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Is there really an epidemic of diabetes?

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Diabetologia has staged a debate as to whether there really is an epidemic of diabetes. As is often the case, the difference between the apparently opposing sides is less than it seems. For example, if ‘epidemic’ were considered in the commonly understood sense of an increase in total or crude prevalence, neither side would seriously argue that such an epidemic does not exist. Epidemiologists often consider disease prevalence after taking account of age by standardisation or stratification. However, total prevalence is relevant from a health service perspective, since the total number of cases drives demand and fills clinics. The marked increase in the total number of cases of diabetes predicted by the various widely quoted estimates is based on projections from age- and sex-specific prevalence in different countries multiplied by the forecasts of the population age/sex structure. Thus, an ageing population becomes the most important determinant of the predicted increase. Dramatic as these are, such estimates of the future total burden of diabetes may prove conservative if incidence rises in parallel with obesity, or mortality falls with improved health care.

Why is prevalence rising?

The debate is really about the relative balance between factors driving the rise in total prevalence. Colagiuri and colleagues maintain that the process is driven by a rising incidence [1]; there is good evidence that age-specific prevalence rates are increasing [2]. Possible explanations for this include inward migration of susceptible individuals, a factor of increasing relevance as populations become more mobile. A rise in incidence secondary to temporal changes

in key determinants, such as obesity and physical activity, is also highly plausible. A fall in mortality could explain changes in age-specific prevalence, but this would mainly affect the older age groups and would not explain the observed rise in prevalence in the young. The emergence of type 2 diabetes among younger age groups is, indeed, the most striking development of recent years. However, although there are data to support the contention that the incidence of type 2 diabetes is rising in adolescents and younger adults [3], information is lacking from many countries because of the scarcity of chronic disease surveillance systems. Epidemiologically defined registers that systematically identify incident cases according to subtype of diabetes would be needed to ensure that incidence is really changing and that apparent trends are not affected by changes in diagnostic methods.

Why do we have such poor information about the changing incidence of type 2 diabetes?

It may seem surprising that our descriptive epidemiological data on diabetes are so poor. There are multiple studies of point prevalence in different adult populations, but few studies of incidence. The problem stems, in part, from the way in which diabetes is defined. Green’s study [4], for example, is based on drug-treated diabetes, which constitutes only a fraction of total cases. Inferences about secular trends in diabetes incidence based on treatment would be weak if the proportion offered pharmaceutical treatment altered with time. Other studies report a rising incidence of diabetes on the basis of clinical diagnosis, whether ascertained from medical records or from patient self-report [5], but these become less reliable if the proportion of diagnosed cases changes with time. Despite continued uncertainty about the public health benefits of screening for diabetes, glucose testing is increasingly performed in primary care. This means that the proportion of true cases detected could well change with time, but this is likely to differ between areas and should not be generalised from one country, or region, to another.

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If the incidence of clinically diagnosed cases provides a poor reflection of true incidence, can anything better be done? The challenge is to define the true incidence of type 2 diabetes, and this can only be measured in a population that has systematically been screened with the gold standard test to exclude prevalent cases and that is then periodically retested by the same method to ascertain undiagnosed incident cases as well as new clinical cases occurring in the interim. Since the current definition of diabetes requires oral glucose testing with confirmation on a second occasion, the logistics of conducting such a study with a sufficiently high response rate to ensure representativeness are formidable. A similar strategy based on repeated testing with fasting glucose might also be used to assess incidence, but this would not detect either prevalent or incident cases that were only manifest with post-glucose-load hyperglycaemia. An added complexity is the interval between re-screens, since more frequent retesting of a variable phenomenon, such as glucose tolerance, will lead to a higher incidence if individuals are censored once they cross the diagnostic threshold [6]. This is the explanation for higher incidence rates in studies that retest individuals at short intervals. It is, therefore, unsurprising that there are very few accurate estimates of incidence, let alone concrete evidence that incidence is changing. Given the strength of the aetiological relationship between obesity and diabetes, and the marked rise in the prevalence of obesity, it would be extremely surprising if diabetes incidence were not to rise in the future; however, we currently have no good systems for monitoring such a trend.

Can declining mortality explain rising prevalence?

Anders Green argues [4], and correctly so, that total prevalence can rise as a result of the success of clinical diabetes care in reducing diabetes-associated mortality. This highlights the need to be cautious about making snap inferences about the underlying causes of changes in crude measures such as total prevalence. However, the evidence that diabetes-related mortality is falling is not as strong as Green suggests. The limitation of analyses that focused only on those receiving pharmacologic therapy for diabetes is obvious, given that 30% of cases are not considered [7]. Other studies in differently defined populations have not found a decrease in diabetes-related mortality, and the general statement that mortality rates are declining is unsubstantiated [8, 9]. Even if it were true that mortality is declining in places such as Denmark, this would only explain a small proportion of the total rise in prevalence.

Who wins?

The answer to the question posed by this debate: Is there is an epidemic of diabetes? must surely be 'yes', if we define epidemic in terms of total prevalence. However, total prevalence does not help us to identify the reasons for rising prevalence and is not a useful outcome measure with which to determine the success of health care systems in

dealing with the challenge. We need much more sophisticated population-level diabetes surveillance systems. Estimation of the burden of diabetes-associated mortality requires the establishment and follow-up of cohorts of individuals with and without diabetes whose mortality experience is tracked. There are already isolated examples of this, but a concerted effort is warranted. The establishment of systems for monitoring the incidence of diabetes provides more of a challenge, since a purist approach based on serial glucose tolerance testing would probably mean that the cost of acquisition of information far outweighed its utility. A system of surveillance of clinically incident cases plus ongoing monitoring of the ratio of diagnosed : undiagnosed diabetes and age-specific prevalence would almost certainly be easier to implement and sustain.

If the debate in the pages of this journal leads to wider recognition that our understanding of the descriptive epidemiology of type 2 diabetes is limited and that steps to enhance surveillance are necessary, it will have been well worthwhile. The most important conclusion from such an exercise is, perhaps, that although total prevalence is an important measure of the public health burden of diabetes, it is not particularly useful as an outcome measure of the success or failure of public health interventions designed to deal with the problem.

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