25 WHO. Positioning health in the post-2015: WHO discussion paper. Geneva: World Health Organization, 2012. http://www.who.int/topics/millennium_development_goals/post2015/WHOdiscussionpaper_October2012.pdf (accessed Nov 4, 2014).

26 The world we want. Health in the post-2015 agenda: report of the global thematic consultation on health. 2013. http://www.worldwewant2015.org/health (accessed Nov 4, 2014).

27 Atun R, Jaffar S, Nishtar S, et al. Improving responsiveness of health systems to non-communicable diseases. *Lancet* 2013; **381:** 690–67.

28 Institute for Health Metrics and Evaluation. The Global Burden of Disease: generating evidence, guiding policy. Seattle: IHME, 2013.

29 James SL, Gubbins P, Murray CJ, Gakidou E. Developing a comprehensive time series of GDP per capita for 210 countries from 1950 to 2015. *Popul Health Metr* 2012; **10:** 12.

30 Gakidou E, Cowling K, Lozano R, Murray CJ. Increased educational attainment and its effect on child mortality in 175 countries between 1970 and 2009: a systematic analysis. *Lancet* 2010; **376:** 959–74.

31 Ng M, Fleming T, Robinson M, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014; **384:** 766–81.

32 Ng M, Freeman MK, Fleming TD, et al. Smoking prevalence and cigarette consumption in 187 countries, 1980–2012. *JAMA* 2014; **311:** 183–92.

33 Wang H, Liddell CA, Coates MM, et al. Global, regional, and national levels of neonatal, infant, and under-5 mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014; **384:** 957–79.

34 Murray CJL, Rajaratnam JK, Marcus J, Laakso T, Lopez AD. What can we conclude from death registration? Improved methods for evaluating completeness. *PLoS Med* 2010; **7:** e1000262.

35 Obermeyer Z, Rajaratnam JK, Park CH, et al. Measuring adult mortality using sibling survival: a new analytical method and new results for 44 countries, 1974–2006. *PLoS Med* 2010; **7:** e1000260.

36 Kannisto V. Development of oldest-old mortality, 1950–1990: evidence from 28 developed countries. Odense University Press, 1994.

37 Gompertz B. On the nature of the function expressive of the law of human mortality, and on a new mode of determining the value of life contingencies. *Philos Trans R Soc Lond* 1825; **115:** 513–83.

38 Murray CJL, Ortblad KF, Guinovart C, et al. Global, regional, and national incidence and mortality for HIV, tuberculosis, and malaria during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet* 2014; **384:** 1005–70.

39 Zellner A. An efficient method of estimating seemingly unrelated regressions and tests for aggregation bias. *J Am Stat Assoc* 1962; **57:** 348–68.

40 UNAIDS. Methodology—understanding the HIV estimates. Strategic Information and Monitoring Division, 2013 http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2013/gr2013/20131118_Methodology.pdf (accessed Nov 4, 2014).

41 Department of Peace and Conflict Research. Uppsala Conflict Data Program. Uppsala Universitet, Uppsala, Sweden. http://www.pcr.uu.se/research/UCDP/ (accessed Nov 4, 2014).

42 The International Institute For Strategic Studies. Armed Conflict Database. London. https://acd.iiss.org/ (accessed Nov 4, 2014).

43 WHO. WHO Mortality Database. http://www.who.int/healthinfo/cod/en/ (accessed May 5, 2014).

44 Centre for Research on the Epidemiology of Disasters (CRED), Office of US Foreign Disaster Assistance (OFDA). EM-DAT: The OFDA/CRED international disaster database. Brussels, Belgium, Université Catholique de Louvain. http://www.emdat.be/database (accessed Nov 4, 2014).

45 United Nations Department of Economics and Social Affairs Population Division. World Population Prospects: The 2012 Revision. http://esa.un.org/unpd/wpp/Documentation/publications.htm (accessed Nov 4, 2014).

46 Wheldon MC, Raftery AE, Clark SJ, Gerland P. Reconstructing past populations with uncertainty from fragmentary data. *J Am Stat Assoc* 2013; **108:** 96–110.

47 Murray CJ, Lozano R, Flaxman AD, et al. Using verbal autopsy to measure causes of death: the comparative performance of existing methods. *BMC Med* 2014; **12:** 5.

48 North AB, South CD. Cancer incidence in Antarctica (2003–2007). Forman D, Bray F, Brewster DH, et al, eds. Cancer Incidence in Five Continents, Vol X (electronic version). Lyon, IARC. http://ci5.iarc.fr (accessed 22 Nov, 2014).

49 Ahern RM, Lozano R, Naghavi M, Foreman K, Gakidou E, Murray CJ. Improving the public health utility of global cardiovascular mortality data: the rise of ischemic heart disease. *Popul Health Metr* 2011; **9:** 8.

50 WHO. International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) Version for 2010. Geneva: World Health Organization. http://apps.who.int/classifications/icd10/browse/2010/en#/X59 (accessed May 5, 2014).

51 WHO. WHO evidence review group: malaria burden estimation. Report on the second meeting, geneva, Switzerland, 2013. http://www.who.int/malaria/mpac/malaria_burden_estimates_report.pdf (accessed May 4, 2014).

52 Foreman KJ, Lozano R, Lopez AD, Murray CJ. Modeling causes of death: an integrated approach using CODEm. *Popul Health Metr* 2012; **10:** 1.

53 Ortblad KF, Lozano R, Murray CJL. The burden of HIV: insights from the Global Burden of Disease Study 2010. *AIDS* 2013; **27:** 2003–17.

54 Murray CJL, Ezzati M, Flaxman AD, et al. GBD 2010: design, definitions, and metrics. *Lancet* 2012; **380:** 2063–66.

55 Flaxman A, ed. Integrated meta-regression framework for descriptive epidemiology. University of Washington Press, 2014.

56 Blackwelder WC, Biswas K, Wu Y, et al. Statistical methods in the Global Enteric Multicenter Study (GEMS). *Clin Infect Dis Off Publ Infect Dis Soc Am* 2012; **55** (suppl 4): S246–53.

57 Kotloff KL, Nataro JP, Blackwelder WC, et al. Burden and aetiology of diarrhoeal disease in infants and young children in developing countries (the Global Enteric Multicenter Study, GEMS): a prospective, case-control study. *Lancet* 2013; **382:** 209–22.

58 Hanley JA. A heuristic approach to the formulas for population attributable fraction. *J Epidemiol Community Health* 2001; **55:** 508–14.

59 Levine MM, Kotloff KL, Nataro JP, Muhsen K. The Global Enteric Multicenter Study (GEMS): impetus, rationale, and genesis. *Clin Infect Dis Off Publ Infect Dis Soc Am* 2012; **55** (suppl 4): S215–24.

60 Kotila SM, Virolainen A, Snellman M, Ibrahem S, Jalava J, Lyytikäinen O. Incidence, case fatality and genotypes causing *Clostridium difficile* infections, Finland, 2008. *Clin Microbiol Infect Off Publ Eur Soc Clin Microbiol Infect Dis* 2011; **17:** 888–93.

61 Klugman KP. Contribution of vaccines to our understanding of pneumococcal disease. *Philos Trans R Soc Lond B Biol Sci* 2011; **366:** 2790–98.

62 Feikin DR, Scott JAG, Gessner BD. Use of vaccines as probes to define disease burden. *Lancet* 2014; **383:** 1762–70.

63 Watt JP, Wolfson LJ, O'Brien KL, et al. Burden of disease caused by *Haemophilus influenzae* type b in children younger than 5 years: global estimates. *Lancet* 2009; **374:** 903–11.

64 O'Brien KL, Wolfson LJ, Watt JP, et al. Burden of disease caused by *Streptococcus pneumoniae* in children younger than 5 years: global estimates. *Lancet* 2009; **374:** 893–902.

65 Baqui AH, El Arifeen S, Saha SK, et al. Effectiveness of *Haemophilus influenzae* type B conjugate vaccine on prevention of pneumonia and meningitis in Bangladeshi children: a case-control study. *Pediatr Infect Dis J* 2007; **26:** 565–71.

66 Gessner BD, Sutanto A, Linehan M, et al. Incidences of vaccine-preventable *Haemophilus influenzae* type b pneumonia and meningitis in Indonesian children: hamlet-randomised vaccine-probe trial. *Lancet* 2005; **365:** 43–52.

67 Levine OS, Lagos R, Muñoz A, et al. Defining the burden of pneumonia in children preventable by vaccination against *Haemophilus influenzae* type b. *Pediatr Infect Dis J* 1999; **18:** 1060–64.

68 Mulholland K, Hilton S, Adegbola R, et al. Randomised trial of *Haemophilus influenzae* type-b tetanus protein conjugate vaccine [corrected] for prevention of pneumonia and meningitis in Gambian infants. *Lancet* 1997; **349:** 1191–97.

69 Black SB, Shinefield HR, Ling S, et al. Effectiveness of heptavalent pneumococcal conjugate vaccine in children younger than five years of age for prevention of pneumonia. *Pediatr Infect Dis J* 2002; **21:** 810–15.

70 Cutts FT, Zaman SMA, Enwere G, et al. Efficacy of nine-valent pneumococcal conjugate vaccine against pneumonia and invasive pneumococcal disease in The Gambia: randomised, double-blind, placebo-controlled trial. *Lancet* 2005; **365:** 1139–46.

71 Klugman KP, Madhi SA, Huebner RE, Kohberger R, Mbelle N, Pierce N. A trial of a 9-valent pneumococcal conjugate vaccine in children with and those without HIV infection. *N Engl J Med* 2003; **349:** 1341–48.

72 Lucero MG, Nohynek H, Williams G, et al. Efficacy of an 11-valent pneumococcal conjugate vaccine against radiologically confirmed pneumonia among children less than 2 years of age in the Philippines: a randomized, double-blind, placebo-controlled trial. *Pediatr Infect Dis J* 2009; **28:** 455–62.

73 Sigaúque B, Vubil D, Sozinho A, et al. *Haemophilus influenzae* type b disease among children in rural Mozambique: impact of vaccine introduction. *J Pediatr* 2013; **163:** S19–24.

74 Gessner BD, Adegbola RA. The impact of vaccines on pneumonia: key lessons from *Haemophilus influenzae* type b conjugate vaccines. *Vaccine* 2008; **26** (suppl 2): B3–8.

75 Simonsen L, Viboud C, Taylor RJ, Miller MA. The epidemiology of influenza and its control. In: Rappuoli R, Giudice GD, eds. Influenza vaccines for the future. Springer Basel, 2011: 27–54.

76 Griffin MR, Zhu Y, Moore MR, Whitney CG, Grijalva CG. U.S. Hospitalizations for pneumonia after a decade of pneumococcal vaccination. *N Engl J Med* 2013; **369:** 155–63.

77 Gini C. Variabilità e mutabilità, contribrito allo studio delle distribuzioni e delle relazioni statistiche: fascicolo Ier: Introduzione—Indici di variabilita—Indici di mutabilità. Bologne, 1912.

78 Preston S, Heuveline P, Guillot M. Demography: measuring and modeling population processes, 1st edn. Malden, MA: Wiley-Blackwell, 2000.

79 Beltrán-Sánchez H, Preston SH, Canudas-Romo V. An integrated approach to cause-of-death analysis: cause-deleted life tables and decompositions of life expectancy. *Demogr Res* 2008; **19:** 1323–50.

80 Ahmad O, Boschi-Pinto C, Agresti A. Age standardization of rates: a new WHO standard. WHO, 2001 http://www.who.int/healthinfo/paper31.pdf (accessed May 5, 2014).

81 United Nations, Department of Economic and Social Affairs Population Division, Population Division. World Population Ageing 2013. http://www.un.org/en/development/desa/population/publications/pdf/ageing/WorldPopulationAgeing2013.pdf (accessed Nov 28, 2014).

82 Mueller Y, Cristofani S, Rodriguez C, et al. Integrating mental health into primary care for displaced populations: the experience of Mindanao, Philippines. *Confl Health* 2011; **5:** 3.

83 International Agency for Research on Cancer. GLOBOCAN 2012: Estimated cancer incidence, mortality and prevalence worldwide in 2012. WHO: International Agency for Reserach on Cancer. http://globocan.iarc.fr/Default.aspx (accessed May 5, 2014).

84 UNICEF. Committing to child survival: a promise renewed—progress report 2013. New York: UNICEF, 2013.

85 USAID. Child survival: call to action. Ending preventable child deaths. Washington: USAID, 2012.

86 Bustreo F, Say L, Koblinsky M, Pullum TW, Temmerman M, Pablos-Méndez A. Ending preventable maternal deaths: the time is now. *Lancet Glob Health* 2013; **1:** e176–e177.

87 Quah DT. Twin peaks: growth and convergence in models of distribution dynamics. *Econ J* 1996; **106:** 1045–55.

88 Sala-i-Martin X. The world distribution of income: falling poverty and...convergence, period. *Q J Econ* 2006; **121:** 351–97.

89 Ravallion M. Why don't we see poverty convergence? *Am Econ Rev* 2012; **102:** 504–23.

90 Bloom DE, Canning D. Mortality traps and the dynamics of health transitions. *Proc Natl Acad Sci* 2007; **104:** 16044–49.

91 Clark R. World health inequality: convergence, divergence, and development. *Soc Sci Med* 2011; **72:** 617–24.

92 Wilson C. On the scale of global demographic convergence 1950–2000. *Popul Dev Rev* 2001; **27:** 155–71.

93 Vallin J, Meslé F. Convergences and divergences in mortality. *Demogr Res Spec Collect* 2004; **2:** 11–44.

94 Moser K, Shkolnikov V, Leon DA. World mortality 1950–2000: divergence replaces convergence from the late 1980s. *Bull World Health Organ* 2005; **83:** 202–09.

95 Balabanova D, Mills A, Conteh L, et al. Good Health at Low Cost 25 years on: lessons for the future of health systems strengthening. *Lancet* 2013; **381:** 2118–33.

96 Jamison DT, Breman JG, Measham AR, et al, eds. Disease control priorities in developing countries, 2nd edn. Washington: World Bank, 2006.

97 Leon DA, Shkolnikov VM, McKee M, Kiryanov N, Andreev E. Alcohol increases circulatory disease mortality in Russia: acute and chronic effects or misattribution of cause? *Int J Epidemiol* 2010; **39:** 1279–90.

98 AIWH: Field B. Rheumatric heart disease: all but forgotten in Australia except among Aboriginal and Torres Strait Islander people. Australian Insitute of Health and Welfare, 2004. http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=6442453321 (accessed Nov 4, 2014).

99 Matthews FE, Arthur A, Barnes LE, et al. A two-decade comparison of prevalence of dementia in individuals aged 65 years and older from three geographical areas of England: results of the Cognitive Function and Ageing Study I and II. *Lancet* 2013; **382:** 1405–12.

100 United States Department of Health and Human Services. Centers for Disease Control and Prevention. National Center for Health Statistics. National Mortality Followback Survey, 1993. Ann Arbor: Inter-university Consortium for Political and Social Research, 2000.

101 Nash TE, Herrington DA, Losonsky GA, Levine MM. Experimental human infections with *Giardia lamblia*. *J Infect Dis* 1987; **156:** 974–84.

102 Musher DM, Musher BL. Contagious acute gastrointestinal infections. *N Engl J Med* 2004; **351:** 2417–27.

103 Rendtorff RC. The experimental transmission of human intestinal protozoan parasites. II. *Giardia lamblia* cysts given in capsules. *Am J Hyg* 1954; **59:** 209–20.

104 Yoder J, Harral C, Beach M, Division of Foodborne, Waterborne, and Environmental Diseases (proposed), National Center for Emerging and Zoonotic Infectious Diseases (proposed), CDC. Giardiasis Surveillance—United States, 2006–2008. Centers for Disease Control, 2010.

105 Laishram S, Kang G, Ajjampur SSR. Giardiasis: a review on assemblage distribution and epidemiology in India. *Indian J Gastroenterol* 2012; **31:** 3–12.

106 Walker CLF, Rudan I, Liu L, et al. Global burden of childhood pneumonia and diarrhoea. *Lancet* 2013; **381:** 1405–16.

107 Nair H, Nokes DJ, Gessner BD, et al. Global burden of acute lower respiratory infections due to respiratory syncytial virus in young children: a systematic review and meta-analysis. *Lancet* 2010; **375:** 1545–55.

108 Nair H, Brooks WA, Katz M, et al. Global burden of respiratory infections due to seasonal influenza in young children: a systematic review and meta-analysis. *Lancet* 2011; **378:** 1917–30.

109 Pfizer. Pfizer presents detailed results from landmark community-acquired pneumonia immunization trial in adults (CAPiTA) evaluating efficacy of prevenar 13. New York, NY, 2014. http://www.pfizer.com/news/press-release/press-release-detail/pfizer_presents_detailed_results_from_landmark_community_acquired_pneumonia_immunization_trial_in_adults_capita_evaluating_efficacy_of_prevenar_13 (accessed Nov 4, 2014).

110 Levine OS, O'Brien KL, Deloria-Knoll M, et al. The pneumonia etiology research for child health project: a 21st century childhood pneumonia etiology study. *Clin Infect Dis* 2012; **54:** S93–101.

111 Gunnell D, Eddleston M, Phillips MR, Konradsen F. The global distribution of fatal pesticide self-poisoning: systematic review. *BMC Public Health* 2007; **7:** 357.

112 Sahloul Z, Coutts A, Fouad FM, et al. Health response system for Syria: beyond official narrative. *Lancet* 2014; **383:** 407.

113 Das S, Kolher RP, Mane BG, Singh JPN, Singh AP. Chikungunya epidemic: global and Indian scenario. *J Commun Dis* 2007; **39:** 37–43.

114 Kalantri SP, Joshi R, Riley LW. Chikungunya epidemic: an Indian perspective. *Natl Med J India* 2006; **19:** 315–22.

115 Raheel U, Faheem M, Riaz MN, et al. Dengue fever in the Indian subcontinent: an overview. *J Infect Dev Ctries* 2011; **5:** 239–47.

116 Dhama K, Verma AK, Rajagunalan S, et al. Swine flu is back again: a review. *Pak J Biol Sci PJBS* 2012; **15:** 1001–09.

117 Forouzanfar MH, Foreman KJ, Delossantos AM, et al. Breast and cervical cancer in 187 countries between 1980 and 2010: a systematic analysis. *Lancet* 2011; **378:** 1461–84.

118 Hill K, Zimmerman L. Adolescent mortality in low- and middle-income countries. WHO, 2013 http://globalhealth2035.org/sites/default/files/working-papers/adolescent-mortality.pdf (accessed May 5, 2014).

119 Gore FM, Bloem PJ, Patton GC, et al. Global burden of disease in young people aged 10–24 years: a systematic analysis. *Lancet* 2011; **377:** 2093–102.

120 Patton GC, Coffey C, Sawyer SM, et al. Global patterns of mortality in young people: a systematic analysis of population health data. *Lancet* 2009; **374:** 881–92.

121 Brown GD, Denning DW, Levitz SM. Tackling human fungal infections. *Science* 2012; **336:** 647.

122 Vangen S, Ellingsen L, Andersgaard AB, et al. Maternal deaths in Norway 2005–2009. *Tidsskr Den Nor Laegeforening Tidsskr Prakt Med Ny Raekke* 2014; **134:** 836–39.

123 Roulson J, Benbow EW, Hasleton PS. Discrepancies between clinical and autopsy diagnosis and the value of post mortem histology; a meta-analysis and review. *Histopathology* 2005; **47:** 551–59.

124 Sonderegger-Iseli K, Burger S, Muntwyler J, Salomon F. Diagnostic errors in three medical eras: a necropsy study. *Lancet* 2000; **355:** 2027–31.

125 Murray CJL, Kulkarni SC, Ezzati M. Understanding the coronary heart disease versus total cardiovascular mortality paradox a method to enhance the comparability of cardiovascular death statistics in the United States. *Circulation* 2006; **113:** 2071–81.

参考資料 6

Ng M, Fleming T, Robinson M, Thomson B, Graetz N, et al. Global, regional, and national prevalence of overweight and obesity in children and adults during 1980—2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet. 2014; 384 (9945):766 - 781.

Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013

Marie Ng, Tom Fleming, Margaret Robinson, Blake Thomson, Nicholas Graetz, Christopher Margono, Erin C Mullany, Stan Biryukov, Cristiana Abbafati*, Semaw Ferede Abera*, Jerry P Abraham*, Niveen M E Abu-Rmeileh*, Tom Achoki*, Fadia S AlBuhairan*, Zewdie A Alemu*, Rafael Alfonso*, Mohammed K Ali*, Raghib Ali*, Nelson Alvis Guzman*, Walid Ammar*, Palwasha Anwari*, Amitava Banerjee*, Simon Barquera*, Sanjay Basu*, Derrick A Bennett*, Zulfiqar Bhutta*, Jed Blore*, Norberto Cabral*, Ismael Campos Nonato*, Jung-Chen Chang*, Rajiv Chowdhury*, Karen J Courville*, Michael H Criqui*, David K Cundiff*, Kaustubh C Dabhadkar*, Lalit Dandona*, Adrian Davis*, Anand Dayama*, Samath D Dharmaratne*, Eric L Ding*, Adnan M Durrani*, Alireza Esteghamati*, Farshad Farzadfar*, Derek F J Fay*, Valery L Feigin*, Abraham Flaxman*, Mohammad H Forouzanfar*, Atsushi Goto*, Mark A Green*, Rajeev Gupta*, Nima Hafezi-Nejad*, Graeme J Hankey*, Heather C Harewood*, Rasmus Havmoeller*, Simon Hay*, Lucia Hernandez*, Abdullatif Husseini*, Bulat T Idrisov*, Nayu Ikeda*, Farhad Islami*, Eiman Jahangir*, Simerjot K Jassal*, Sun Ha Jee*, Mona Jeffreys*, Jost B Jonas*, Edmond K Kabagambe*, Shams Eldin Ali Hassan Khalifa*, Andre Pascal Kengne*, Yousef Saleh Khader*, Young-Ho Khang*, Daniel Kim*, Ruth W Kimokoti*, Jonas M Kinge*, Yoshihiro Kokubo*, Soewarta Kosen*, Gene Kwan*, Taavi Lai*, Mall Leinsalu*, Yichong Li*, Xiaofeng Liang*, Shiwei Liu*, Giancarlo Logroscino*, Paulo A Lotufo*, Yuan Lu*, Jixiang Ma*, Nana Kwaku Mainoo*, George A Mensah*, Tony R Merriman*, Ali H Mokdad*, Joanna Moschandreas*, Mohsen Naghavi*, Aliya Naheed*, Devina Nand*, K M Venkat Narayan*, Erica Leigh Nelson*, Marian L Neuhouser*, Muhammad Imran Nisar*, Takayoshi Ohkubo*, Samuel O Oti*, Andrea Pedroza*, Dorairaj Prabhakaran*, Nobhojit Roy*, Uchechukwu Sampson*, Hyeyoung Seo*, Sadaf G Sepanlou*, Kenji Shibuya*, Rahman Shiri*, Ivy Shiue*, Gitanjali M Singh*, Jasvinder A Singh*, Vegard Skirbekk*, Nicolas J C Stapelberg*, Lela Sturua*, Bryan L Sykes*, Martin Tobias*, Bach X Tran*, Leonardo Trasande*, Hideaki Toyoshima*, Steven van de Vijver*, Tommi J Vasankari*, J Lennert Veerman*, Gustavo Velasquez-Melendez*, Vasiliy Victorovich Vlassov*, Stein Emil Vollset*, Theo Vos*, Claire Wang*, XiaoRong Wang*, Elisabete Weiderpass*, Andrea Werdecker*, Jonathan L Wright*, Y Claire Yang*, Hiroshi Yatsuya*, Jihyun Yoon*, Seok-Jun Yoon*, Yong Zhao*, Maigeng Zhou*, Shankuan Zhu*, Alan D Lopez†, Christopher J L Murray†, Emmanuela Gakidou†‡

Lancet 2014; 384: 766–81

Published Online May 29, 2014 http://dx.doi.org/10.1016/S0140-6736(14)60460-8

See Online/Comment http://dx.doi.org/10.1016/S0140-6736(14)60767-4

This online publication has been corrected. The corrected version first appeared at thelancet.com on Aug 29, 2014

*Authors listed alphabetically

†Joint senior authors

‡Corresponding author

Institute for Health Metrics and Evaluation (M Ng PhD, T Fleming BS, M Robinson BA, B Thomson BA, N Graetz BS, C Margono BS, E C Mullany BA, S Biryukov BS, T Achoki PhD, Prof L Dandona MD, A Flaxman PhD, M H Forouzanfar PhD, A H Mokdad PhD, M Naghavi PhD, E L Nelson MLIS, M Tobias PhD, T Vos PhD, Prof C J L Murray PhD, Prof E Gakidou PhD), **School of Medicine** (J L Wright MD), **University of Washington, Seattle, WA, USA** (R Alfonso MD); **"La Sapienza" University of**

Summary

Background In 2010, overweight and obesity were estimated to cause 3·4 million deaths, 3·9% of years of life lost, and 3·8% of disability-adjusted life-years (DALYs) worldwide. The rise in obesity has led to widespread calls for regular monitoring of changes in overweight and obesity prevalence in all populations. Comparable, up-to-date information about levels and trends is essential to quantify population health effects and to prompt decision makers to prioritise action. We estimate the global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013.

Methods We systematically identified surveys, reports, and published studies (n=1769) that included data for height and weight, both through physical measurements and self-reports. We used mixed effects linear regression to correct for bias in self-reports. We obtained data for prevalence of obesity and overweight by age, sex, country, and year (n=19 244) with a spatiotemporal Gaussian process regression model to estimate prevalence with 95% uncertainty intervals (UIs).

Findings Worldwide, the proportion of adults with a body-mass index (BMI) of 25 kg/m² or greater increased between 1980 and 2013 from 28·8% (95% UI 28·4–29·3) to 36·9% (36·3–37·4) in men, and from 29·8% (29·3–30·2) to 38·0% (37·5–38·5) in women. Prevalence has increased substantially in children and adolescents in developed countries; 23·8% (22·9–24·7) of boys and 22·6% (21·7–23·6) of girls were overweight or obese in 2013. The prevalence of overweight and obesity has also increased in children and adolescents in developing countries, from 8·1% (7·7–8·6) to 12·9% (12·3–13·5) in 2013 for boys and from 8·4% (8·1–8·8) to 13·4% (13·0–13·9) in girls. In adults, estimated prevalence of obesity exceeded 50% in men in Tonga and in women in Kuwait, Kiribati, Federated States of Micronesia, Libya, Qatar, Tonga, and Samoa. Since 2006, the increase in adult obesity in developed countries has slowed down.

Interpretation Because of the established health risks and substantial increases in prevalence, obesity has become a major global health challenge. Not only is obesity increasing, but no national success stories have been reported in the past 33 years. Urgent global action and leadership is needed to help countries to more effectively intervene.

Funding Bill & Melinda Gates Foundation.

Rome, Rome, Italy (C Abbafati PhD); School of Public Health, College of Health Sciences, Mekelle University, Mekelle, Ethiopia (S F Abera MA); University of Texas School of Medicine, San Antonio, TX, USA (J P Abraham MPH); Institute of Community and Public Health, Birzeti University, Ramallah, West Bank, Occupied Palestinian Territory (N M E Abu-Rmeileh PhD); Ministry of Health, Gaborone, Botswana (T Achoki);

Introduction

The rising prevalence of overweight and obesity in several countries[1–5] has been described as a global pandemic.[6–8] In 2010, overweight and obesity were estimated to cause 3·4 million deaths, 4% of years of life lost, and 4% of disability-adjusted life-years (DALYs) worldwide.[9] Data from studies in the USA have suggested that, unabated, the rise in obesity could lead to future falls in life expectancy.[10] Concern about the health risks associated with rising obesity has become nearly universal; member states of WHO introduced a voluntary target to stop the rise in obesity by 2025,[11] and widespread calls have been made for regular monitoring of changes in the prevalence of overweight and obesity in all populations.[12–15]

Monitoring of trends in the prevalence of overweight and obesity depends on household surveys. Many health interview surveys include questions on self-reported weight and height, which have been used to monitor trends over time;[16–18] however, estimates of body-mass index (BMI) from self-reported data are biased downwards.[19–21] Examination surveys provide direct measurements of weight and height, but few countries do repeated national examination surveys, and estimates from these surveys might be biased because of low participation rates.[19] Despite the paucity of complete and unbiased information about overweight and obesity, various systematic analyses have tried to assess levels and trends. Finucane and colleagues[2] used data from 369 national surveys and 591 subnational surveys to estimate country trends in mean BMI between 1980 and 2008. De Onis and colleagues[3] examined 450 national surveys to estimate trends in childhood obesity and overweight from 1990 to 2020. Investigators have used mean BMI estimates to predict levels of overweight and obesity during 1980–2008.[1] Data from these analyses suggest widespread increases in overweight and obesity in the past few decades, although data from recent country-specific analyses suggest that trends might have stabilised in some populations.[22–24]

Up-to-date information about levels and trends in overweight and obesity is essential both to quantify the health effects and to prompt decision makers to prioritise action and assess where progress is, or is not, being made. We aimed to analyse trends in overweight and obesity by country during 1980–2013 with data from surveys, reports, and scientific literature.

Methods

Definitions and data extraction

Following convention, we defined prevalence of overweight and obesity (in adults [aged >18 years] overweight categorised as BMI ≥25 to <30 kg/m² and obesity as BMI ≥30 kg/m²; in children, classification is based on the International Obesity Task Force [IOTF] definition; appendix). We reported estimates for 188 countries, 21 regions, and development status (developed or developing) as defined in the GBD study.[25] We report estimates of the prevalence of overweight and obesity for men and women separately and for 17 age groups (from age 2–4 years to ≥80 years).

We used several strategies to identify data sources. First, we included all major multicountry survey programmes that included information about height and weight, such as the Demographic and Health Surveys,[26] the WHO STEPwise approach to Surveillance programme,[27] the Eurobarometer Surveys,[28] the Multiple Indicator Cluster Surveys,[29] the World Health Surveys,[30] the Reproductive Health Surveys,[31] the Survey of Healthy Ageing and Retirement in Europe,[32] and the International Social

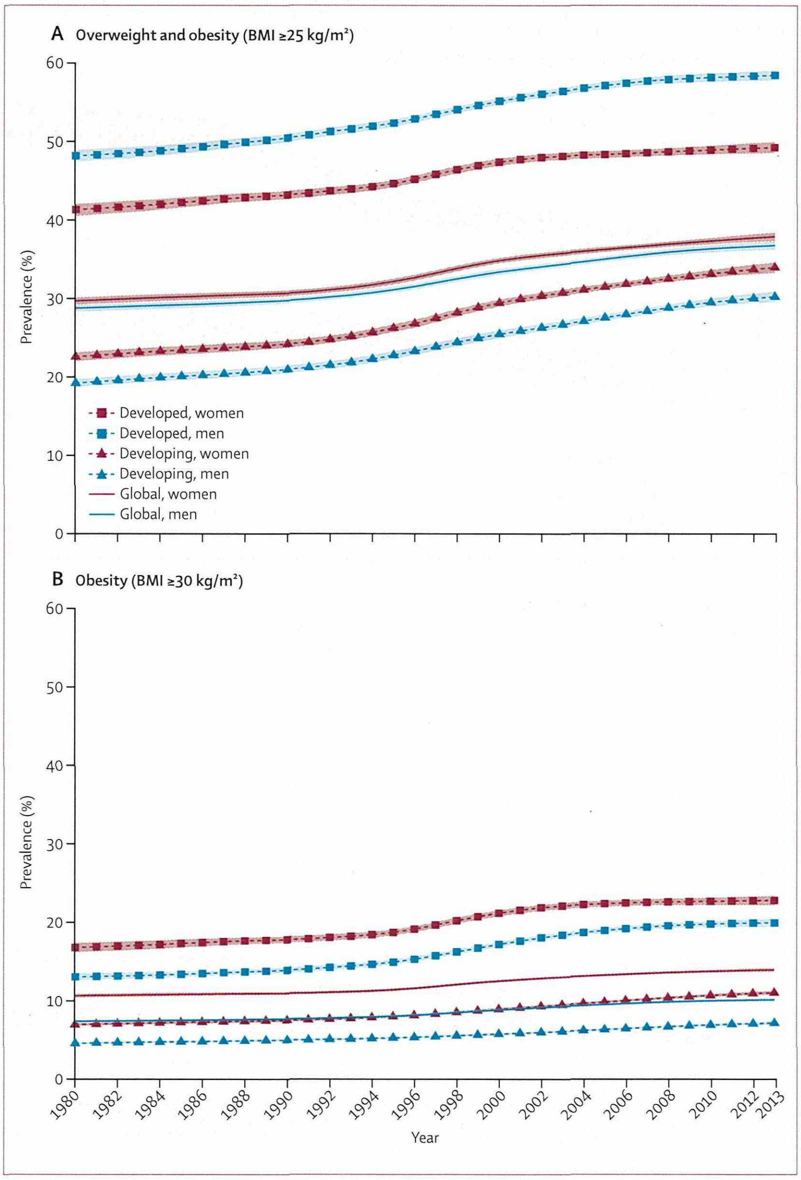

Figure 1: **Age-standardised prevalence of overweight and obesity and obesity alone, ages ≥20 years, by sex, 1980–2013**
BMI=body-mass index.

King Abdulaziz Medical City, King Saud bin Abdulaziz University for Health Sciences and King Abdullah International Medical Research Center, Riyadh, Saudi Arabia (F S AlBuhairan MBBS); Debre Markos University, Debre Markos, Ethiopia (Z A Alemu MPH); Emory University, Atlanta, GA, USA (M K Ali MBChB, K C Dabhadkar MBBS, A Dayama MD, Prof K M V Narayan MD); University of Oxford, Oxford,

Survey Programme.[33] Second, we searched three large databases (the WHO Global Infobase,[34] the International Association for the Study of Obesity Data Portal,[35] and the Global Health Data Exchange),[36] and national health ministry websites to identify national multiyear surveys, such as national health surveys and national longitudinal studies. Of 2270 sources identified, we excluded 501 because the samples were not representative.

Third, we did a systematic literature review with similar search criteria as those applied by Finucane and colleagues.[2] We identified all articles reporting prevalence of overweight and obesity based on BMI from 1980 to 2012. We included studies designed with a representative random sample of the population and both self-report and measured data (appendix). We compared data with the survey and report database and removed all duplicated data (with preference given to survey microdata). We excluded studies reporting prevalence of overweight and obesity based on alternative measurements, such as waist circumference and hip-waist ratio, because of insufficient reliable data for conversion of prevalence based on these alternative measurements to an equivalent prevalence estimate based on BMI.

These sources provided 1769 country-years of data and 19 244 datapoints for country, year, age, and sex from 183 countries. Five countries had no data (Antigua and Barbuda, Brunei, Grenada, Saint Vincent and the Grenadines, Venezuela). The appendix provides more details on the surveys included and excluded, specific search terms and inclusion and exclusion criteria for the systematic review, and a complete list of all the sources included in the analysis.

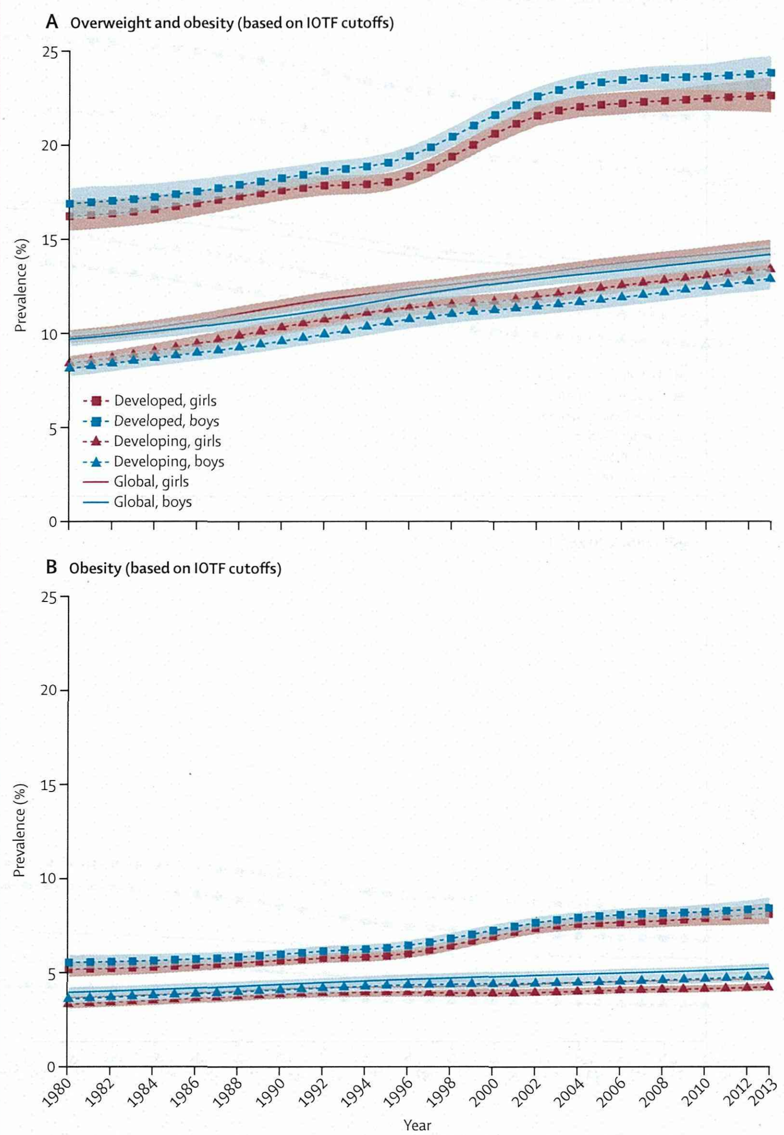

Figure 2: **Age-standardised prevalence of overweight and obesity, and obesity alone (based on IOTF cutoffs), ages 2–19 years, by sex, 1980–2013**
IOTF=International Obesity Task Force.

Data processing

Cross-walking different definitions

Self-reported weights for women in some countries tend to be under-reported and self-reported heights for men tend to be over-reported.[19–21] However, self-reported weights and heights are a major source of information for studies of obesity. We examined the association between self-reported and measured BMI with 538 country-years with both types of measurements available. We used a mixed effects linear regression to estimate bias correction factors for each GBD region, age, and sex. The uncertainty introduced from this adjustment was incorporated as the data variance and propagated into the Gaussian process regression. We did a sensitivity analysis excluding all self-reported data from the analysis (appendix).

Several reports have presented data for broader age groups than those selected for this analysis and sometimes for both sexes combined. We disaggregated these data into the required age and sex groups by applying an age–sex splitting model previously used in GBD 2010,[37] which used all surveys that provided information about multiple age–sex groupings as the reference standard to redistribute aggregated prevalence estimates into specific 5-year age bands and sex groups of interest (appendix).

Prevalence modelling

We often had many sources of data for the same year, which implied different levels of prevalence. In other cases, the data sequence had gaps. To deal with both issues and generate a complete time series based on all available data, we used a spatiotemporal regression model and Gaussian process regression to synthesise the data. Spatiotemporal Gaussian process regression has been used extensively to synthesise time series cross-sectional data,[38–42] and is a powerful method for interpolation and extrapolation of nonlinear trends. Specifically, it allows the borrowing of strength across space and time. Additionally, rather than treating every datapoint with equal weight, the relative uncertainty of data are taken into account in the estimation procedure with less uncertain data given a higher weight. The appendix provides details of each step of the estimation process. Briefly, we assumed that the trend of overweight and obesity prevalence followed a Gaussian process, which is defined by a mean function $m(\bullet)$ and a covariance function $Cov(\bullet)$. To estimate the mean function, we applied a procedure with two stages. First, we fitted a linear model separately for each sex. Specifically for prevalence of overweight the following model is applied

$$logit\left(p^{ow}_{c,a,t}\right) = \beta_0 + \beta_1 \log\left(Kcal_{pc,t}\right) + \beta_2 Lat + \beta_3 Urban + \sum_{k=4}^{k+16} \beta_k I_{age} + \sum_{k=21}^{k+21} \beta_k I_{region}$$

where $p^{ow}_{c,a,t}$ is the prevalence of overweight and obesity for country (c), age (a), at time (t). In view of the association between food consumption and overweight,[43] we used total kilocalories consumed per year per person as a covariate obtained from the Food and Agriculture Organization food balance sheets ($Kcal_{pc,t}$).[43,44] Additionally, we included latitude (Lat) and urbanicity ($Urban$) as measured by the proportion of a country's land area having a population density of 1000 people/km2 or greater, to measure the variation in overweight and obesity within and between countries. Finally, we included I_{age} as a dummy indicator to capture the age pattern and I_{region} to capture regional variation. To estimate the prevalence of obesity ($p^{ob}_{c,a,t}$), we applied a similar model:

$$logit\left(\frac{p^{ob}_{c,a,t}}{p^{ow}_{c,a,t}}\right) = \beta_0 + \beta_1 \log\left(Kcal_{c,t}\right) + \beta_2 Lat + \beta_3 Urban + \sum_{k=4}^{k+16} \beta_k I_{age} + \sum_{k=21}^{k+21} \beta_k I_{region}$$

We modelled the prevalence of obesity as a fraction of the joint category of overweight and obesity. We used this method to ensure that the prevalence of obesity did not exceed the joint category of overweight and obesity, which is bound between 0 and 1. We explored the use of other covariates to predict prevalence, including average income per person and various measures of diet composition. Our results were not sensitive to the choice of these covariates and we present estimates based on the most parsimonious model. The appendix shows details on the various model specifications that we included.

Although the linear component captured the general trend in prevalence, some of the data variability was still not adequately accounted for. Therefore, we applied a smoothing function that allowed for borrowing strength across time, age, and space patterns to the residuals from the linear model, as has been done repeatedly in the GBD analytical framework (appendix).

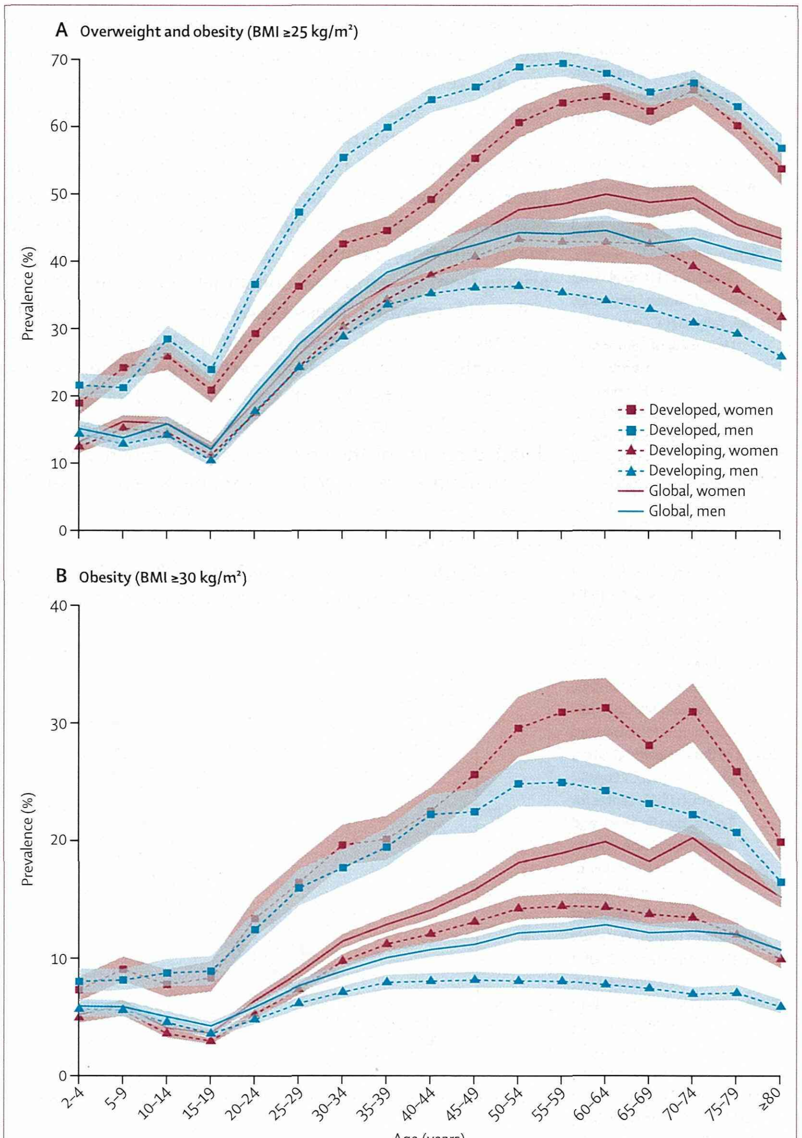

Figure 3: **Prevalence of overweight and obesity and obesity alone, by age and sex, 2013**
BMI=body-mass index.

In addition to the definition of the mean function, another key component in Gaussian process regression is the covariance function, which defines the shape and distribution of trends. We applied the Matern covariance function, which offers flexibility to model a wide spectrum of trends with varying degrees of smoothness (appendix).

On the basis of the mean and covariance function, estimates of overweight and obesity prevalence $p^{ow}_{c,a,t*}$ and $p^{ob}_{c,a,t*}$ were derived for country (c), age (a), and sex (s) for time (t). We did the analysis with the PyMC package (version 3.3) in Python. We obtained random draws of

UK (R Ali MSc, D A Bennett PhD, Prof S Hay DPhil); **Universidad de Cartagena, Cartagena de Indias, Colombia** (Prof N Alvis Guzman PhD); **Ministry of Public Health, Beirut, Lebanon** (Prof W Ammar PhD); **UNFPA, Kabul, Afghanistan** (P Anwari MD); **University of Birmingham, Birmingham, UK** (A Banerjee DPhil); **National Institute of Public Health, Cuernavaca, Morelos, Mexico** (S Barquera PhD, I Campos Nonato PhD, L Hernandez MS, A Pedroza MS); **Stanford University, Stanford, CA, USA** (S Basu PhD); **Aga Khan University Medical Center, Karachi, Pakistan** (Prof Z Bhutta PhD, M I Nisar MSc); **University of Melbourne, Melbourne, VIC, Australia** (J Blore PhD, Prof A D Lopez PhD); **Universidad de Joinville-Univille, Joinville, Brazil** (Prof N Cabral PhD); **National Taiwan University, Taipei, Taiwan** (J-C Chang PhD); **University of Cambridge, Cambridge, UK** (R Chowdhury MD); **Hospital Dr. Gustavo N. Collado, Chitre, Herrera, Panama** (K J Courville MD); **University of California San Diego, San Diego, CA, USA** (Prof M H Criqui MD); **Independent Researcher, Long Beach, CA, USA** (D K Cundiff MD); **Public Health Foundation of India, New Delhi, India** (Prof L Dandona); **Public Health England, London, UK** (Prof A Davis PhD, D F J Fay MSc); **University of Peradeniya, Peradeniya, Sri Lanka** (S D Dharmaratne MD); **Harvard School of Public Health, Boston, MA USA** (E L Ding ScD, Y Lu MSc, GM Singh PhD); **Center for Translation Research and Implementation Science (CTRIS), National Heart, Lung, and Blood Institute** (G A Mensah MD), **National Institutes of Health, Bethesda and Montgomery, MD, USA** (A M Durrani MD); **Endocrinology and Metabolism Research Center** (Prof A Esteghamati MD, F Farzadfar MD, N Hafezi-Nejad MD), **Digestive Diseases Research Institute, Tehran University of Medical Sciences, Tehran, Iran** (S G Sepanlou MD); **National Institute for Stroke and Applied Neurosciences, AUT University, Auckland, New Zealand** (Prof V L Feigin PhD); **Department of Diabetes Research, National Center for Global Health and Medicine, Tokyo, Japan** (A Goto PhD); **University of Sheffield, Sheffield, UK** (M A Green MSc); **Fortis Escorts Hospital, Jaipur, India** (R Gupta PhD); **School of Medicine and Pharmacology, University of Western Australia, Perth, WA, Australia** (Prof G J Hankey MD); **Eunice Gibson Polyclinic, Bridgetown, Barbados** (H C Harewood MPH); **Department of Medical**

1000 samples from the marginal distributions of predicted prevalence of overweight and obesity for every country, age, and sex group. The final estimated prevalence for each country, age, and sex group was the mean of the draws. We obtained uncertainty intervals by taking the 2·5 and 97·5 percentiles of the distributions. These uncertainty intervals show many sources of uncertainty, including the unexplained variance in the Gaussian process regression mean function, sampling uncertainty, and uncertainty arising from the empirical adjustment of self-report data.

We did repeated cross-validation and estimated the root-mean squared error for the data held out in each cross-validation run and the percentage of the time that the 95% uncertainty interval for the data prediction included the data held-out. The appendix provides the detailed results of the cross-validation, which shows that the modelling strategy had reasonable error and 95% uncertainty intervals that included close to 95% of the data excluded.

We computed age-standardised prevalence rates for the population aged 20 years and older and for ages 2–19 years with the standard population distribution based on the average country-level population distribution by age from the World Population Prospects 2012 revision.[45]

Role of the funding source

The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

Worldwide, prevalence of overweight and obesity combined rose by 27·5% for adults and 47·1% for children between 1980 and 2013. The number of overweight and obese individuals increased from 857 million in 1980, to 2·1 billion in 2013 (data not shown). Figure 1 shows age-standardised global prevalence of overweight and obesity combined and obesity alone in adults, for developing and developed countries between 1980 and 2013. Worldwide, the

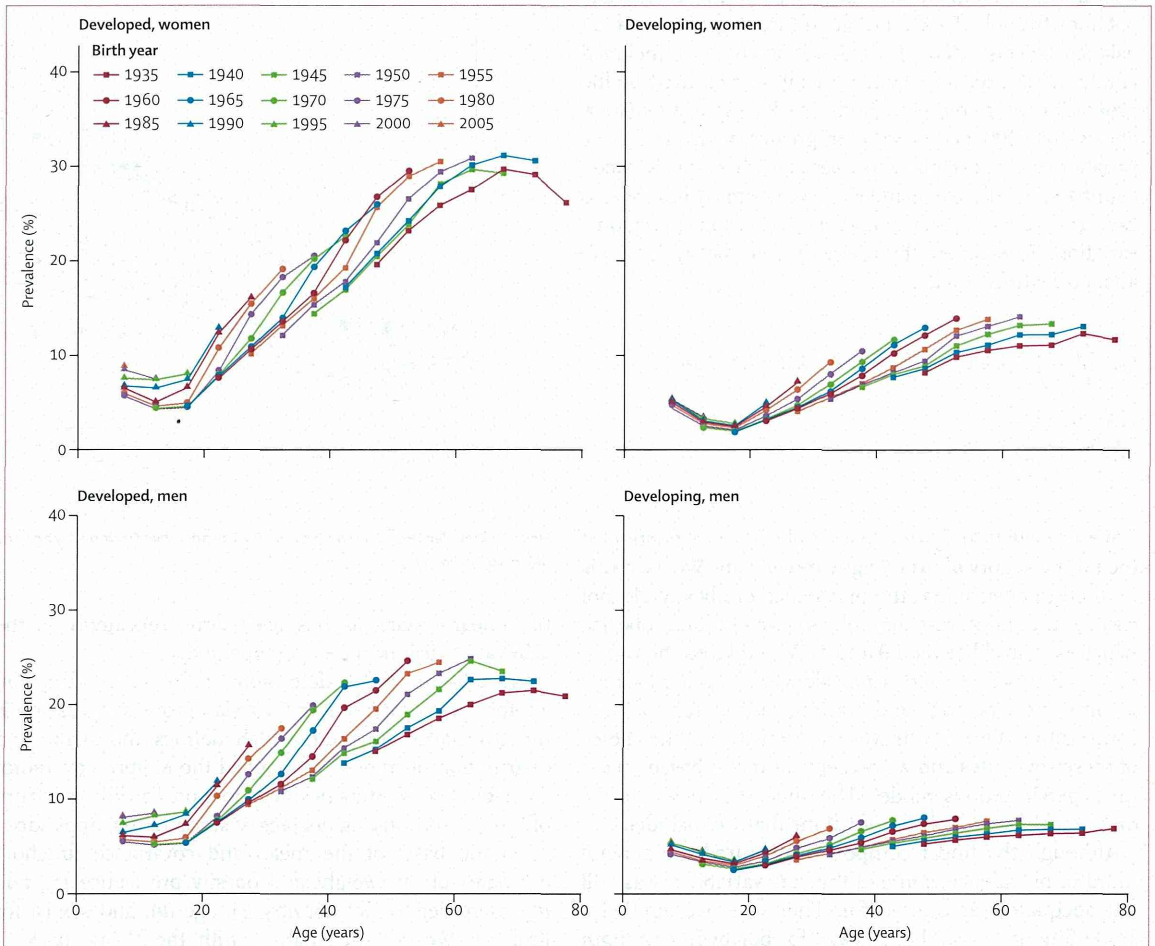

Figure 4: **Prevalence of obesity by age across birth cohorts for men and women in developed and developing countries**

	Boys <20 years		Men ≥20 years		Girls <20 years		Women ≥20 years	
	Overweight and obese	Obese	Overweight and obese	Obese	Overweight and obese	Obese	Overweight and obese	Obese
Andean Latin America	16·7 (15·1–18·3)	3·7 (3·3–4·2)	45·0 (43·2–46·8)	8·5 (7·8–9·1)	27·2 (24·9–29·5)	4·4 (3·8–4·9)	66·7 (65·6–67·7)	23·4 (22·2–24·6)
Bolivia	20·5 (17·4–24·0)	4·6 (3·7–5·5)	51·9 (49·1–54·5)	10·2 (9·1–11·4)	28·2 (24·4–32·4)	4·7 (3·7–5·7)	62·0 (59·7–64·4)	24·5 (22·4–26·8)
Ecuador	13·7 (11·4–16·2)	3·1 (2·4–3·7)	40·2 (37·5–42·9)	6·9 (6·1–7·7)	29·6 (25·4–34·2)	4·6 (3·7–5·8)	69·8 (67·2–72·1)	19·8 (17·6–22·0)
Peru	16·6 (14·2–19·4)	3·8 (3·1–4·5)	45·4 (42·7–48·2)	8·8 (7·7–9·8)	25·6 (22·3–29·2)	4·1 (3·3–4·9)	66·5 (65·1–67·9)	24·9 (23·1–26·6)
Australasia	25·3 (22·7–28·2)	7·5 (6·5–8·6)	68·6 (66·3–70·6)	27·6 (25·5–29·6)	24·0 (21·3–26·9)	7·6 (6·4–9·0)	56·7 (54·4–59·1)	29·8 (27·7–32·0)
Australia	24·4 (21·4–28·0)	7·0 (5·8–8·2)	68·2 (65·6–70·5)	27·5 (25·2–29·8)	23·0 (19·9–26·5)	7·3 (5·9–8·9)	56·1 (53·4–58·9)	29·8 (27·3–32·4)
New Zealand	29·6 (26·0–33·3)	9·7 (8·4–11·4)	71·4 (69·6–73·3)	28·1 (26·3–29·9)	28·7 (25·3–32·6)	9·0 (7·6–10·6)	60·0 (57·8–62·2)	30·0 (28·1–31·9)
Caribbean	13·4 (12·3–14·6)	4·5 (4·1–4·9)	37·8 (36·4–39·1)	12·3 (11·5–13·1)	19·9 (18·4–21·5)	6·6 (5·9–7·3)	50·4 (49·1–51·8)	24·5 (23·4–25·9)
Antigua and Barbuda	11·2 (9·4–13·4)	4·5 (3·6–5·6)	35·5 (32·7–38·4)	10·1 (8·9–11·4)	20·5 (17·3–24·2)	6·7 (5·3–8·2)	49·1 (46·3–52·0)	20·5 (18·4–22·7)
Barbados	25·3 (21·6–29·1)	8·7 (7·0–10·5)	57·5 (54·7–60·1)	18·1 (16·4–20·0)	32·4 (27·9–37·3)	14·9 (12·0–17·9)	69·9 (67·2–72·4)	33·0 (30·6–35·8)
Belize	18·4 (15·7–21·4)	7·9 (6·4–9·5)	58·6 (55·9–61·4)	23·0 (20·9–25·3)	27·1 (23·1–31·5)	11·6 (9·3–14·2)	75·3 (72·9–77·5)	42·7 (39·5–45·8)
Cuba	15·7 (13·1–18·4)	7·4 (6·1–9·0)	37·5 (34·5–40·4)	16·0 (14·4–17·8)	23·9 (20·3–28·1)	10·7 (8·5–13·0)	51·4 (48·5–54·3)	29·7 (26·9–32·6)
Dominica	15·2 (12·7–18·0)	4·6 (3·7–5·7)	36·6 (33·8–39·1)	10·7 (9·7–11·9)	29·2 (24·5–33·6)	12·2 (9·9–14·9)	74·0 (71·5–76·4)	39·4 (36·8–42·1)
Dominican Republic	17·8 (14·8–20·9)	4·3 (3·5–5·3)	50·7 (47·9–53·7)	10·3 (9·1–11·7)	25·2 (21·5–29·5)	7·3 (5·9–9·1)	54·8 (51·7–57·9)	20·9 (18·8–23·4)
Grenada	11·6 (9·7–13·9)	4·7 (3·8–5·9)	36·5 (33·9–39·0)	10·5 (9·4–11·8)	21·2 (17·8–25·1)	7·0 (5·5–8·7)	50·2 (47·2–53·2)	21·3 (19·0–23·6)
Guyana	11·5 (9·8–13·3)	4·5 (3·6–5·4)	40·9 (38·6–43·2)	11·5 (10·4–12·7)	22·2 (18·8–25·8)	8·6 (7·0–10·5)	62·3 (60·2–64·5)	30·4 (28·0–32·7)
Haiti	7·7 (6·5–9·1)	2·1 (1·7–2·6)	16·6 (15·1–18·4)	5·0 (4·4–5·6)	9·5 (7·9–11·5)	2·0 (1·6–2·5)	30·8 (28·7–33·0)	12·2 (11·2–13·4)
Jamaica	13·4 (11·1–15·7)	5·3 (4·2–6·6)	37·1 (34·3–39·9)	10·6 (9·4–11·8)	31·0 (26·5–36·0)	10·9 (8·6–13·3)	62·7 (59·7–65·2)	32·0 (29·2–34·8)
Saint Lucia	15·8 (13·2–18·7)	6·2 (5·0–7·4)	46·9 (44·0–49·6)	14·4 (12·9–16·2)	17·0 (13·9–20·2)	6·0 (4·7–7·5)	44·2 (41·4–47·2)	19·2 (17·3–21·5)
Saint Vincent and the Grenadines	15·3 (12·7–17·9)	6·0 (4·9–7·4)	43·5 (40·8–46·3)	13·3 (11·8–14·8)	26·0 (22·1–30·7)	8·8 (7·0–10·9)	56·5 (53·2–59·7)	25·4 (23·0–28·0)
Suriname	11·8 (9·8–14·0)	4·2 (3·3–5·4)	49·7 (46·9–52·5)	12·5 (11·2–13·9)	22·6 (19·0–26·3)	7·4 (5·8–9·2)	64·7 (61·8–67·5)	33·8 (30·7–36·8)
The Bahamas	19·1 (16·3–22·3)	15·9 (12·9–18·9)	49·9 (47·1–52·8)	30·9 (28·3–33·6)	33·3 (28·7–38·3)	20·2 (16·6–24·2)	64·3 (61·4–67·2)	47·7 (44·5–51·2)
Trinidad and Tobago	19·2 (16·3–22·1)	7·8 (6·3–9·4)	55·5 (53·2–57·7)	20·9 (19·3–22·5)	21·3 (18·0–25·0)	7·2 (5·7–8·9)	66·1 (64·1–68·1)	36·2 (34·2–38·3)
Central Asia	19·9 (18·6–21·4)	6·8 (6·2–7·6)	50·8 (49·5–52·0)	12·6 (12·0–13·2)	20·6 (19·0–22·1)	5·9 (5·3–6·7)	53·2 (52·0–54·4)	22·0 (21·1–22·9)
Armenia	23·3 (20·1–27·1)	7·3 (5·8–8·9)	44·7 (42·1–47·3)	11·4 (10·0–12·8)	24·1 (20·7–28·2)	6·6 (5·2–8·2)	60·4 (58·0–62·7)	26·4 (24·1–28·8)
Azerbaijan	24·9 (21·2–28·6)	8·3 (6·5–10·4)	59·0 (56·6–61·4)	9·0 (8·0–10·0)	23·1 (19·5–26·9)	7·9 (6·2–9·9)	67·3 (65·1–69·5)	30·4 (28·2–32·8)
Georgia	26·3 (22·5–30·1)	10·7 (8·9–12·7)	58·7 (56·0–61·4)	21·2 (19·7–22·8)	29·9 (25·7–34·3)	12·1 (9·9–14·5)	59·7 (57·1–62·5)	28·1 (26·1–30·1)
Kazakhstan	20·5 (17·6–23·8)	7·4 (6·0–8·9)	52·7 (49·9–55·4)	15·4 (13·8–17·0)	21·9 (18·6–25·8)	5·7 (4·6–7·0)	55·9 (53·1–58·7)	27·3 (24·8–29·7)
Kyrgyzstan	19·7 (16·6–23·1)	4·6 (3·7–5·6)	50·9 (47·9–53·6)	10·3 (9·1–11·5)	19·1 (15·8–22·6)	4·5 (3·5–5·6)	50·0 (47·2–52·8)	19·7 (17·8–22·0)
Mongolia	15·5 (13·1–18·2)	4·7 (3·7–5·8)	44·3 (42·0–46·7)	12·1 (10·9–13·4)	18·9 (15·9–22·2)	4·5 (3·6–5·5)	53·8 (51·3–56·2)	18·3 (16·8–20·2)
Tajikistan	13·0 (11·0–15·3)	5·9 (4·8–7·1)	39·6 (37·1–42·4)	13·0 (11·5–14·4)	13·3 (10·8–15·7)	4·3 (3·4–5·5)	41·8 (39·5–44·2)	13·4 (12·0–14·8)
Turkmenistan	21·5 (18·2–25·1)	6·5 (5·3–8·1)	53·2 (50·4–56·0)	14·1 (12·6–15·8)	24·2 (20·4–28·4)	2·6 (2·1–3·3)	53·7 (50·7–56·7)	22·0 (19·9–24·1)
Uzbekistan	20·2 (17·3–23·5)	7·0 (5·5–8·5)	49·2 (46·6–51·9)	11·3 (10·0–12·6)	20·6 (17·1–24·3)	6·6 (5·1–8·4)	46·6 (43·8–49·2)	15·8 (14·1–17·7)
Central Europe	21·3 (20·0–22·7)	7·5 (6·9–8·1)	62·2 (61·1–63·3)	18·0 (17·2–18·8)	20·3 (18·9–21·6)	6·3 (5·8–6·9)	50·4 (49·2–51·5)	20·7 (19·8–21·7)
Albania	32·8 (28·5–37·3)	11·5 (9·2–13·9)	56·2 (53·6–58·7)	9·2 (8·2–10·2)	26·7 (22·9–30·5)	12·8 (10·3–15·8)	45·8 (43·3–48·5)	11·1 (9·9–12·4)
Bosnia and Herzegovina	17·2 (14·7–20·1)	10·1 (8·3–12·1)	57·3 (54·5–60·2)	15·4 (13·8–17·0)	22·7 (19·2–26·3)	11·6 (9·6–14·1)	51·9 (49·2–54·7)	20·4 (18·4–22·4)
Bulgaria	26·7 (22·9–30·8)	6·9 (5·6–8·5)	59·7 (56·9–62·2)	16·6 (14·9–18·5)	25·7 (21·9–29·9)	6·7 (5·3–8·3)	48·8 (46·1–51·7)	20·3 (18·3–22·5)
Croatia	29·5 (25·3–33·8)	7·6 (6·1–9·3)	65·5 (62·9–68·2)	19·9 (17·9–22·2)	19·7 (16·5–23·1)	5·6 (4·4–7·1)	51·0 (48·3–53·7)	19·6 (17·5–21·7)
Czech Republic	22·3 (19·1–26·3)	6·4 (5·2–7·7)	65·5 (62·9–68·2)	17·8 (16·0–19·6)	18·0 (15·0–21·0)	4·8 (3·8–6·1)	50·0 (47·2–52·7)	20·8 (18·8–22·9)
Hungary	30·2 (26·3–34·4)	7·9 (6·5–9·6)	65·6 (63·0–68·1)	21·7 (19·6–24·0)	24·9 (21·3–28·6)	6·1 (4·9–7·5)	54·8 (52·0–57·5)	24·7 (22·4–27·2)
Macedonia	23·7 (20·5–27·2)	8·6 (7·2–10·4)	57·0 (54·2–59·9)	16·8 (15·1–18·6)	22·3 (19·1–25·9)	5·4 (4·4–6·7)	51·7 (49·0–54·3)	21·6 (19·6–23·6)
Montenegro	26·3 (22·7–30·2)	9·4 (7·6–11·3)	60·1 (57·1–62·9)	19·5 (17·5–21·5)	27·3 (23·1–31·4)	8·3 (6·8–10·2)	57·0 (54·1–60·1)	24·1 (21·7–26·6)
Poland	21·9 (18·6–25·7)	6·9 (5·6–8·4)	64·0 (61·4–66·7)	18·3 (16·5–20·3)	17·8 (14·7–21·3)	6·0 (4·7–7·4)	49·4 (46·8–52·1)	20·9 (18·9–23·2)
Romania	11·0 (9·2–13·2)	8·6 (7·0–10·4)	60·4 (57·6–63·0)	18·7 (16·9–20·6)	20·3 (17·1–24·2)	5·7 (4·5–6·9)	50·3 (47·6–53·0)	19·8 (17·8–22·1)
Serbia	19·2 (16·5–22·5)	6·7 (5·5–8·1)	55·7 (53·5–58·2)	16·0 (14·5–17·4)	23·1 (19·8–26·7)	6·9 (5·6–8·4)	50·4 (47·8–52·8)	19·5 (17·7–21·3)
Slovakia	20·6 (17·5–23·8)	5·5 (4·5–6·7)	64·4 (61·8–66·9)	17·6 (15·7–19·5)	13·5 (11·0–16·4)	5·5 (4·3–6·9)	51·5 (48·9–54·1)	21·5 (19·3–23·7)
Slovenia	33·1 (29·4–36·9)	7·2 (5·9–8·6)	65·1 (62·3–67·6)	19·9 (17·9–22·0)	24·0 (20·7–27·3)	5·3 (4·3–6·4)	52·1 (49·1–54·8)	22·4 (20·2–24·9)
Central Latin America	21·7 (20·1–23·3)	7·4 (6·5–8·4)	57·1 (56·0–58·2)	16·7 (15·7–17·6)	25·5 (23·7–27·3)	7·5 (6·6–8·3)	65·2 (64·1–66·2)	28·4 (27·3–29·8)
Colombia	15·4 (13·1–18·0)	4·1 (3·4–4·8)	52·7 (50·4–54·9)	14·6 (13·5–15·8)	18·3 (15·4–21·6)	3·6 (2·9–4·3)	57·0 (54·9–59·2)	22·6 (21·0–24·3)

(Table continues on next page)