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SPECIAL ARTICLE

Psychiatric epidemiology now: some achievements and prospects

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Aims. It is timely to ask what epidemiology has brought to our knowledge about mental illness and what information is proving of particular value. In this task, the first step is to identify the truly fundamental questions that the epidemiology of mental disorders should be expected to answer. This review is selectively directed at four such questions.

Methods. A small number of significant publications were identified.

Results. The extent to which some major questions in epidemiology have been answered is examined.

Conclusions. When considered alongside epidemiological knowledge elsewhere in medicine, psychiatric epidemiology has indisputably proved to be a powerful tool. Descriptive studies have been particularly useful for advocacy and policy, while analytic studies of aetiology have yielded some valuable clues. There are now signs that linkage with neuroscience will bring further progress in understanding the causes of mental disorders.

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What has epidemiology contributed to knowledge about mental disorders; and where is it now heading? In all fields of science, one should be constantly vigilant for observations that may point to underlying processes, processes about which we should like to know more. It is this approach that allows relatively trivial issues to be set aside, but instead the emergence of new and sometimes unexpected understanding. Five decades ago, Morris (1964) said there were seven uses of epidemiology:

- Completing the clinical picture
- Community diagnosis
- Secular changes in incidence
- The search for causes
- Applying population data to individual risk
- Delineation of syndromes
- Health services research

To these, Gruenberg (1966) said an eighth had to be added, prevention, which he said was its 'ultimate service'. Since Morris gave his list, psychiatric epidemiology has indeed made a contribution to each of its items, sometimes plentifully. This paper identifies selected contributions to four significant questions:

(1) Can epidemiology contribute to classification?
(2) How should morbidity in large population samples be measured?
(3) What is the distribution of mental illness in the human population?
(4) What pathogenic exposures in the environment have been identified by epidemiology?

The following is a commentary on these questions rather than their exhaustive analysis. By our looking at the configuration of ideas within them, some sense of their significance may emerge.

Classification

How mental disorders can be classified has once more become topical. If it is assumed that there is a pattern of abnormal mental states, with a recognisable architecture, consistently occurring across the human population, it clearly should be apparent in treated cases. But in the general population, there will be people whose abnormalities are less severe, or are just as severe but where the individual has not reached services. This is where epidemiology contributes, by completing the clinical picture, just as Morris indicated. Where the morbidity is not categorical, either present or absent, but lies on a spectrum, it will be invaluable to consider the population distribution of symptoms lower in the continuum. This is clearly the case for

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all the common mental disorders, anxiety, depression, alcohol abuse and cognitive decline. Counter-intuitively, it may also apply to psychotic symptoms.

Classification is currently attracting attention because of the forthcoming revision of the two major systems. In an important paper describing the research planning for this task, Regier *et al.* (2011) spelt out the need to rethink the assumptions made in DSM-IV (American Psychiatric Association, 1994) and ICD-10 (World Health Organization, 1992), where a hierarchical structure was used with a clear distinction between the psychoses, mood disorders, anxiety, personality disorders and other syndromes. In designing DSM-V and ICD-11, two matters have demanded attention and both are derived directly from epidemiology. The first is the dimensional nature of morbidity, recognition of which greatly helps the quantification of severity. This has been much needed not only for its clinical relevance but also for administrative purposes and certainly for research. The second matter is comorbidity, the apparent co-occurrence of two or more of the currently recognised diagnoses. In population surveys and in clinical samples alike, two or more diagnoses occur much more often than by chance. The reasons why this occurs are of great interest. One appealing explanation is that it is the result of imposing categorical distinctions that do not exist in nature (Maj, 2005). That is, comorbidity is, may be, an iatrogenic artefact.

Regier *et al.* (2011) say explicitly that epidemiological data are currently being used to improve the validity of the new classification. They give as examples the huge meta-analysis by Krueger & Markon (2006), based on five well-known population surveys yielding data on a total of 23 500 individuals and 11 diagnoses. This has led to the liability spectrum model in which everyone in a population is considered to lie on a continuum of predisposition for all the common mental disorders. Significantly, a closely similar conclusion was reached by Slade & Watson (2006) in their analysis of the first Australian National Survey of Mental Health and Well-being (Andrews *et al.* 2001). In this model's hierarchical arrangement, the architecture of the common mental disorders shows itself as follows: their total body splits into two groups, internalising and externalising. The former divides into diagnoses characterised by either fear or distress. Distress is where major depression, dysthymia and generalised anxiety disorder are positioned, while the phobias and panic disorder are under the fear rubric. The externalising disorders include alcohol and drug abuse, conduct disorder and adult antisocial behaviour. This model is derived from data through statistical analysis rather than through the minds of academic clinicians. We should note that the model unfortunately says nothing about the psychoses, where comorbidity certainly occurs just as much and a liability spectrum may also exist.

In the liability spectrum model, the constituent factors resemble personality traits but extend beyond these. It is this common liability that leads to two or more mental disorders occurring at the same time in one person. But seeing mental pathology as dimensional can be important elsewhere. In studies of aetiology, the pathological consequences of a particular exposure may lie on a continuum, not just leading to discrete cases and non-cases, so it can be useful to identify individuals having a range of severity. Dimensionality is also of particular relevance in genetic studies where phenotypic expression can certainly be dimensional. The model takes us even further: it becomes unsurprising that the relatives of persons with one mental disorder tend to be at risk for a range of other disorders. Here is an example of epidemiological data leading to a new level of understanding.

How should morbidity in a population be measured?

If classification provides an operational map of mental pathology, the next step is to measure its proposed components. Measurement has always been an absolute prerequisite in all science, but if we are frank, in psychiatry it remains very much work in hand. It has to be remembered that the first studies of psychiatric disorders in the general population were based on the clinical judgment of individual clinicians, sometimes supplemented by the subjective opinion of key informants. Later, brief scales of mental health were administered, as in study of Mental Health on a Housing Estate by Taylor & Chave (1964). The influential Midtown Manhattan Study by Srole *et al.* (1962) used only a series of questions that did not in any way intend to reach a particular diagnosis. Five decades later, there are two main strategies being used for ascertaining morbidity. Although readers will be very familiar with the following instruments, it is instructive to stand back and consider what they actually do.

The first method is to ask a sample of individuals only a few questions about their recent mental health. Such screening tests are exemplified by instruments such as the GHQ-12 (Goldberg & Williams, 1988) or the K-10 (Kessler *et al.* 2002) which take only a few minutes to complete. The end product is a score for each individual, the score indicating the probability that the person is a case. But one can also examine the frequency distribution of symptoms as they occur in the whole sample. Rose (1993) emphasised that this distribution of scores can be used to characterise the population itself. As he puts it, 'Psychiatrists, unlike sociologists, seem generally unaware of the

existence and importance of mental health attributes of whole populations, their concern being only with sick individuals'.

In marked contrast, the second strategy is to use one of the standardised clinical interviews. Three are in common use: the Composite International Diagnostic Interview (CIDI) (World Health Organization, 1990), the Clinical Interview Schedule (revised) or CIS-R (Lewis *et al.* 1992) and the Schedule for Clinical Assessment in Neuropsychiatry (SCAN) (Wing *et al.* 1990). The first two can be used by lay interviewers after training, but the SCAN is different in an important way. It is a research instrument for use by clinicians already familiar with the phenomenology of psychiatric illness. It allows probing questions to be used before a symptom is rated as present or absent, and it records some aspects of behaviour during the interview. The CIDI is administered by lay workers who need not have prior knowledge of mental illness and who must not deviate from the tightly scripted text. All three instruments take between a half hour and 2 h to complete. For many respondents, they are a tedious experience.

What has to be recognised in all of these standardised interviews is that case finding necessarily uses a different method from elsewhere in medicine: the presence of morbidity is determined exclusively by the verbal response of individuals to questions about their recent symptoms. In all the instruments, no truly objective measure of morbidity is used because none yet exists. So when we go on to consider the findings in large population studies, the findings have only one source: what people have verbally told the interviewers. While it would be senseless to ignore the findings altogether, a great deal of thought should be given to their meaning and significance. In a publication of commanding significance, Eaton *et al.* (2007) examined evidence for the validity of case identification in epidemiology as carried out in both community and clinical settings. They looked at over 1000 publications, finding great variation in validity. Sensitivities ranged from 0 to 100% and specificities from 22 to 100%. The great majority of the studies were using instruments such as the CIDI or its predecessor the Diagnostic Interview Schedule. Rather arrestingly, Eaton *et al.* concluded that 'The validity of case ascertainment in psychiatric epidemiology is still in question'. They did recognise that we have come a long way from seeking only to identify a case of any mental disorder, as in the 1950s. With optimism, one can now look for some advance coming from new strategies, such as multiple imputation approaches. But for the foreseeable future, it seems unlikely that case ascertainment will be able to go beyond self-reporting of symptoms. For large population studies, we do not yet have practicable biological variables, as in peripheral blood or brain function.

The two-phase design. Before we leave the topic of measuring morbidity, the two-phase design is one strategy that is under-utilised, but nevertheless an elegant advance in methods. Its strength lies in the parsimony of effort and cost. It harnesses together both the above methods. This design makes it possible to estimate the prevalence of specific diagnoses in a population within acceptable confidence limits without all members having a full diagnostic interview. All members of the population of interest are administered the screening test, such as the K-10. High scorers then go on, within a few days at most, to have the full interview, while the middle-range and low scorers are also administered, but in decreasing proportions. Importantly, although some in the lowest range of scores do have the full interview, only a fraction of the total population need to have the full assessment. From this dataset, one can calculate the probability that persons within a certain range of screening scores will be cases of a particular disorder. For many purposes, such estimates are sufficient. A further benefit is that the same brief screening test can subsequently be administered for case detection in the same population for some years ahead, because its validity for case detection has been determined. The successful application of this two-phase design to a national population study has been described by Slade *et al.* (2011).

What is the distribution of mental illness in the human population?

To evaluate the significance of psychiatric epidemiology for global health, one should have some notion of its distribution across the human population. Readers will already be familiar with the large national studies conducted in many countries in recent decades. In some instances, the surveys have been repeated after an interval of some 10 years. Rather than summarising their respective findings, it is more instructive to consider what they have collectively achieved (Henderson & Andrews, 2008). They have in fact contributed generously to Morris's original list. Each country now has information on how much morbidity there is in the general population in contrast to what reaches health services, its demographic distribution, the amount of lost productivity through disablement, unmet need and the extent to which people with specific disorders say they have sought professional help.

Many of the large surveys present data on the experience of symptoms over the person's life to

date, the so-called lifetime prevalence. This is based exclusively on the response to questions typically starting with the words, 'Have you ever…?', inviting the respondent to cast their mind back to past episodes. The likelihood of reporting error in this must be very considerable, so that what is reported is probably an incomplete account. Moffitt *et al.* (2010) have evidence from their cohort study in New Zealand that prospective ascertainment *doubles* the lifetime prevalence rates. This finding must invite some caution in accepting the assertions about lifetime data published over recent decades, but often taken to be significant information.

National surveys of mental health have now been undertaken in more than 20 countries, involving some 200 000 respondents in their homes. These countries represent diverse economic and social conditions, including Australia, China, at least six European nations, Iran, Latin America, New Zealand, Nigeria, the UK and the USA (World Health Organization Consortium, 2004). In a highly significant paper, Kessler (2007) laid out the background to this work, its clinical relevance and what now needs to be done. All the studies were undertaken to inform health policy, though other research objectives were often included. Most used the CIDI, usually administered by lay interviewers and applying the same diagnostic criteria for the common mental disorders. All data were derived solely by self-report. The morbidity reported is categorical, the diagnosis being either absent or present. The data typically refer to not only the previous 12 months but also the respondent's lifetime to date (*vide supra*). Independent variables have usually been confined to basic demographics though information on childhood experiences has frequently been included. Most surveys covered the age range of 18–65 years, so an important deficiency is that prevalence data on children and older persons is sparser. Most included measures of disability and recent health service use. It is important to note that response rates ranged greatly, from 51% in Belgium to 88% in Colombia.

Some consistent findings have emerged. The total prevalence rates for adults have been much higher than might be expected, with the median 12-month prevalence for all disorders being 12%. The range, however, is considerable, from 4% in Shanghai to 26% in the USA, more than a 6-fold difference. Anxiety and depressive disorders are more common in women and substance use disorders are more common in men. All the common mental disorders begin when people are young. The burden of disability, in terms of the number of days lost from work or family life, is very much greater than might have been expected and yet the majority of sufferers received no treatment. This is so in the developed as well as the developing world.

The most striking and unexplained finding is the remarkable variation in rates for specific diagnoses. For example, the 12-month prevalence of depressive disorder in the USA is 9.6% but only 3.1% in Japan, 1.7% in Shanghai and 0.8% in Nigeria. Could this 12-fold difference really be true? It is surely an observation calling for thorough enquiry. Some of the difference could lie in the following: the different response rates, the quality of interviewing, how the interviewer and the visit is perceived by the respondent and others who may be present, the translation of the CIDI, the validity of using exactly the same items in different cultures to tap what is assumed to be the same subjective experience and the readiness of respondents in contrasted economic, cultural and political settings to tell the interviewer about their symptoms. It may also be a mistake to assume the diagnostic criteria themselves are equally applicable across countries. Kessler (2007) has himself been explicit about these issues, saying that 'There is no guarantee that the same good validity of the CIDI will be found in other parts of the world'. In ongoing work that may prove of great future significance, the World Mental Health investigators are seeking ways to overcome some of these difficulties. But for the present, one must conclude that the global pattern of psychiatric morbidity is not yet known with any certainty.

Could it be that countries do indeed differ in the prevalence of these common mental disorders? More than 40 years ago, in his influential paper in the *Lancet*, 'Are international comparisons timely?' Kessel (1965) concluded that they were not, because of insuperable problems in method and interpretation. What he said remains applicable today. Kessel concluded that epidemiological work on the aetiology of mental disorders would be better directed to within-country studies. In these, monitoring a country's mental health over time is particularly attractive. The USA repeated its national survey in 1991–1992 10 years later, finding not only an increase in depressive disorder from 3.3 to 7.1% but also an increase in treatment rates from 12 to 20% (Compton *et al.* 2006). In England, representative samples were examined in 1993, 2000 and 2007 (McManus *et al.* 2009). There, the proportion of persons aged 16–64 years having at least one of the common mental disorders increased in the first of these intervals but remained the same in the second.

In the small number of population studies, in which investigators have been able examine the *same individuals* at more than one point in time, associations that may be causal are much more likely to be shown. Outstanding examples are the contribution of cannabis use to the later onset of psychotic disorders

(Fergusson, 2010), the mental health sequelae of induced abortion (Fergusson *et al.* 2009) and the impact of sexual abuse in childhood on adult mental health (Spataro *et al.* 2004).

Unmet need. If 12% of adults have a common mental disorder, do they all need and want treatment? Fortunately not, but more information on this matter is greatly needed. It is known that a proportion of cases have little associated disability, others will spontaneously remit and may prefer to continue with their symptoms. But there will nevertheless be many whose function in daily life could be improved by treatment, and their quality of life improved through better pathways to care (Andrews & Henderson, 2000). Treatments that work do exist (Nathan & Gorman, 1998) and are now available online to the expanding proportion of humankind with internet access.

Epidemiology and advocacy. Perhaps the greatest benefit of the large national surveys has been for advocacy (Henderson & Andrews, 2008). The consistent finding is that one in five adults has at least one of the common mental disorders in any one year. Where the investigators have included a measure of disability, this has shown that the economic and social burden arising from mental disorders is high, and this has been persuasive for health policy. These two findings, the high prevalence and the proportion of all disability that comes from mental illness, have been administratively the most influential products of the large surveys. They have been noted by senior administrators and politicians. It is very timely that such information has become available during the same period that mental health literacy has been improving, as has the visibility of mental disorders in the media and public fora. In our own scientific world but outside the immediate field of psychiatry, the two most prestigious journals, *Nature* and *Science*, now commonly carry papers on mental disorders. In 2010, an entire issue of *Nature* focused on schizophrenia. Such visibility within the scientific community would have been unimaginable a few decades ago. More importantly, some national governments have begun to accord much more funding for community mental health care. Epidemiology can confidently see itself as having contributed to these important changes.

What pathogenic exposures in the environment have been identified by epidemiology?

The general advances made in this field are well illustrated by work on schizophrenia over the last decade. Before examining the emergence of new data from epidemiological studies in this particular field, it is worth recognising something that is basic for progress in knowledge. Without advances in methodology, findings would have emerged but not been recognised as seriously misleading. While readers will be very familiar with the issues involved here, they remain an ever-present challenge in study design and data analysis. Epidemiological work on schizophrenia has been commendably aware of dangers in interpretation of data if two sources of error are not considered. In their magisterial paper in *Nature* on the environment and schizophrenia, van Os *et al.* (2010) begin their exposition by setting them out. The first is bias, where either cases or controls are collected that do not represent their true denominators, and who are therefore likely to have disproportionally more or less of the attributes of interest. Furthermore, schizophrenia is itself a noun referring to a diversity of phenotypes, so the cases may be of the wrong type for some research purposes. The second source of error is confounding, where a third set of variables lies behind an association that looks temptingly causal. This can be exceptionally difficult to overcome, as those investigating developmental exposures in schizophrenia have found.

van Os *et al.* (2010) set out the evidence for four environmental factors that throw light on how schizophrenia develops in particular groups in the population. Identified exposures are developmental trauma, minority groups, urban living and cannabis. What is attractive is that some hypotheses can now be formulated for biological pathways whereby each of these might have its effect on the brain. This is coming by harnessing epidemiological research to advances in molecular genetics. In this way, gene–environment studies may show how social factors influence biological pathways that lead to psychosis. Danese (2008) has presented a valuable overview of the situation for depressive states. So what we are now seeing is the possibility of embracing both epidemiological and neurobiological data into one explanatory model. With such highly saturated datasets becoming available, advanced statistical methods will be needed. Kilbride & Scoriels (2009) have referred to a 'flat and featureless epidemiological horizon' which has now begun to show attractive contours. The discipline may be entering a new phase in its evolution.

Declaration of Interest

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