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Health and Sustainable Development Challenges of the 21st Century: A Comparative Analysis of Salt Reduction Strategies

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Abstract

The epidemic rise in cardiovascular diseases, the primary cause of global mortality, is a major impediment to human sustainable development as it leads to heavy expenditure on chronic treatment and loss in income and productivity due to increased morbidity and mortality. Raised blood pressure is one of the more potent risk factors for cardiovascular diseases. High dietary salt consumption triggers an increase in blood pressure and also adversely affects other vital organs, such as the kidneys. The global mean per capita salt intake is almost twice the recommended amount of 5 g/day. Member States of the World Health Organization have thus set a global target of 30% reduction in salt intake by 2025 to address the current health and development challenges, especially those posed to low and middle income countries. This paper compares certain aspects of the policies (and the implementation of those policies) that are aimed at the reduction of salt intake in South Africa and India with those in Canada and the United Kingdom. As developing countries, South Africa and India already face lower levels of development and greater health challenges due to the double burden of communicable and non-communicable diseases. This is further exacerbated by these two countries having a large adult population with the increased challenges of raised blood pressure. South Africa and India could benefit from adopting (with appropriate modifications) successful approaches to salt reduction that have been implemented in the UK and Canada. Adoption of sustainable, context-specific, culturally appropriate salt-reduction strategies are needed to reduce death and disability caused by excessive salt intake.

Keywords

Cardiovascular diseases, raised blood pressure, salt intake, salt reduction, salt regulation, sustainable development

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Introduction

Good health is an end in itself and is an integral part of human well-being and sustainable development. Sustainable development involves a progressive transformation of the economy and society, enabling present generations to meet their needs without impairing the ability of future generations to meet their needs in turn (Brundtland Commission Report 1987). Better health augments economic output by improving education and skill development, increasing employment and labour productivity, enhancing savings and investment, facilitating positive demographic changes, and improving ecosystems. These interrelated and interdependent health-related outcomes all facilitate sustainable development (United Nations General Assembly 2014). Despite global health advances on many fronts, poor health continues to restrain development efforts. The process of development itself, in some cases, adversely affects human health due to economic, political and social upheaval, environmental degradation, and uneven development or rising inequities (Schirnding and Mulholland 2002). Consequently, global organizations such as the United Nations and the World Health Organization (WHO) have been according vital importance to eradicating diseases and achieving a healthy life for all.

The globally expanding burden of chronic non-communicable diseases (NCDs) is a major concern for sustainable human development as it results in loss of productivity and catastrophic expenditure for treatments, which are often unaffordable, thereby driving many people into poverty (WHO 2013c). NCDs were responsible for an average of 38 million deaths in 2012, accounting for 68% of global deaths (WHO 2013c), a figure that is projected to increase to 75% by 2030. Furthermore, almost three quarters (28 million) of NCD deaths occur in low- and middle-income countries (LMICs) (WHO 2015b). NCDs may be prevented and managed by addressing modifiable risk factors, such as obesogenic diets, increased use of tobacco and alcohol, and physical inactivity (WHO 2011a). WHO has set a global target of a 25% reduction of deaths due to NCDs by 2025 (WHO 2015b), and the United Nations Development Programme (UNDP), under the Sustainable Development Goal of *Good health and well-being*, has targeted a one third reduction in premature mortality from NCDs through prevention and treatment by 2030 (United Nations 2015).

Cardiovascular diseases (CVDs) are the prime cause of global deaths and disability, accounting for 31% of all deaths and 46% of NCD deaths. In the absence of any change in behaviour, the impact of CVDs will continue to accelerate. More than 75% of CVD deaths occur in LMICs (WHO 2015c), and they occur at a much younger age in LMICs than in high income countries (HICs), resulting in a loss of potential years of healthy life and economic productivity (Joshi et al. 2008). Evidence supports the association between a high intake of salt (the major dietary source of sodium and raised blood pressure) (SACN Online database) and an increase in CVDs (He and MacGregor 2008). Salt intake reduction is therefore prescribed as an effective method to address CVDs (WHO 2011a).

The present paper reviews salt reduction strategies adopted by the United Kingdom (UK) and Canada (two advanced countries), and examines how India and South Africa (two emerging countries) could learn from the experiences of these two advanced countries. The UK and Canada are members of the Global Food Monitoring Group (FMG) – an international organization that encourages countries to monitor the nutritional composition of their foods.

Global salt intake: implications for public health

Salt is required for the auto-regulation of water and fluid balances within the body, but excessive intake results in a significant rise in blood pressure, which in turn can lead to hypertension. Salt has been identified as the primary cause of raised blood pressure and is largely responsible for the development of hypertension among the majority of adults as they age (He and MacGregor 2007). Hypertension is the leading risk factor for premature deaths due to NCDs in the world (WHO 2011b). High dietary salt consumption has additional adverse effects on multiple target organs and tissues, such as the vascular system, kidneys and heart (Kotchen, Allen, Cowley and Frohlich 2013). Evidence suggests that excessive long-term consumption of salt by children has the potential to be detrimental during their adult life. It is therefore highly desirable to moderate children's intake of salt to prevent them from developing an early preference for high salt intake (SACN online database).

The global mean per capita intake of salt is around 10 g/day (4 g/day of sodium) (He and MacGregor 2002), which is double the recommended maximum level of intake of 5 g/day (WHO 2014). This indicates that the global population is consuming much more salt than is physiologically necessary for the optimum functioning of the body (Meneton et al. 2005). WHO has therefore urged its member States to take action to reduce population-wide dietary salt intake (WHO 2006). Successful implementation of this recommendation is expected to have a positive impact on public health through lowered premature morbidity/mortality and a substantial reduction in the related healthcare costs (Bibbins-Domingo 2010).

Global experiences and initiatives to address the challenges

Reducing salt intake has been identified as one of the most cost-effective measures to improve population health outcomes. Key salt reduction measures are expected to generate an extra year of healthy life, at a cost that falls below the average annual income or gross domestic product per person (WHO 2014c). In most developed countries, a reduction in salt intake can be achieved by a gradual and sustained reduction in the amount of salt added to processed food by the food industry. In other countries, where most of the salt consumed comes from salt added during cooking, public health campaigns form an integral part of health promotion to raise awareness of the detrimental effects of excessive salt intake (He and MacGregor 2008). Rapid urbanization and the globalization of the processed food/beverage industry have led to an increase in the intake of processed foods/beverages that are high in salt, fat and sugar, all of which are major triggers of NCDs and CVDs.

WHO member States have agreed to reduce their respective populations' intake of salt by 30% by 2025 (WHO 2014c). Approaches to reduce salt intake have already been in place or planned by 83 countries, of which 38 have fixed voluntary and/or mandatory targets. Mandatory targets have been set by nine countries (bread is the common food item in these countries): two countries (South Africa and Argentina) have set mandatory targets for a range of food products; two more countries have set mandatory targets for four product categories; and five countries have set mandatory targets for bread only (Webster et.al. 2014). Various countries have been trying to tackle the problem of excessive salt intake by creating educational programmes and emphasizing warning labels on food products. Countries such as Finland and the UK have successfully reduced levels of hypertension, heart disease, and stroke among the general population through the introduction of voluntary public-private partnerships and educational health campaigns (WHO 2013b). The effectiveness of Finland's voluntary salt reduction program, which was introduced in the 1980s, can be credited to legislative requirements to label the salt content of foods (Webster et.al. 2014).

Comparative analysis of Canada, the UK, South Africa and India

In terms of the Human Development Index, Canada and the UK are classified as very highly developed (VHD) countries, while South Africa and India are medium developed (MD) countries (see table 1). India, the second most populous country in the world, has more than tenfold the combined populations of Canada, the UK and South Africa. All the countries have around 65% of their population in the age group of 15-64. The proportion of the population under the age of 5 is significantly higher in the two developing countries. Both advanced countries have life expectancies of over 81 years. The two developing countries have considerably lower life expectancies than the advanced countries. With regard to the developing countries under study, India has the lowest level of urbanization, the lowest mean years of schooling, and the lowest per capita income.

Table 1: Development indicators for selected countries

Indicators	Canada	UK	South Africa	India
World Bank Classification	HIC	HIC	UMIC	LMIC
HDI Rank, and Category	9, VHD	14, VHD	116, MD	130, MD
Human Development Index (HDI) (Value) 2014	0.913	0.907	0.666	0.609
Population in millions, 2014	34.84	62.78	54	1267
% of Population under age 5, 2014	5.63	6.14	9.98	9.63
% of Population in age group 15-64, 2014	67.89	64.57	64.97	65.89
Density of Population (per sq.km.), 2014	04	267	45	426
Life expectancy at birth (in years), 2014	82	80.7	57.4	68
Mean years of schooling, 2012	12.3	12.3	9.9	4.4
Gross national income per capita (2011 PPP $), 2014	42,155	39,267	12,122	5,497
Percentage of population below national poverty line (2013)	---	---	53.8	21.9
Gini coefficient (2003-2012)	32.6	36.0	63.1	33.9

Source: UNESCO (Online database); World Bank (Online database); UNDP (Online database).
Note: HIC-High income country; UMIC- Upper middle income country; LMIC-Lower middle income country.

India has the lowest proportion of Gross Domestic Product (GDP) per capita expenditure and share of public sector expenditure on health, while its out-of-pocket expenditure in the total private health expenditure is the highest among the four referred countries (see table 2). The Per Capita Health Expenditure incurred by both Canada and the UK is far greater than that incurred by India. In the UK, the public sector provides much of the health service, as evident from the significant proportion of total health expenditure borne by the public sector. In terms of major development indicators, Canada is placed on the highest level, followed by the UK (see table 1). Despite belonging to the upper middle income group and spending a considerable proportion of GDP on health, poverty in South Africa is high and life expectancy is low, which could be due to the prevalence of great income inequality (see table 1).

Table 2: Health expenditure in selected countries (2013)

Country	Health expenditure as percentage of GDP	Per capita health expenditure (current US$)	Public health expenditure as percentage of total health expenditure	Out-of-pocket health expenditure as percentage of private health expenditure
Canada	10.9	5717.97	69.8	50.07
United Kingdom	9.1	3597.92	83.5	56.44
South Africa	8.9	593.45	48.4	13.78
India	4.0	61.41	32.2	85.88

Source: Compiled from WHO data (WHO 2013a).

Burden of NCDS and CVDS

For the countries under study, with the exception of South Africa, NCDs are the primary cause of mortality (see table 3). South Africa, however, is equally confronted with the problem of high death rates due to communicable diseases and poor maternal, perinatal and nutritional conditions. Even though the proportion of deaths due to NCDs is significantly higher in Canada and the UK, premature deaths due to NCDs in these countries are half of those in South Africa and India. This clearly testifies to the fact that premature deaths due to NCDs are higher in developing than in advanced countries, adversely affecting their productivity and sustainable development. The epidemic rise in CVDs is an imminent danger to humanity, being the major cause of mortality in all of the selected countries, with cancers also having a major share in the total mortality of HICs (see table 3).

Table 3: Proportional mortality in selected countries, 2012 (percentage of total deaths, all ages, both sexes)

Causes of death	United Kingdom	Canada	South Africa*	India*
Cardiovascular diseases	27	31	18	26
Cancers	30	29	7	7
Chronic respiratory diseases	7	8	3	13
Diabetes	3	1	6	2
Other NCDs	22	20	10	12
Communicable, maternal, perinatal and nutritional conditions	5	7	48	28
Injuries	6	4	8	12
Percentage of estimated deaths to total deaths due to NCDs	88	89	43	60
Premature mortality due to NCDs*	11	12	27	26

Source: Compiled from WHO data (WHO 2014b).

Note:* As per the source, the mortality estimates for these countries have a high degree of uncertainty as they are not based on any national NCD mortality data.

Even though CVDs caused a very high proportion of deaths in the overall tolls in the HICs, in absolute terms the age-standardized death rates for both sexes resulting from CVDs in South Africa and India are more than threefold those in Canada and the UK for 2012 (see table 4). This can be attributed to the lower overall death rates in these HICs. However, death rates due to CVDs have significantly decreased

in all of the referred countries when compared to the rates in 2000, with the highest achievement in the UK, followed by Canada and South Africa.

Table 4: Age-standardized death rate due to cardiovascular diseases (per 100,000)

Country	Males		Females	
	2000	2012	2000	2012
Canada	195	112	116	68
United Kingdom	249	141	153	87
South Africa	445	354	301	260
India	373	349	302	265

Source: WHO 2013a.

The prevalence of raised blood pressure in the population aged 18 years and above was highest in South Africa for both males and females, followed by those in India, in 2014 (see table 5). Even though all four countries indicate a decrease in the prevalence of high blood pressure, the achievements in Canada and the UK are significantly higher. These factors highlight the challenges faced by developing countries, such as India and South Africa, in terms of the prevalence of raised blood pressure and deaths resulting from CVDs.

Table 5: Prevalence of raised blood pressure (SBP≥140 and/or DBP≥90)

Country	Males		Females	
	2010	2014	2010	2014
Canada	17.9	15.7	12.4	11.0
United Kingdom	20.6	18.0	14.5	12.5
South Africa	30.4	29.3	28.6	27.1
India	26.3	25.9	25.2	24.8

Source: WHO 2014a.
Note: Age-standardized adjusted estimates for population aged 18+ years.

Table 6 shows the projected national income lost due to CVDs and diabetes in India and South Africa between 2006 and 2015. It also indicates the possible cumulative gains in GDP if a global goal of an additional 2% annual reduction in mortality due to chronic diseases is achieved during the same period (Abegunde et al. 2007).

Table 6: Projected cost of cardiovascular diseases and diabetes in terms of lost GDP in India and South Africa

Country	Baseline scenario		2015 as proportion of 2006 estimates	Cumulative GDP loss by 2015 (billions US dollars)	Aversion of cumulative GDP loss if global goals are achieved by 2015 (billions US dollars)
	Foregone GDP (billions US dollars)				
	2006	2015			
India	1.35	1.96	145%	16.68	1.64 (9.83%)
South Africa	0.16	0.21	133%	1.88	0.21 (11.43%)

Source: Abegunde et al. 2007.

In 2010, CVDs accounted for 21.1% of total deaths and 9.4% of total disability-adjusted life years (DALYs) (i.e., the lost year of healthy life in India). Between 1990 and 2010, DALYs due to ischemic

heart disease increased by 66%; in 2010, the same disease triggered nearly 26 million DALYs – the largest number of any NCD (IHME 2013). India undergoes the highest loss of potentially productive years of life in the world due to CVDs alone (Reddy et al. 2005). Its estimated economic loss between 2012 and 2030 due to CVD is predicted to reach 2.7 trillion in terms of 2010 dollars, which works out to be over 47% of the overall loss of output (World Economic Forum and Harvard School of Public Health 2014). South Africa also bears a higher burden of NCDs when compared to other developing countries (Mayosi et al. 2009). This rise in NCDs, complicated by infectious diseases together with HIV/AIDS, contributes to the unique quadruple burden of diseases borne by the country (Department of Health, South Africa 2013). WHO estimates an annual cost of South African Rand 1 billion to address NCDs in an upper middle income country such as South Africa (Department of Health South Africa 2013). Hypertension, a precursor of cardiovascular diseases and stroke, has caused 350,000 stroke deaths in South Africa alone, with 35% of survivors suffering from a resultant moderate to severe disability (Mayosi et al. 2009). These facts clearly highlight the need for South Africa and India to take preventive measures in addressing the problem of NCDs in general and CVDs in particular to reap the advantage of the demographic dividend for sustainable development.

Population salt reduction strategies

The progress achieved by countries in the implementation of time-bound commitments for 2015 and 2016 included in the 2014 United Nations Outcome Document on NCDs shows that all four countries under study have adopted national policies to reduce population salt/sodium consumption (WHO - *NCD Progress Monitor*, 2015). Salt reduction initiatives undertaken by Canada and the UK are briefly highlighted in figures 1A-B and 2A-B respectively (see Appendix). Canada and the UK are the members of the Global Food Monitoring Group (FMG) that brings countries together to support to monitor the nutrition composition of foods. There are also members of the European Union (EU) that has adopted the Salt Reduction Framework. Therefore, Lessons to be learned from these countries can provide a way forward for LMICs to consider key aspects of how salt-reduction programs can be managed successfully.

South Africans have a high unrestricted salt intake (WHO 2013b) with an average adult consumption of 9.5 g/day (Charlton, Webster and Kowal 2014; WHO 2014). As a result, South Africa has one of the highest hypertension rates in the world among both men and women, affecting a significant portion of the population and causing severe strain on the national health budget (Mayosi et al. 2009). Research shows that reducing the average salt intake by a mere 0.85 g/person/day in South Africa would result in reduced CVDs and NCDs, in turn leading to reduced health expenditures for individuals and governments (Bertram et al. 2012).

Considering the dissatisfactory responses to voluntary salt reduction initiatives implemented to address the problem of CVDs in other countries (He and MacGregor 2008) and aware of the exponential increase in the burden of hypertension due to the high salt levels found in processed foods, the Health Ministry of South Africa initiated legislative action to regulate sodium content found in food products at the manufacturing level (WHO 2013b). Positive responses in the form of feedback and negotiations with members of the food industry have shown an inclination towards mandatory, rather than voluntary, initiatives, to ensure fairness to the competitors operating within the field. Years of research, intersectoral discussions and debates between the Government of South Africa, academia and the food industry have finally led to the signing of a mandatory salt reduction agreement for the food industry in 2013, which will be effective from June 2016, with the first phase continuing up to June 2019 (WHO

2013b). Food products will be monitored to ensure compliance with the new legislation, and testing of sodium levels will be performed using chemical analyses such as atomic absorption spectrometry. Companies failing to comply with the legislative requirements will face fines and penalties, and the requirements will be regulated by safety environment officers at the municipal level. However, even with a successful regulation of salt intake in processed foods, only 50% of the daily sodium intake per person in South Africa is consumed through processed foods. The other 50% is accounted for by discretionary salt use, that is, salt that is voluntarily added to food to enhance taste (WHO 2013b).

In India, on average, adults consume 8.5 g -15 g of salt per day (Basu et al. 2012) and its massive population is increasingly at risk of high blood pressure and hypertension. High blood pressure accounts for about 170,000 annual deaths, and 140 million people are currently living with hypertension, which is projected to increase to 214 million by 2030 (WHO 2014). There has been a marked shift in Indian consumers' preferences, represented in the decreased intake of coarse cereals, fruits and vegetables, and an accompanying rise in the consumption of meat and pre-salted food. With modernization, globalization and unplanned urbanization, nearly 80-85% of the Indian population consumes at least some form of commercially processed food (Gupta et al 2013). WHO lists *voluntary salt reduction* as a "best buy," with a projected educational and advertising cost of $33,400 per million people per annum for India (WHO 2011a). Salt reduction strategies in India are still in the planning stages. There is, however, an ongoing investigation as to how to best integrate salt reduction strategies into existing policies and programmes that are aimed at controlling NCDs and CVDs (WHO, GIGH and ICCIDDGN 2014).

Discussion

Unlike advanced countries, South Africa and India will continue to have a large productive population, as evinced by their age-wise population distribution (see table 1) and predictions, which suggest that both countries will have around 68% of their population in the age group of 15-64 by 2030 (United Nations 2015). It is essential for South Africa and India to augment their human resources in a sustainable manner to reap the benefits of their respective demographic dividends. However, a comparative analysis between the situations faced by the two LMICs and the two HICs reveals that even though HICs have a higher proportion of deaths due to CVDs, the proportion of premature deaths and absolute death rates occurring due to CVDs are considerably higher in LMICs. Thus, CVDs decrease the size of the active labor force due to death and disability, resulting in a negative impact on the productivity of developing countries. A main risk factor for CVDs is raised blood pressure. Research has established a direct link between salt intake and raised blood pressure (He and MacGregor 2007; Takase Hiroyuki et al 2015) . The present global trend is towards the consumption of food and beverages containing more than the nutritional requirement of salt.

WHO has called on its member States to control excessive salt intake, and 38 member States have already set voluntary and/or mandatory sodium content targets. The UK and Canada introduced voluntary reduction initiatives in 2003 and 2010 respectively. The UK preferred a voluntary approach because the process of setting targets is more flexible and faster than passing salt reduction legislation (Webster 2014). Unfortunately the mandatory approach failed in Canada due to opposition from the food manufacturing industry – similar to the Salt Manufacturers Association opposing the "Sid the Slug" campaign run by the UK to raise awareness on the dangers of excess dietary salt. One positive aspect of mandatory salt reduction is that it typically does not change in the face of changes in government, so the public health policy normally stays even if there is change in government. South

Africa opted for mandatory salt reduction in order to have a level playing field for food manufacturers – one that is imposed on all food manufacturers. Being part of the legislation, this measure cannot be affected by changes in the government. It is critical that food manufacturers support both methods of salt reduction, especially in light of their social responsibilities towards their consumers, and to strike a balance between profit and public health (Charlton et.al. 2014).

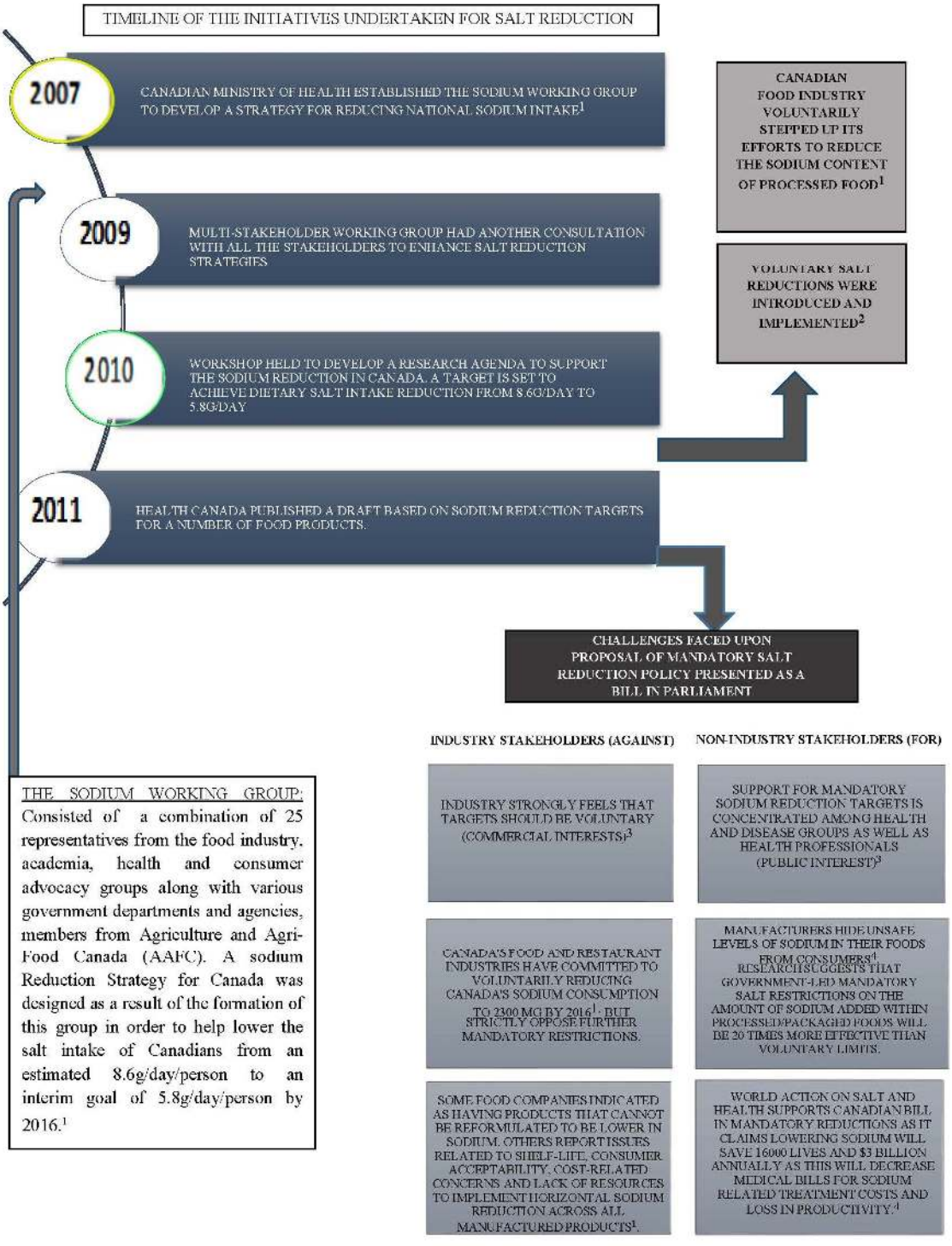
To achieve positive results on salt reduction, countries should strengthen their ties with local NGOs. In South Africa, for example, NGOs such as Salt Watch and the Heart and Stroke Foundation are involved in decision-making processes. Assessing which of the two methods of salt reduction will benefit the country most (mandatory vs voluntary) is also an important element that must be considered in order to reach positive outcomes on salt reduction. Approaches that have already proven to be successful in the UK and Canada – both members of FMG – could be utilized in context-specific and culturally-appropriate ways to compliment the implementation of intersectoral salt reduction approaches in LMICs, such as South Africa and India. Voluntary salt reduction tends to work better in advanced countries because of their small population size and high literacy/education levels. Mandatory salt reduction tends to be easier for developing countries because of their large population size and low literacy/education level, especially among the poorer strata. With voluntary salt reduction, patients/individuals with a low literacy level take longer to understand the importance of salt reduction, which leads to more damage (especially in LMICs). Mandatory and voluntary actions, therefore, should work in tandem, particularly in developing nations such as South Africa and India. India has yet to start an active initiative for salt reduction. With its large population size and low levels of literacy/education, the burden of CVDs threatens to affect India's sustainable development. Therefore, it is essential for India, and other LMICs, to learn from those successful approaches adopted by other countries and subsequently to formulate sustainable salt reduction policies/programs that are culturally appropriate.

Conclusion

Despite having the advantage of a (potential) significant demographic dividend, India's large population size, low level of education, scarce resources and rapidly growing CVDs are posing a threat to sustainable development in the country. It is therefore, imperative for India and other LMICs to prevent and control CVDs with appropriate measures. The salt reduction strategy has proved to be one of the most cost effective measures to control raised blood pressure and associated CVDs. Advanced countries, such the UK and Canada, have implemented voluntary salt reduction measures, and with significant success. South Africa has adopted a mandatory salt regulation strategy, which will be implemented in June 2016. Existing conditions in advanced and developing countries differ on many fronts, including food habits and education levels, among others. Developing countries may need to compliment voluntary approaches with mandatory regulations in order to reduce salt intake to acceptable levels. It is essential to adopt sustainable, context-specific, culturally appropriate salt-reduction strategies involving community members and educational institutions. This would facilitate developing countries to mobilize support to advocate for a reduction in the discretionary use of salt in the interest of health benefits to the communities.

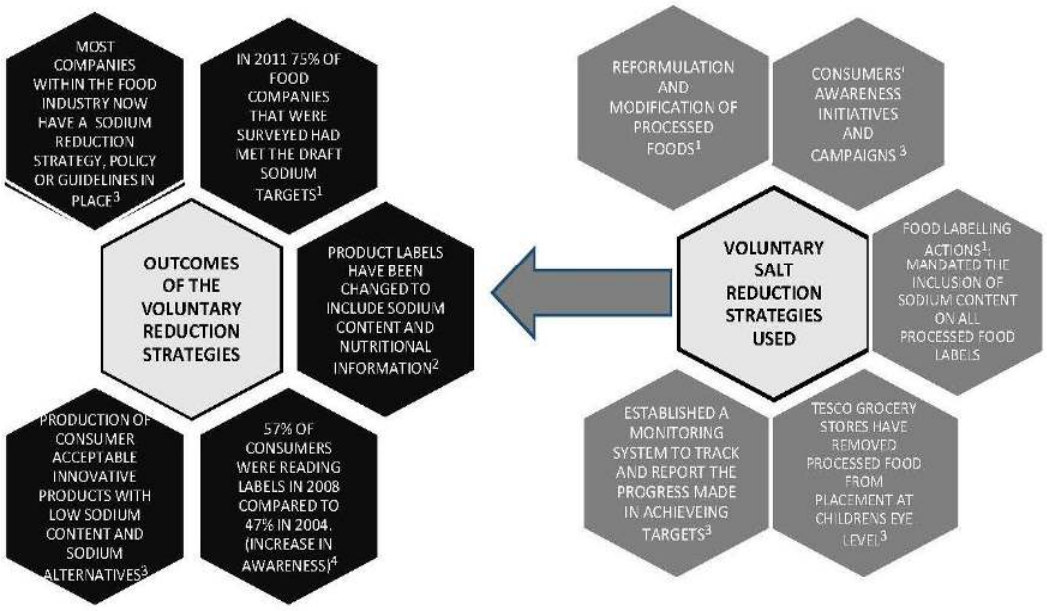
Appendix

Fig 1A: Brief overview of the Canadian Salt Reduction Initiatives



Source: 1. Agriculture and Agri-Food Canada 2014; 2. Health Canada 2013; 3.WASH Canada2013; 4. Government of Canada 2013.

Fig. 1B: Brief overview of the Canadian Salt Reduction Initiatives and the Outcomes

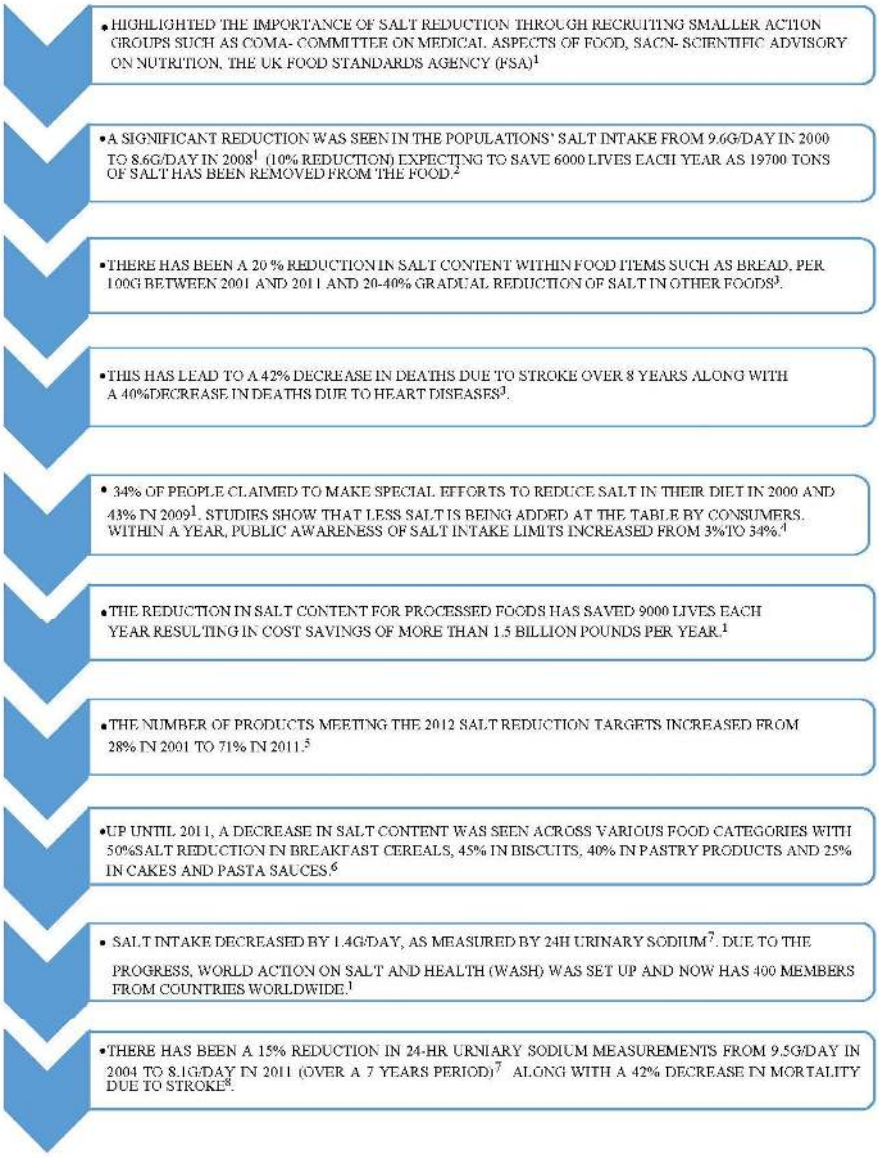


Source: 1. Agriculture and Agri-Food Canada 2014; 2. Health Canada 2013; 3. Carly Weeks 2012; 4. Government of Canada 2013.

Fig 2A: Brief overview of the UK's Successful Salt Reduction Initiatives

Source: 1. CASH 2015; 2. He, Feng J., Brinsden & MacGregor 2014; 3. MacGregor & Sever 1996; 4. SACN 2003, 2014; 5. FSA 2010; 6. UK Department of Health 2010; 7 UK Department of Health 2015.

Fig 2B: Brief overview of the UK's Successful Salt Reduction Initiatives



Source: 1 CASH 2015; 2. Wyness et.al. 2012; 3. Niamh 2015; 4. EUFIC 2015; 5. Brinsden et al., 2013;6. Food Standards Agency 2010; 7. He, Feng J., Sonia P-R. & MacGregor (2014); 8. Statistical Press Notice 2012.

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