



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.

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.

\**Sania Nishtar, Peter Gluckman, Timothy Armstrong*  
Office of the Prime Minister's Chief Science Advisor, Auckland, New Zealand (PG); Heartfile, Chak Shahzad, Islamabad 44000, Pakistan (SN); and World Health Organization, Geneva, Switzerland (TA)  
sania@heartfile.org

We all contributed to the 2016 Report of the Commission on Ending Childhood Obesity. SN and PG are Co-Chairs of the WHO Commission on Ending Childhood Obesity. TA is Programme Manager, Secretariat, WHO Commission on Ending Childhood Obesity. We declare no competing interests. The authors alone are responsible for the views expressed in this Comment and they do not necessarily represent the views, decisions, or policies of the institutions with which they are affiliated. We would like to thank the other members of the Commission on Ending Childhood Obesity: Sir George Alleyne, Constance Chan Hon Yee, Helen Clark, Adrian Gore, Betty King, Nana Oye Lithur, David Nabarro, Paula Radcliffe, Hoda Rashad, Srinath Reddy, Jacques Rogge, Sachita Shrestha, and Colin Tukuitonga. The Commission gratefully acknowledges the support of Juana Willumsen, Jude Osei, and Hilda Muriuki during the entire process of the Commission's proceedings including preparation of the report.

- 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.

© 2016. World Health Organization. Published by Elsevier Ltd/Inc/BV. All rights reserved.

## 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

Published Online  
January 26, 2016  
[http://dx.doi.org/10.1016/S0140-6736\(16\)00203-8](http://dx.doi.org/10.1016/S0140-6736(16)00203-8)

	% of total DALYs
High body-mass index	12
Dietary risks	10
Raised fasting plasma glucose	10
High blood pressure	8
Physical inactivity	5
Ambient air pollution	4
Smoking	3
Iron deficiency anaemia	3
Substance use disorders	2
Occupational risks	2

DALYs=disability-adjusted life-years. Data are from Memish et al.<sup>4</sup>

**Table: Leading risk factors for disease in Saudi Arabia, 2010**

levels of education, and climatic and sociocultural conditions.<sup>3,5,6</sup> The high burden of undiagnosed and uncontrolled diabetes and hypertension,<sup>6,7</sup> will consume a large proportion of the health budget.<sup>8</sup>

Second, future temperature in the region is projected to increase consistently and exceed the threshold deemed unsuitable for human adaptability.<sup>9</sup> This changing climate will have an effect on the promotion of some healthy lifestyle habits, the country's production of fresh fruits and vegetables, and micronutrient deficiencies.<sup>9</sup> For example, vitamin D deficiency from inadequate exposure to sun and limited intake of enriched products is common in Saudi Arabia.<sup>10</sup>

Finally, there is a need for sustained investment in the control of emerging infectious diseases in the region. Such control efforts are important given the risk of emerging diseases within Saudi Arabia, such as Middle East respiratory syndrome, and as a result of disease importation through the large expatriate workforce and the 2-3 million pilgrims for Hajj and 5-6 million pilgrims for Umrah who come to Saudi Arabia each year from more than 180 countries.<sup>3,11</sup>

Although economic recession is often feared as a "health tragedy", evidence from high-income countries is mixed and related to variations in social and political contexts.<sup>12,13</sup> In high-income countries, some health indices showed counter-cyclical effects with economic contractions (eg, increases in suicides, depression, and anxiety disorders and worsening reproductive health outcomes).<sup>12,13</sup> However, mortality is shown to be pro-cyclical and it decreases during rapid economic contractions. In high-income countries, there are generally slower declines in mortality during periods of economic growth and greater declines

in mortality during recessions.<sup>13</sup> In low-income countries, economic growth seems to improve health through improvements in basic services, until a country reaches \$5000-10 000 GDP per person.<sup>12</sup> Declines in mortality in high-income countries during recession could be related to decline in excess mortality from modifiable causes of death, such as those arising from alcohol abuse and motor vehicle accidents.<sup>12,13</sup> Given that Saudi Arabia has one of the highest rates of traffic-related deaths globally,<sup>4</sup> the country might benefit from the austerity measures in this regard. If Saudi Arabia maintains increased relief spending on child health, improvements in access to nutrition and health, and strong infectious diseases control then these approaches can also help reduce mortality.

Since Saudi Arabia's sociodemographic and geopolitical foundation is different from that of the case studies available thus far, it is difficult to predict potential health effects of the present economic recession and newly proposed health-sector reforms. Saudi nationals (and pilgrims coming to Mecca for the Hajj) are entitled to free health care and the government accounted for 66% of health care spending in 2012 (about 5% of GDP).<sup>3</sup> The expatriate workforce of Saudi Arabia, which accounts for 56% of the total population and about 86% of the private sector workforce, are not covered by the government health-care system.<sup>3,5</sup> The proposed nationalisation process to reduce the expatriate workforce by employing more Saudi nationals in the employment sector could adversely affect the health-care workforce since about 77% of physicians and 63% of nursing staff in Saudi Arabia are expatriates.<sup>3</sup> A much needed boost in the country's health promotion portfolio would require expertise in various public health disciplines that are currently in short supply in Saudi Arabia.

The greatest burden of economic recession generally falls on the unemployed.<sup>12,13</sup> About a third of the 30 million population of Saudi Arabia are younger than 15 years, and the child dependency ratio is 44% (ratio of people below working age to workforce).<sup>3</sup> In 2013, the rate of unemployment in Saudi Arabian nationals was 28.4% for people aged 15-29 years (men 17.5%, women 60.3%).<sup>3,5</sup> A recent emphasis on privatisation of health and preventive care, or even cost sharing of preventive care, could lead to an increase in overall health-care costs if people forego essential medications, immunisations, or routine clinic visits such as antenatal care.

We do not know how long the current economic downturn will last in Saudi Arabia. Anticipating potential effects of recession at an early stage of the crisis can inform health-sector reforms to diminish or avoid its harmful consequences on nation's health. Despite Saudi Arabia's unique challenges, the Ministry of Health has so far been successful in providing state-of-the-art medical services to its citizens. For example, Saudi Arabia's premarital sickle cell screening is a unique initiative.<sup>14</sup> Despite free health care, Saudi Arabia's shortcomings are in the control of non-communicable diseases and mitigation of risk factors for disease.<sup>4</sup> Only 23% of Saudi adults have had a preventive care visit.<sup>15,16</sup> There is a need to consider multipronged approaches to health promotion and avoidance of risk factors, including those that fall outside the services of health ministry (eg, enforcement of motor vehicle accident prevention advisories, point of sale restrictions on tobacco). By training primary care providers to serve as advocates for health promotion, each encounter between the provider and patient can be used as an opportunity to educate patients about a set of prevention messages. Informed personal decision making is important to increase the uptake of healthy lifestyles and prevention recommendations; this is a process achieved through education and a sense of personal empowerment that comes with employment. Outreach to civic organisations for partnerships in health promotion initiatives can help increase visibility and uptake.

Beyond the immediate effects of the current economic crisis, Saudi Arabia needs to target its policies to mitigate the effects of climate change. Agricultural approaches such as hydroponics, vertical farming, and landscaping with food-producing plants can increase food production, enable healthy eating habits, and improve air quality. Additionally, enrichment of food products (vitamin D, folic acid, iodine) is an easy and cheaper alternative to promotion of supplement use by individuals. The transition in the country's health-care delivery to the private sector and cost-sharing should be implemented without compromising services for the unemployed and uninsured. Similarly, efforts to nationalise the health labour force should consider continuity in essential service delivery.

Saudi Arabia's religious leadership can encourage the population to adhere to guidance on health promotion, which is particularly important for mental health where

health-care infrastructure is not adequate. Health security cannot be achieved by focused efforts from the health ministry alone; nations that offer greater social safety nets are better positioned to diminish the health effects of economic recession.<sup>12</sup> Finally, implementation of evidence from case studies on the health effects of the economic crisis are useful and can contribute to the emerging body of literature on economics and health. Health-care reform was long overdue in Saudi Arabia and the current crisis affords the country an opportunity to do it right. Saudi Arabia's future health security will rely on the choices made today by its health policy makers.

*Habida Elachola, \*Ziad A Memish*

Ministry of Health, Riyadh, Saudi Arabia (ZAM); College of Medicine, Alfaisal University, Riyadh 11514, Saudi Arabia (ZAM); and Atlanta, Georgia, USA (HE)  
zmemish@yahoo.com

We declare no competing interests.

- 1 AL-Khatteeb L. Saudi Arabia's economic time bomb. The Brookings Institution. Dec 30, 2015. <http://www.brookings.edu/research/opinions/2015/12/30-saudi-arabia-economic-time-bomb-alkhatteeb> (accessed Jan 18, 2016).
- 2 Kerr S. Riyadh plans radical surgery to rejuvenate Saudi health sector. *Financial Times* Jan 11, 2016.
- 3 De Bel-Air F. Demography, migration and labour market in Saudi Arabia, Explanatory note no. 1/2014. Gulf Labour Markets and Migration, 2014. <http://gulfmigration.eu> (accessed Jan 23, 2016).
- 4 Memish ZA, Jaber S, Mokdad AH, et al. Burden of disease, injuries, and risk factors in the Kingdom of Saudi Arabia, 1990-2010. *Prev Chronic Dis* 2014; **11**: 140176.
- 5 Central Department of Statistics and Information, Kingdom of Saudi Arabia. [www.cdsi.gov.sa/english/](http://www.cdsi.gov.sa/english/) (accessed Jan 25, 2016).
- 6 El Bcheraoui C, Basulaiman M, Tuffaha M, et al. Status of the diabetes epidemic in the Kingdom of Saudi Arabia, 2013. *Int J Public Health* 2014; **59**: 1011-21.
- 7 El Bcheraoui C, Memish ZA, Tuffaha M, et al. Hypertension and its associated risk factors in the Kingdom of Saudi Arabia, 2013: a national survey. *Int J Hypertens* 2014; **2014**: 564679.
- 8 Mokdad AH, Tuffaha M, Hanlon M, et al. Cost of diabetes in the Kingdom of Saudi Arabia, 2014. *J Diabetes Metab* 2015; **6**: 575.
- 9 Pal JS, Eltahir EAB. Future temperature in southwest Asia projected to exceed a threshold for human adaptability. *Nat Climate Change* 2015; published online Oct 26. DOI:10.1038/nclimate2833.
- 10 Tuffaha M, El Bcheraoui C, Daoud F, et al. Deficiencies under plenty of sun: vitamin D status among adults in the Kingdom of Saudi Arabia, 2013. *N Am J Med Sci* 2015; **7**: 467-75.
- 11 Memish ZA, Zumla A, Alhakeem RF, et al. Hajj: infectious disease surveillance and control. *Lancet* 2014; **383**: 2073-82.
- 12 Karamanoli E. 5 years of austerity takes its toll on Greek health care. *Lancet* 2015; **386**: 2239-40.
- 13 Bezruchka S. The effect of economic recession on population health. *CMAJ* 2009; **181**: 281-85.
- 14 Memish ZA, Saeedi MY. Six-year outcome of the national premarital screening and genetic counseling program for sickle cell disease and  $\beta$ -thalassaemia in Saudi Arabia. *Ann Saudi Med* 2011; **31**: 229-35.
- 15 El Bcheraoui C, Basulaiman M, Wilson S, et al. Breast cancer screening in Saudi Arabia: free but almost no takers. *PLoS One* 2015; **10**: e0119051.
- 16 El Bcheraoui C, Tuffaha M, Daoud F, et al. Low uptake of periodic health examinations in the Kingdom of Saudi Arabia, 2013. *J Family Med Prim Care* 2015; **4**: 342-46.