

A century of trends in adult human height

NCD Risk Factor Collaboration (NCD-RisC)*

Abstract Being taller is associated with enhanced longevity, and higher education and earnings. We reanalysed 1472 population-based studies, with measurement of height on more than 18.6 million participants to estimate mean height for people born between 1896 and 1996 in 200 countries. The largest gain in adult height over the past century has occurred in South Korean women and Iranian men, who became 20.2 cm (95% credible interval 17.5–22.7) and 16.5 cm (13.2–19.7) taller, respectively. In contrast, there was little change in adult height in some sub-Saharan African countries and in South Asia over the century of analysis. The tallest people over these 100 years are men born in the Netherlands in the last quarter of 20th century, whose average heights surpassed 182.5 cm, and the shortest were women born in Guatemala in 1896 (140.3 cm; 135.8–144.8). The height differential between the tallest and shortest populations was 19–20 cm a century ago, and has remained the same for women and increased for men a century later despite substantial changes in the ranking of countries.

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Introduction

Being taller is associated with enhanced longevity, lower risk of adverse pregnancy outcomes and cardiovascular and respiratory diseases, and higher risk of some cancers (*Paajanen et al., 2010; Kohoutová, 1975; Green et al., 2011; Nelson et al., 2015; Batty et al., 2010; World Cancer Research Fund / American Institute for Cancer Research, 2007; 2010; 2011; 2012; 2014a; 2014b; Nüesch et al., 2015; Davies et al., 2015; Zhang et al., 2015; Kozuki et al., 2015; Black et al., 2008*). There is also evidence that taller people on average have higher education, earnings, and possibly even social position (*Adair et al., 2013; Stulp et al., 2015; Barker et al., 2005; Strauss and Thomas, 1998; Chen and Zhou, 2007; Case and Paxson, 2008*).

Although height is one of the most heritable human traits (*Fisher, 1919; Lettre, 2011*), cross-population differences are believed to be related to non-genetic, environmental factors. Of these, foetal growth (itself related to maternal size, nutrition and environmental exposures), and nutrition and infections during childhood and adolescence are particularly important determinants of height during adulthood (*Cole, 2000; Silventoinen et al., 2000; Dubois et al., 2012; Haeffner et al., 2002; Sørensen et al., 1999; Victora et al., 2008; Eveleth and Tanner, 1990; Tanner, 1962; Tanner, 1992; Bogin, 2013*). Information on height, and its trends, can therefore help understand the health impacts of childhood and adolescent nutrition and environment, and of their social, economic, and political determinants, on both non-communicable diseases (NCDs) and on neonatal health and survival in the next generation (*Cole, 2000; Tanner, 1992; Tanner, 1987*).

Trends in men's height have been analysed in Europe, the USA, and Japan for up to 250 years, using data on conscripts, voluntary military personnel, convicts, or slaves (*Cole, 2000; Floud et al., 1990; Fogel et al., 1983; Schmidt et al., 1995; Floud et al., 2011; Tanner et al., 1982; Hatton and Bray, 2010; Tanner, 1981; Facchini and Gualdirusso, 1982*). There are fewer historical data for women, and for other regions where focus has largely been on children and where adult data tend to be reported at one point in time or over short periods (*Marniemi and Parkki, 1975; Grasgruber et al., 2014; Baten and Blum, 2012; Deaton, 2007; Mamidi et al., 2011; van Zanden et al., 2014*). In this paper, we pooled worldwide population-based data to estimate height in adulthood for men and women born over a whole century throughout the world.

*For correspondence: majid.ezzati@imperial.ac.uk

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(University of California Davis, USA)*; Rajiv T Erasmus (University of Stellenbosch, South Africa)*; Cihangir Erem (Karadeniz Technical University, Turkey)*; Louise Eriksen (University of Southern Denmark, Denmark)*; Jorge Escobedo-de la Peña (Instituto Mexicano del Seguro Social, Mexico)*; Alun Evans (The Queen's University of Belfast, UK)*; David Faeh (University of Zurich, Switzerland)*; Caroline H Fall (University of Southampton, UK)*; Farshad Farzadfar (Tehran University of Medical Sciences, Iran)*; Francisco J Felix-Redondo (Centro de Salud Villanueva Norte, Spain)*; Trevor S Ferguson (The University of the West Indies, Jamaica)*; Daniel Fernández-Bergés (Hospital Don Benito-Villanueva de la Serena, Spain)*; Daniel Ferrante (Ministry of Health, Argentina)*; Marika Ferrari (Council for Agricultural Research and Economics, Italy)*; Catterina Ferreccio (Pontificia Universidad Católica de Chile, Chile)*; Jean Ferrieres (Toulouse University School of Medicine, France)*; Joseph D Finn (University of Manchester, UK)*; Krista Fischer (University of Tartu, Estonia)*; Eric Monterubio Flores (Instituto Nacional de Salud Pública, Mexico)*; Bernhard Föger (Agency for Preventive and Social Medicine, Austria)*; **Leng Huat Foo (Universiti Sains Malaysia, Malaysia)***; Ann-Sofie Forslund (Luleå University, Sweden)*; Maria Forsner (Karolinska Institutet, Sweden)*; Stephen P Fortmann (Stanford University, USA)*; Heba M Fouad (World Health Organization Regional Office for the Eastern Mediterranean, Egypt)*; Damian K Francis (The University of the West Indies, Jamaica)*; Maria do Carmo Franco (Federal University of São Paulo, Brazil)*; Oscar H Franco (Erasmus Medical Center Rotterdam, The Netherlands)*; Guillermo Frontera (Hospital Universitario Son Espases, Spain)*; Flavio D Fuchs (Hospital de Clinicas de Porto Alegre, Brazil)*; Sandra C Fuchs (Universidade Federal do Rio Grande do Sul, Brazil)*; Yuki Fujita (Kindai University Faculty of Medicine, Japan)*; Takuro Furusawa (Kyoto University, Japan)*; Zbigniew Gaciong (Medical University of Warsaw, Poland)*; Mihai Gafencu (Victor Babes University of Medicine and Pharmacy, Romania)*; Dickman Gareta (University of KwaZulu-Natal, South Africa)*; Sarah P Garnett (University of Sydney, Australia)*; Jean-Michel Gaspoz (Geneva University Hospitals, Switzerland)*; Magda Gasull (CIBER en Epidemiología y Salud Pública, Spain)*; Louise Gates (Australian Bureau of Statistics, Australia)*; Johanna M Geleijnse (Wageningen University, The Netherlands)*; Anoosheh Ghasemian (Non-Communicable Diseases Research Center, Iran)*; Simona Giampaoli (Istituto Superiore di Sanità, Italy)*; Francesco Gianfagna (University of Insubria, Italy)*; Jonathan Giovannelli (Lille University Hospital, France)*; Aleksander Giwercman (Lund University, Sweden)*; Rebecca A Goldsmith (Nutrition Department, Ministry of Health, Israel)*; Helen Gonçalves (Federal University of Pelotas, Brazil)*; Marcela Gonzalez Gross (Universidad Politécnica de Madrid, Spain)*; Juan P González Rivas (The Andes Clinic of Cardio-Metabolic Studies, Venezuela)*; Mariano Bonet Gorbea (National Institute of Hygiene, Epidemiology and Microbiology, Cuba)*; Frederic Gottrand (Université de Lille 2, France)*; Sidsel Graff-Iversen (Norwegian Institute of Public Health, Norway)*; Dušan Grafnetter (Institute for Clinical and Experimental Medicine, Czech Republic)*; Aneta Grajda (The Children's Memorial Health Institute, Poland)*; Maria G Grammatikopoulou (Alexander Technological Educational Institute, Greece)*; Ronald D Gregor (Dalhousie University, Canada)*; Tomasz Grodzicki (Jagiellonian University Medical College, Poland)*; Anders Grøntved (University of Southern Denmark, Denmark)*; Gabriella Gruden (University of Turin, Italy)*; Vera Grujic (University of Novi Sad, Serbia)*; Dongfeng Gu (National Center of Cardiovascular Diseases, China)*; Emanuela Gualdi-Russo (University of Ferrara, Italy)*; Ong Peng Guan (Singapore Eye Research Institute, Singapore)*; Vilmundur Gudnason (Icelandic Heart Association, Iceland)*; Ramiro Guerrero (Universidad Icesi, Colombia)*; Idris Guessous (Geneva University Hospitals, Switzerland)*; Andre L Guimaraes (State University of Montes Claros, Brazil)*; Martin C Gulliford (King's College London, UK)*; Johanna Gunnlaugsdottir (Icelandic Heart Association, Iceland)*; Marc Gunter (Imperial College London, UK)*; Xiuhua Guo (Capital Medical University, China)*; Yin Guo (Capital Medical University, China)*; Prakash C Gupta (Healis - Sekhsaria Institute for Public Health, India)*; Oye Gureje (University of Ibadan, Nigeria)*; Beata Gurzkowska (The Children's Memorial Health Institute, Poland)*; Laura Gutierrez (Institute for Clinical Effectiveness and Health Policy, Argentina)*; Felix Gutzwiller (University of Zurich, Switzerland)*; Jytte Halkjær (Danish Cancer Society Research Centre, Denmark)*; Ian R Hambleton (The University of the West Indies, Barbados)*; Rebecca Hardy (University College London, UK)*; Rachakulla Hari Kumar (Indian Council of Medical Research, India)*; Jun Hata (Kyushu University, Japan)*; Alison J Hayes (University of Sydney, Australia)*; Jiang He (Tulane University, USA)*; Marleen Elisabeth Hendriks (Academic Medical Center of University of Amsterdam, The Netherlands)*; Leticia Hernandez Cadena (National Institute of Public Health, Mexico)*; Sauli Herrala (Oulu University Hospital, Finland)*; Ramin Heshmat (Tehran University of Medical Sciences, Iran)*; Ilpo Tapani Hihtaniemi (Imperial College London, UK)*; Sai Yin Ho