health needs of local communities, making it difficult to ensure that services are accessible to local populations. Indices can only ever be an approximate guide of population-based mental health needs. Better indices would take into account the wide spectrum of disorders, various service models available and a range data sources. Until then, we accept the current indices, for want of something better.

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