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- 1 Kaiser T, Feng G. Modeling psychiatric disorders for developing effective treatments. *Nat Med* 2015; **21**: 979–88.
- 2 Brennand KJ, Simone A, Jou J, et al. Modelling schizophrenia using human induced pluripotent stem cells. *Nature* 2011; **473**: 221–25.
- 3 Mariani J, Coppola G, Zhang P, et al. FOXP1-dependent dysregulation of GABA/glutamate neuron differentiation in autism spectrum disorders. *Cell* 2015; **162**: 375–90.
- 4 Chen HM, DeLong CJ, Bame M, et al. Transcripts involved in calcium signaling and telencephalic neuronal fate are altered in induced pluripotent stem cells from bipolar disorder patients. *Transl Psychiatry* 2014; **4**: e375.
- 5 Madison JM, Zhou F, Nigam A, et al. Characterization of bipolar disorder patient-specific induced pluripotent stem cells from a family reveals neurodevelopmental and mRNA expression abnormalities. *Mol Psychiatry* 2015; **20**: 703–17.
- 6 Wang JL, Shamah SM, Sun AX, et al. Label-free, live optical imaging of reprogrammed bipolar disorder patient-derived cells reveals a functional correlate of lithium responsiveness. *Transl Psychiatry* 2014; **4**: e428.
- 7 Mertens J, Wang QW, Kim Y, et al. Differential responses to lithium in hyperexcitable neurons from patients with bipolar disorder. *Nature* 2015; **527**: 95–99.
- 8 Andreatza AC, Young LT. The neurobiology of bipolar disorder: identifying targets for specific agents and synergies for combination treatment. *Int J Neuropsychopharmacol* 2014; **17**: 1039–52.
- 9 Harrison PJ. Molecular neurobiological clues to the pathogenesis of bipolar disorder. *Curr Opin Neurobiol* 2016; **36**: 1–6.
- 10 Alda M. Lithium in the treatment of bipolar disorder: pharmacology and pharmacogenetics. *Mol Psychiatry* 2015; **20**: 661–70.
- 11 Young-Pearse TL, Morrow EM. Modeling developmental neuropsychiatric disorders with iPSC technology: challenges and opportunities. *Curr Opin Neurobiol* 2016; **36**: 66–73.
- 12 Yoshimizu T, Pan JQ, Mungenast AE, et al. Functional implications of a psychiatric risk variant within CACNA1C in induced human neurons. *Mol Psychiatry* 2015; **20**: 162–69.
- 13 Handel AE, Chintawar S, Lalic T, et al. Assessing similarity to primary tissue and cortical layer identity in induced pluripotent stem cell-derived cortical neurons through single-cell transcriptomics. *Hum Mol Genet* 2016; published online Jan 5. DOI:10.1093/hmg/ddv637.
- 14 Lancaster MA, Renner M, Martin C-A, et al. Cerebral organoids model human brain development and microcephaly. *Nature* 2013; **501**: 373–79.

## Ending childhood obesity: a time for action

On Jan 25, 2016, the Commission on Ending Childhood Obesity (ECHO) presented its final report<sup>1</sup> to the Director-General of WHO during the 138th session of the WHO Executive Board. The ECHO report is the culmination of a 2-year process that has involved discussions with more than 100 countries, non-state actor hearings, and online consultations. The process was supported by extensive reports from two expert working groups on science and evidence and on implementation, monitoring, and accountability. The report presents recommendations (panel 1, appendix) and proposes actions and responsibilities of key stakeholders (panel 2).

The ECHO report draws attention to the alarming rise of childhood obesity and the serious threat it poses to the health of children and adults. At least 41 million children younger than 5 years are overweight or obese, most of whom live in low-income and middle-income countries.<sup>2</sup> Of even greater concern are those young people on the path to become obese later in life. Childhood obesity has physical and psychological health consequences during childhood, can contribute to behavioural and emotional difficulties, and reduces educational attainment.<sup>3,4</sup> Importantly, obesity in childhood is a strong predictor of adult obesity with health and economic consequences for the individual and society.<sup>5,6</sup> Why have efforts to date failed to stem the rise in childhood obesity and can emerging trends in low-income and middle-income countries be reversed?

ECHO's review of the evidence and global consultations highlighted childhood obesity as a complex and multidimensional problem, underscoring the limited potential of any single intervention to provide a solution. ECHO noted with concern the number of children today who are growing up in an obesogenic environment. Energy imbalance has resulted from changes in food type, availability, affordability, and marketing, as well as a decline in physical activity, with more time being spent on sedentary leisure activities. The behavioural and biological responses of a child to the obesogenic environment can be shaped by processes even before birth.<sup>7</sup> Developmental factors affect the biology and



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See Online for appendix

### Panel 1: Recommendations of the Commission on Ending Childhood Obesity

- 1 Implement comprehensive programmes that promote the intake of healthy foods and reduce the intake of unhealthy foods and sugar-sweetened beverages by children and adolescents
- 2 Implement comprehensive programmes that promote physical activity and reduce sedentary behaviours in children and adolescents
- 3 Integrate and strengthen guidance for non-communicable disease prevention with current guidance for preconception and antenatal care to reduce the risk of childhood obesity
- 4 Provide guidance on, and support for, healthy diet, sleep, and physical activity in early childhood to ensure children grow appropriately and develop healthy habits
- 5 Implement comprehensive programmes that promote healthy school environments, health and nutrition literacy, and physical activity in school-age children and adolescents
- 6 Provide family-based, multicomponent, lifestyle weight management services for children and young people who are obese

Full recommendations of the ECHO report are listed in the appendix.

**Panel 2: Commission on Ending Childhood Obesity's recommended actions and responsibilities for stakeholders**

**WHO**

- Institutionalise a cross-cutting and life-course approach to ending childhood obesity across all relevant technical areas in WHO headquarters, regional, and country offices
- Develop, in consultation with Member States, a framework to implement the recommendations of ECHO
- Strengthen capacity to provide technical support for action to end childhood obesity at global, regional, and national levels
- Support international agencies, national governments, and relevant stakeholders in building upon existing commitments to ensure that relevant actions to end childhood obesity are implemented at global, regional, and national levels
- Promote collaborative research on ending childhood obesity with a focus on the life-course approach
- Report on progress made on ending childhood obesity

**International organisations**

- Cooperate to build capacity and support Member States in addressing childhood obesity

**Member States**

- Take ownership, provide leadership, and engage political commitment to tackle childhood obesity over the long term
- Coordinate contributions of all government sectors and institutions responsible for policies, including, but not limited to: education; food, agriculture; commerce and industry; development; finance and revenue; sport and recreation; communication; environmental and urban planning; transport and social affairs; and trade
- Ensure data collection on body-mass index for age of children—including for ages not currently monitored—and set national targets for childhood obesity
- Develop guidelines, recommendations, or policy measures that appropriately engage relevant sectors—including the private sector where applicable—to implement actions aimed at reducing childhood obesity, as set out in ECHO report

**Non-state actors**

*Non-governmental organisations*

- Raise the profile of childhood obesity prevention through advocacy efforts and the dissemination of information
- Motivate consumers to demand that governments support healthy lifestyles and that the food and non-alcoholic beverage industry provide healthy products, and do not market unhealthy foods and sugar-sweetened beverages to children
- Contribute to the development and implementation of a monitoring and accountability mechanism

*The private sector*

- Support the production of, and facilitate access to, foods and non-alcoholic beverages that contribute to a healthy diet
- Facilitate access to, and participation in, physical activity

*Philanthropic foundations*

- Recognise childhood obesity as endangering child health and educational attainment and address this important issue
- Mobilise funds to support research, capacity-building, and service delivery

*Academic institutions:*

- Raise the profile of childhood obesity prevention through the dissemination of information and incorporation into appropriate curricula
- Address knowledge gaps with evidence to support policy implementation
- Support monitoring and accountability activities

behaviour of individuals from before birth and through infancy, such that they have an increased or reduced risk of developing obesity. ECHO formed the view that inadequate consideration of these factors has probably limited previous efforts to address childhood obesity.

As a result, the ECHO report proposes a set of policy recommendations for a comprehensive and coordinated package of interventions to address three strategic objectives. The first is to tackle the obesogenic environment and norms. The second seeks to reduce the risk of obesity during critical periods in the life-course—preconception and pregnancy, infancy and early childhood, and older childhood and adolescence. The third objective is the provision of treatment for children who are obese to improve their current and future health. It is only through government commitment and leadership of a multisectoral effort that the challenge will be met and important social, health, and economic benefits achieved globally.

Rather than propose a vertical approach, the ECHO report reiterates that a new emphasis on childhood obesity can be achieved through integration with existing WHO and other, national, regional, and global initiatives. The Commission's recommendations are situated within the framework of the Sustainable Development Goals (SDGs), notably its call for ending malnutrition in all its forms, reducing premature mortality from non-communicable diseases, and achievement of universal health coverage. ECHO encourages engagement with all stakeholders to address childhood obesity, including the private sector (panel 2). As such, it is arguably the first implementation-oriented report to be based on new norms of the SDGs.

To tackle the obesogenic environment throughout the life-course recommendations centre on effective taxation on sugar-sweetened beverages, context-specific nutrition information, and interpretive front-of-pack labelling. The emphasis on the life-course approach is a new and central dimension to ECHO's recommendations. The report calls for the integration and strengthening of current guidance to promote breastfeeding, healthy diets, sleep, and physical activity during infancy and early childhood, as well as for comprehensive programmes for school-age children and adolescents. Schools offer a key opportunity for programmatic action and the recommendations focus on: standards for school meals; elimination of unhealthy

foods, such as sugar-sweetened beverages and energy-dense, nutrient-poor foods, in the school environment; informed nutrition education as part of the core curriculum; and ensuring levels of physical activity for all children according to WHO recommendations.

In addition to the new approaches, the imperative to implement existing standards has been underlined. ECHO noted the disappointing lack of progress on implementation of WHO's Set of Recommendations on the Marketing of Foods and Non-alcoholic Beverages to Children.<sup>8</sup> It reiterates the need to implement regulatory measures, such as the International Code of Marketing of Breast-milk Substitutes,<sup>9</sup> and to develop regulations on the marketing of complementary foods and beverages for infants and young children.

ECHO's recommendations call for various stakeholders to take action, such as WHO to institutionalise a cross-cutting and life-course approach to ending childhood obesity and for civil society, philanthropic and academic institutions, and the private sector to mobilise their comparative advantage to end childhood obesity (panel 2). These actions notwithstanding, ECHO remains firmly of the opinion that it is the primary responsibility of governments to ensure that policies and actions address the obesogenic environment and to provide guidance and support for optimum development at each stage of the life-course. By improving and integrating these actions, there will be major benefits to other parts of the maternal, reproductive, child health, and non-communicable disease prevention and control and health systems agendas.

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- 1 Commission on Ending Childhood Obesity. Report of the Commission on Ending Childhood Obesity. Geneva: World Health Organization, 2016. <http://www.who.int/end-childhood-obesity/en/> (accessed Jan 25, 2016).
- 2 UNICEF, WHO, The World Bank. Levels and trends in child malnutrition: UNICEF-WHO-The World Bank joint child malnutrition estimates. New York, United Nations Children's Fund; Geneva, World Health Organization; Washington, DC, The World Bank, 2015.
- 3 Lobstein T, Jackson-Leach R. Estimated burden of paediatric obesity and co-morbidities in Europe. Part 2. Numbers of children with indicators of obesity-related disease. *Int J Pediatr Obes* 2006; **1**: 33–41.
- 4 Pizzi MA, Vroman K. Childhood obesity: effects on children's participation, mental health, and psychosocial development. *Occup Ther Health Care* 2013; **27**: 99–112.
- 5 Litwin SE. Childhood obesity and adulthood cardiovascular disease: quantifying the lifetime cumulative burden of cardiovascular risk factors. *J Am Coll Cardiol* 2014; **64**: 1588–90.
- 6 Nader PR, O'Brien M, Houts R, et al. Identifying risk for obesity in early childhood. *Pediatrics* 2006; **118**: e594–e601.
- 7 Hanson MA, Gluckman PD. Early developmental conditioning of later health and disease: physiology or pathophysiology? *Physiol Rev* 2014; **94**: 1027–76.
- 8 WHO. Set of recommendations on the marketing of foods and non-alcoholic beverages to children. Geneva: World Health Organization, 2010.
- 9 WHO. International Code of Marketing of Breast-milk Substitutes. Geneva: World Health Organization, 1981.

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## Oil prices, climate change—health challenges in Saudi Arabia

In December, 2015, Saudi Arabia reported a US\$98 billion budget deficit (about 15% of gross domestic product [GDP]) in 2015 with no improvement projected for 2016.<sup>1</sup> Saudi Arabia has been resilient during oil price fluctuations in the past, so the new government budget came as a surprise. The new spending plan reflects several measures to curb subsidies, raise revenue, and improve healthy lifestyles.<sup>2</sup>

Health and social affairs consume about a fifth (\$45 billion, 5% of GDP) of Saudi Arabian Government spending.<sup>2,3</sup> There are not many relevant examples of the health effects of recession and structural

adjustments for countries with a similar development trajectory of Saudi Arabia. Economic growth in Saudi Arabia (19th highest GDP worldwide) contrasts with its position on the Human Development Index (39th in the world);<sup>3</sup> this gap indicates substantial development challenges. Further, the economic changes are occurring amid other challenges unique to the region.

First, along with the rising oil revenues in recent decades, Saudi Arabia has seen a rapid epidemiological transition in the population (table).<sup>4</sup> The uptake of some health-promoting behaviours has been limited by Saudi Arabia's unemployment rate (11.7% in 2014), moderate

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