Do current IDF predictions underestimate the true and future burden of diabetes?

In 2004, a collaboration of public health scientists and epidemiologists published estimates for diabetes prevalence across all 191 World Health Organization (WHO) member states. In many cases these estimates were based on historical diabetes prevalence data collected in other member states, and then extrapolated to those countries where data were limited or lacking. The predictions assumed that the UN estimates for future global populations would be accurate. The authors were careful to point out the methodological risks inherent in such extrapolation of historical data, whose quality could not be verified especially in circumstances where the future population estimates might prove to be incorrect. They ensured that their predictive methodology was, if anything, conservative. They also pointed out that the predictions assumed that levels of obesity would remain static, which they reminded us was far from likely. They concluded that it was probable that ‘these figures provide an underestimate of future diabetes prevalence’.

At the 20th World Diabetes Congress in October 2009 in Montreal the 4th edition of the International Diabetes Federation (IDF) Atlas was published. This was intended to ‘provide healthcare professionals, scientists, health economists, policy makers, national and international governmental agencies with evidence-based information and projections on the current and future magnitude of the diabetes epidemic’. It is explicit in the executive summary of the Atlas that it aims ‘to highlight the evidence base needed for governments, civil society, international health organizations and the health community to make informed decisions on prevention and care strategies’. The 4th edition reflected the fact that since the publication of the first IDF Atlas in 2000 the predictions had increased significantly from 151 to 285 million and that by 2030 some 438 million people would have diabetes on a global scale.

Recently published data for China

However, within months of publishing the new ‘Diabetes Atlas’, the IDF released a press statement concerning some recently published data. These showed that the actual prevalence of diabetes in China, assessed by oral glucose tolerance testing in a large nationally representative sample of 46,000 adults >20 years, was in fact over twice that estimated by the IDF Atlas. Thus, while the IDF had estimated diabetes prevalence in China at 43.2 million, the actual figure appears to be closer to 92.4 million. In the press statement, the IDF pointed out that their 2010 diabetes prevalence predictions for China were based upon historical data from the InterASIA study. These data were published in 2003 and showed that between 2000 and 2001 there was a prevalence of diabetes of 5.2 and 5.8% (men and women respectively) overall in the 35–74 year old age group. The statement commented that these were the best available data at the time, and this is a fair comment as the InterASIA study used overnight fasting blood glucose in a nationally representative sample of 15,540 adults applying ADA diabetes diagnostic criteria for diabetes. What the statement did not say was that the IDF diabetes prevalence estimate for China in 2010 was only 4.5%, thus representing an approximately 19% reduction in predicted diabetes prevalence in China from the actual measured value between 2000 and 2010 according to the 4th edition of the IDF Atlas.

Limitations of predictive models

The fundamental issue revolves around the limitations of predictive models as opposed to measured prevalence – which is somewhat akin to the advantages of actual versus estimated electricity or gas meter readings. It is absolutely appropriate to be conservative with any estimated prevalence as this avoids overestimating future risk. However, at face value, it seems that the IDF predictions for diabetes in China in 2010 failed to take account of the true prevalences measured in 2000–2001. That subsequent diabetes prevalence measured by glucose estimates in a large representative sample in 2007–2008 would be greater than the IDF prediction was perhaps entirely predictable, given that diabetes prevalence has been increasing, rather than reducing, everywhere else. Indeed, published data available in 1997 suggest that China had already experienced a three-fold rise in diabetes prevalence in the preceding decade. It seems implausible to think that with increasing Westernisation in China, a factor known to influence increased diabetes prevalence, subsequent diabetes prevalence would fall as predicted by the IDF in 2010. It is possible that in setting the 2010 estimate there were concerns that the prevalence found in the 2000–2001 study was exaggerated. This seems improbable, however, given that another large prevalence study in 1995 of 29,859 subjects aged 30–64 years in Beijing found a measured diabetes prevalence of 3.63% and is thus entirely consistent with the 5.2–5.8% prevalence found in the InterASIA study some five to six years later given the rising diabetes rates in China at that time.

Forecasts for other countries

Is there evidence that the apparent underestimate for China was repeated for other countries and regions? Unfortunately, the answer appears to be yes. In Sri Lanka, for example, the IDF predicted an 11.5% prevalence in 2010. This was despite a publication which showed in 2005 that true measured prevalence in 6447 subjects was 14.2% for men and 13.5% for women, and a rather ironic comment in the Ceylon Medical Journal in 2006 that ‘The World Health Organization and International Diabetes Federation estimates and forecasts are much lower than the available local prevalence rates’. In the United Kingdom, the introduction of incentive payments in general practice led to the development of reasonably
robust data on, among other things, diabetes prevalence. Thus, whilst the IDF Atlas was predicting a 4.9% prevalence in 2010, the data published annually by the NHS Information Centre, and freely available on the internet, showed that in 2008/09 the diabetes prevalence was 5.1% whereas in 2009/10 it had increased to 5.4%. In the Middle East, the gap between the IDF prediction and published actual prevalences may be greater. For instance in Iran, the IDF prediction for 2010 was a 6.1% prevalence, whereas meta-analysis of available data between 1996 and 2004 suggests that the figure in those aged >40 years was already 24% at least six years before the IDF prediction of only a quarter of that value. In the United Arab Emirates a similar picture emerges, with a randomised sample of 2455 adults (>18 years) having a WHO criterion diagnosis of diabetes established by fasting blood glucose and oral glucose tolerance test – in 2007 the prevalence was shown to be 29.16 The IDF predicted in their 4th Atlas that in 2010 it would be less than half this value at just 12.2%.14

In the press statement, the IDF stated that the recently published actual prevalence data should be ‘a wake up call for governments and policy makers to take action on diabetes’. This is true. What is perhaps more questionable is the assertion in the same press release that ‘China has overtaken India and become the global epicenter of the diabetes epidemic’. It seems difficult to reach this conclusion given that the IDF predictions contained within the 2010 4th edition Atlas seem to be flawed when compared to measured prevalence data in many other countries – perhaps it is more probable that the IDF estimates for India are also too low. Indeed, recent evidence suggests that this is exactly the case with the IDF Atlas predicting a 7.1% prevalence against 16% measured in 1239 subjects.17 In another study in Kerala, Southern India, the prevalence of diabetes in 2009 was shown to be 14.6% in 1990 adults, again over twice the IDF estimate for 2010. In the recent data from China the actual prevalence of diabetes was established at 9.7.5 Thus it would appear that, in contrast to the statement by the IDF, India still leads China as the epicentre of the diabetes pandemic.

Conclusion
What does all this show? Firstly, there is a strong suggestion that the predictions contained within the 2010 4th edition IDF Atlas should be treated with great caution, as in numerous instances they seem to be significantly below established, published prevalence. Secondly, it demonstrates that the diabetes pandemic is probably much worse than already thought. Thirdly, and perhaps most importantly, it confirms the views of the authors of the 2004 paper that predictions are prone to errors – possibly multiple.

The foreword of the latest IDF Atlas is correct in suggesting that policy makers, and national and international governmental agencies need good evidence-based information upon which to base their future planning. However, clear shortcomings appear to exist in the present, and probably previous, iteration(s) of the IDF Diabetes Atlas. In light of these, it is perhaps time to revisit existing published evidence of proven diabetes prevalence, and where data are limited to establish the current scale of the diabetes pandemic properly through formal research. In this way there can be no more speculation, and no more nasty surprises.

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Conflict of interest statement
There are no conflicts of interest.

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