Diabetology

Extended Abstract

IDF Diabetes Atlas: Global estimates for theprevalence of diabetes for 2015 and 2040 - K. Ogurtsova - International Diabetes Federation, Brussels, Belgium

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Abstract

Aim:To produce current estimates of the national, regional and global impact of diabetesfor 2015 and 2040.Methods:A systematic literature review was conducted to identify data sources on theprevalence of diabetes from studies conducted in the period from 1990 to 2015. An analytichierarchy process was used to select the most appropriate studies for each country, andestimates for countries without data were modelled using extrapolation from similar coun-tries that had available data. A logistic regression model was used to generate smoothedage-specific estimates, which were applied to UN population estimates.Results:540 data sources were reviewed, of which 196 sources from 111 countries wereselected. In 2015 it was estimated that there were 415 million (uncertainty interval: 340–536 million) people with diabetes aged 20–79 years, 5.0 million deaths attributable to dia-betes, and the total global health expenditure due to diabetes was estimated at 673 billionUS dollars. Three quarters (75%) of those with diabetes were living in low- and middle-income countries. The number of people with diabetes aged 20–79 years was predicted torise to 642 million (uncertainty interval: 521–829 million) by 2040.Conclusion:Diabetes prevalence, deaths attributable to diabetes, and health expendituredue to diabetes continue to rise across the globe with important social, financial and healthsystem implications.

Diabetes mellitus describes a group of metabolic disorderscharacterised by increased blood glucose concentration. Peo-ple living with diabetes have a higher risk of morbidity andmortality than the general population. The global prevalenceof diabetes in adults has been increasing over recent decades.In 1964, it was estimated that 30 million people had diabetes[15]. Less than 40 years later, the WHO estimated that therewere 171 million people living with diabetes[51]. The Inter- national Diabetes Federation (IDF) estimated the globalprevalence to be 151 million in 2000[28], 194 million in2003[27], 246 million in 2006[26], 285 million in 2009[25],366 million in 2011[24], and 382 million in 2013[23]. Eachestimate was based on the latest data available. The IDF Atlasmethodology was substantially updated in 2011[19]to incor-porate an analytic hierarchy process that formalised themethods to prioritise the highest quality data from availablesources.The dramatic increase in diabetes has occurred in allcountries, and in rural as well as urban areas. Accurate global,regional, and country-level estimates and projections of dia-betes prevalence are necessary for prevention and treatmentstrategies to be planned and monitored, and to assess pro-gress towards reaching the targets set by the Global ActionPlan for Non-Communicable Diseases and the SustainableDevelopment Goals[55].This paper provides estimates of the worldwide and regio-nal impact of diabetes for 2015 and 2040, based on the mostrecent and highest quality epidemiological data. For the firsttime, the IDF Diabetes Atlas methodology also includesuncertainty intervals to reflect confidence levels around theprevalence estimates. These uncertainty measurements per-mit the comparison of the IDF Diabetes Atlas estimates withother sources and over time.

Using the analytic hierarchical process, each study wasgiven a score, with higher scores indicating better quality. Astepwise threshold sensitivity analysis was conducted to findthe optimal lowest selection threshold. The value of 0.32resulted in the most conservative global estimate of diabetesprevalence, and was thus selected. Thresholds higher orlower than 0.32 resulted in less conservative global estimatesof diabetes prevalence[36]. Data sources scoring below thisthreshold of 0.32 were rejected. Among the studies with ananalytic hierarchy process score greater than 0.32, the highestscoring study for each country was selected. If there were anyother studies that had a score that was greater than 0.32 andwas within the tolerance level (0.1) of the highest scoringstudy, that study was also selected.In countries where more than one study was selected, theage-specific prevalence of diabetes was calculated as theweighted average of the contributing studies, with eachstudy's contribution being weighted by its quality

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score fromthe analytic hierarchy process.

The number of deaths due to diabetes was also updated foreach UN ratified country. The methods to derive these estimates have been previously described[22,41]. Briefly, thenumber of deaths attributable to diabetes used the followinginputs: WHO life tables for 2010 for the expected number ofdeaths; country-specific diabetes prevalence by age and sexfor the year 2015; age- and sex-specific relative risks of deathfor persons with diabetes compared to those without diabetes. These inputs were used to model the estimates usingDisMod II, a program developed for the Global Burden of Dis-ease study from 2000 and then Miettinen's formula for thepopulation-attributable fraction was used to calculate thenumber of deaths attributable to diabetes in people who aged20–79 years.

A systematic literature review identified 540 studies on theprevalence of diabetes conducted between the period of1990 and 2015. Using an analytic hierarchy process, 196sources from 111 countries were selected. Using extrapolation, logistic regression, and UN population estimates, itwas estimated that in 2015 there were 415 million (uncer-tainty interval: 340–536 million) people with diabetes aged20–79 years, 5.0 million deaths attributable to diabetes, anda total global health expenditure due to diabetes of 673 billionUS dollars. The number of people with diabetes aged 20–79 years was predicted to rise to 642 million (uncertaintyinterval: 521–829 million) by 2040.4.1. Study selectionThree main characteristics affect the accuracy of the esti-mates: the availability of data, the quality of data, and therepresentativeness of the data sources chosen. There was alarge variation in methods and standards of the data sources.The data sources used in the model had substantial differ-ences in diagnostic methods, the age of study, sample sizeof the study, and type of data source. Despite efforts to selectthe highest quality studies for each country using the analytichierarchy process, and to standardise estimates using logisticregression, it was still difficult to minimise the differences in country-level estimates that were due to methodological diversity. Thus, the variation in methods and standards arelikely to have influenced the degree to which the estimatescan be depended on to be accurate, and should be taken intoaccount when making comparisons between countries. Ifnewer data based on reliable measurements from well-conducted studies becomes available, future estimates of dia-betes prevalence will become more accurate

The major driver of diabetes costs is the treatment of therelated complications. In the USA, hospital inpatient carewas responsible for 43% of the total medical cost, and medi-cation to treat complications accounted for 18% of the totalmedical cost of diabetes[3]. In the United Kingdom, it wasestimated that 80% of total diabetes costs were spent on treat-ing complications[14]. Investing in intensive blood glucosecontrol could help to reduce the cost of diabetes complica-tions by up to 32%[13]. Furthermore, in the United Kingdomalone it was estimated that improved diabetes managementcould lead to savings of £340 million in the first five years

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