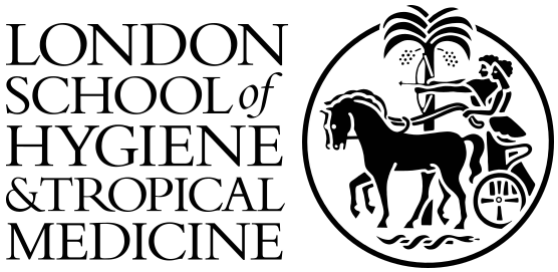

AHA/WHF Scientific Statement

The Heart of 25 by 25: Achieving the Goal of Reducing Global and Regional Premature Deaths From Cardiovascular Diseases and Stroke: A Modeling Study

Ralph L. Sacco, MD, MS; Gregory A. Roth, MD, MPH; K. Srinath Reddy, MD, DM; Donna K. Arnett, PhD, MSPH; Ruth Bonita, PhD; Thomas A. Gaziano, MD; Paul A. Heidenreich, MD, MS; Mark D. Huffman, MD, MPH; Bongani M. Mayosi, MBChB, DPhil; Shanthi Mendis, MD; Christopher J.L. Murray, MD, DPhil; Pablo Perel, MD, MSc, PhD; Daniel J. Piñeiro, MD; Sidney C. Smith, Jr, MD; Kathryn A. Taubert, PhD; David A. Wood, MSc; Dong Zhao, MD, PhD; William A. Zoghbi, MD

Key Words: AHA Scientific Statements, cardiovascular diseases, forecasting, noncommunicable disease, prevention

The American Heart Association and the World Heart Federation make every effort to avoid any actual or potential conflicts of interest that may arise as a result of an outside relationship or a personal, professional, or business interest of a member of the writing panel. Specifically, all members of the writing group are required to complete and submit a Disclosure Questionnaire showing all such relationships that might be perceived as real or potential conflicts of interest.

This document was approved by the American Heart Association Science Advisory and Coordinating Committee on December 4, 2015, and the American Heart Association Executive Committee on January 19, 2016.

The American Heart Association requests that this document be cited as follows: Sacco RL, Roth GA, Reddy KS, Arnett DK, Bonita R, Gaziano TA, Heidenreich PA, Huffman MD, Mayosi BM, Mendis S, Murray CJL, Perel P, Piñeiro DJ, Smith S Jr, Taubert KA, Wood DA, Zhao D, Zoghbi WA. The heart of 25 by 25: achieving the goal of reducing global and regional premature deaths from cardiovascular diseases and stroke: a modeling study. *Circulation.* 2016;133:●●●–●●●.

This article has been copublished in *Global Heart.*

Copies: This document is available on the World Wide Web sites of the American Heart Association (my.americanheart.org) and the World Heart Federation (http://www.world-heart-federation.org/). A copy of the document is available at http://my.americanheart.org/statements by selecting either the "By Topic" link or the "By Publication Date" link. To purchase additional reprints, call 843-216-2533 or e-mail kelle.ramsay@wolterskluwer.com.

Expert peer review of AHA Scientific Statements is conducted by the AHA Office of Science Operations. For more on AHA statements and guidelines development, visit http://my.americanheart.org/statements and select the "Policies and Development" link.

(*Circulation.* 2016;133:000–000.)

***Circulation* is available at http://circ.ahajournals.org**

Abstract

Background

The World Health Organization (WHO), empowered by the unanimous proclamation at the United Nations High Level meeting on non-communicable diseases (NCDs) in September 2011, set a number of key targets for all nations to reach by 2025.[1] The overarching goal is to reduce the risk of premature deaths (defined as the probability of dying between the ages of 30 years and 70 years of age) from NCDs (cardiovascular disease including stroke (CVD), diabetes mellitus (DM), cancer and chronic respiratory disease) by 25% by the year 2025 (referred to as “25 x 25”). The Global CVD Taskforce, comprising the World Heart Federation, American Heart Association, American College of Cardiology Foundation, European Heart Network, and European Society of Cardiology, and expanded representation from Asia, Africa, and Latin America along with global CVD experts, disseminates information and approaches to reach the WHO 2025 targets.[2-4]

To achieve the overarching 25 x 25 target, the WHO identified 8 targets in the prevention, control, and treatment of 6 key risk factors, as well as two health systems targets related to the use of essential medicines, technologies, and drug therapies to prevent NCDs, particularly CVDs. [5] Of the 8 targets, 6 directly align with traditional CVD and stroke risk factors: 3 risk factors (tobacco use, sodium intake, physical inactivity), 2 biological risk factors (raised blood pressure (BP), DM/obesity) and 1 management target directed at treatment of individuals at high risk of CVD. With CVD as the largest single contributor to global mortality, accounting for nearly half of the 36 million annual NCD deaths, and with a global cost of nearly US $863 billion, achieving the global target to reduce premature NCD deaths by 25% requires that CVD and its risk factors be aggressively addressed by WHO Member States, policymakers,

professional organizations, public health experts, health care providers, and key stakeholders. [4]

Although the prevalence of many of these risk factors has improved globally over the past 30 years, with the exception of DM and obesity, trends are not homogenous (Table 1).[6] Between 1990 and 2013, the age-standardized CVD death rate decreased by more than 22% for both ischemic heart disease and stroke.[7] Taking these trends into account, continued progress towards improving CV health and reducing CVD and stroke deaths is vital to reaching the overall premature NCD mortality goal by 2025, just one decade away. The aim of this paper is to investigate the potential impact of reaching selected targets in the WHO Global Monitoring Framework on the reduction of premature CVD mortality by 2025 and examine the policy implications of these predictions.

Data & Methods

The writing committee reflects the members of the Global CVD Taskforce. The committee engaged researchers at the Institute for Health Metrics and Evaluation (IHME), University of Washington, Seattle, WA, to develop region-specific estimates of premature cardiovascular mortality in 2025 based on various scenarios. IHME is the coordinating center for the Global Burden of Disease Study (GBD), a multinational effort to produce consistent estimates of death and disability by age, sex, and over time for all countries.[7]

The methods and results of this exercise have been reported in detail.[8] Data were drawn from the GBD 2013 study.[7] All estimates were produced separately for each age-sex-country-disease specific strata and then collapsed to create regional estimates. (A list of GBD 2015 Geographies detailing the countries that make up “Regions” and “Super Regions” is available here: http://www.healthdata.org/sites/default/files/files/Projects/GBD/GBDRegions_countries.pdf)

To create a scenario in which risk factors continue the trend observed since 1990 ("business as usual"), the analysis first estimated the proportion of CVD and stroke deaths in 1990 and 2013 due to raised systolic BP, tobacco smoking, high body mass index (BMI) and high fasting plasma glucose, using a population attributable fraction. The effect of serum cholesterol was not included because this was not listed among the 8 primary WHO 25 x 25 targets.

The theoretical minimum risk exposure distribution used for the GDB 2010 study was applied except for systolic BP where a theoretical minimum limit of 115 mm Hg was adopted.[9] Using the annualized rate of change between 1990 and 2013, it was assumed that the remaining deaths unattributed to these risk factors would continue their observed trend. Beginning in 2014, deaths attributable to the selected risk factors were estimated using the same population attributable fraction and risk factor exposures estimated for GBD 2013 for each age-sex-country-year projected to 2025 and the annualized rate of change between 1990 and 2013. Future scenarios were developed to match four key risk factor targets for 2025: 1) no further rise in fasting plasma glucose, 2) no further rise in BMI, 3) 25% reduction in the prevalence of systolic BP >140 mm Hg via a shift in the entire population distribution of systolic BP, and 4) 30% reduction in tobacco smoking prevalence, including associated effects from second-hand smoke. For blood pressure, modeling a population-wide shift in systolic BP assumes that there will be both prevention and treatment of hypertension but no blood pressure target is specified. The analysis also estimated a scenario in which all four of these targets are achieved, adjusting for their joint effects on mortality. The impact of access to medications was not modelled because comprehensive estimates do not yet exist.

Results

2025 Estimates of the Absolute Number of Premature Deaths from CVD

Using the GBD dataset, 3 736 540 deaths (95% uncertainty interval 3 483 303, 4 009 003) from CVD occurred in 2013 among men and 2 128 134 (95% uncertainty interval 1 814 857, 2 366 726) among women across the globe for those age 30 to 70 years. Table 2 shows that, globally, more men die prematurely from CVD than women, though no significant difference can be observed in sub-Saharan Africa. For 2025 given population growth and assuming trends in the selected risk factors continue, we estimate 5 009 492 premature deaths from CVD among men (95% UI (4 632 942,5 389 257)) and 2 769 945 among women (95% UI (2 321 954,3 044 866)) will occur, a relative increase of 34% and 30% from 2013, respectively. Only among high-income countries, which include the United States, Canada, Australia, Western Europe, Japan, and South Korea, are there projected reductions in the absolute number of premature deaths of -19% among men and -16% among women in 2025. For the rest of world, the number of premature deaths from CVD are projected to increase from 22% in Latin America and the Caribbean to 48% in Sub-Saharan Africa among women, and from 16% in Central Europe, Eastern Europe, and Central Asia to 56% in South Asia among men, largely because of aging and growth of populations.

Compared to the “business as usual” estimates, the modelling showed major reductions in the number of premature deaths from CVD among men and women across all regions if the 25 x 25 targets for raised BP, smoking, obesity and DM were achieved by 2025. Overall, the model projected a relative decrease of 5% among men and only a 1% increase among women in the number of premature deaths from CVD in comparison to the increases of 34% and 30% in the business as usual estimates. A significant difference between scenarios in number of premature deaths due to CVD in 2025, with no overlap of 95% uncertainty intervals, was seen globally for men and also within the region comprised of Southeast Asia, East Asia, and Oceania. Although there are projected increases from 2013 to 2025 in the absolute number of premature deaths in some regions, the 2025 estimates for the number of deaths in all regions were much improved if the risk factor targets were achieved.

2025 Estimates of Probability of Premature Mortality from CVD

The figures illustrate the global and regional projections for achieving a reduction in the probability of premature mortality from CVDs, including stroke by 2025. Figure 1 shows the global probability of premature death in women ages 30 to 70 years due to CVD using data from 1990 to 2013 and projects these estimates from 2014 to 2025. Notably, recent declines in premature CVD mortality leveled off if risk factors continue the current trend. There was a small estimated reduction in premature mortality if the rise in fasting plasma glucose was halted. A similar magnitude of decline was estimated if the prevalence of smoking was reduced by 30%. Next, a more modest reduction in premature mortality would be realized by halting the rise in elevated BMI. The most robust effect from a single risk factor target being met resulted from the achievement of the BP goal of reducing the prevalence of elevated systolic BP by 25%. An important assumption of this model is that the entire population distribution of 25% was shifted leftward to achieve the target, which includes reduction of SBP both greater and less than 140 mmHg. Shifts of this magnitude reflect an assumption that hypertension is both prevented, via dietary and lifestyle modification, and treated medically, via antihypertensive therapies. However two key observations of the modelling exercise are that 1) the single dominant risk factor strategy varied by region and 2) the combined strategy dominated in almost all regions. The combined scenario if all 4 risk factor targets were achieved by 2025 would result in achieving the 25x25 mortality goal for women in 2025 or shortly thereafter.

For men, the projections for the global probability of premature death due to CVD differed (Figure 2). First, the risk of premature death from CVD was greater for men than women, and the scenario in which current trends continue to 2025 was estimated to lead to an increased premature probability of death in 2025 compared to 2013. If either the rise in fasting plasma glucose or elevated BMI were halted, then the effects on the premature CVD mortality among men was less than that for women and no reduction in the risk of premature CVD

mortality by 2025 could be detected as uncertainty estimates for 2013 and 2025 overlapped. Achieving the target for smoking would have a similar impact among men and women, reducing the risk of premature mortality by approximately 4%. As among women, the BP goal also had the most profound impact on reducing premature mortality from CVD. The scenario if all 4 risk factor targets were achieved in 2025 resulted in achieving the overall goal by around 2025 for both men and women.

The regional variation in the probability rates for premature CVD mortality was striking, and the effects of achieving the targets are demonstrated in the figures. For high income countries among men and women (Figures 3 and 4), the 2025 premature CVD mortality target was achieved if current trends continue, but would be achieved about 5 years sooner if all 4 risk factors targets were achieved. Higher premature CVD mortality rates were estimated in Eastern Europe/Central Asia (Figure 5 and 6), Sub−Saharan Africa (Figure 7 and 8), North Africa/Middle East (Figure 9 and 10), South Asia (Figure 11 and 12), East Asia/Pacific (Figure 13 and 14), and Latin America/Caribbean (Figure 15 and 16) if current trends continue. Achieving the 4 risk factor goals by 2025, however, resulted in the overall 25 x 25 target being achieved on average in high-income regions, North Africa/Middle East, East Asia/Pacific, Latin America/Caribbean for men and women. There is substantial measurement uncertainty for these estimates, particularly in South Asia.

Discussion

The data illustrate the substantial variability in the global burden of premature mortality from CVD with much greater probability of cardiovascular death in low- and middle-income countries than in high- income countries. Given that raised systolic BP, smoking, overweight and obesity, and diabetes are highly prevalent in many populations and increase risk of CVD death, [10], achieving all 4 of these risk factor targets will contribute to reduction in the risk of premature mortality from CVD around the year 2025 globally. A key finding of our exercise is

that, globally and for almost regions, targeting all four of these risk factors leads to greater reductions in CVD death than targeting any single risk factor. However the absolute impact of the WHO 25 x 25 priority targets both in combination and independently differ significantly by world region.

Globally, the targets for systolic BP (reduce by 25%) and tobacco (reduce by 30%) have more substantial effects on the future scenarios compared with maintaining current levels of BMI and fasting plasma glucose. However this general observation is not true for all regions, notably high-income North America and Australasia where reductions in BMI among women dominates as a strategy. .[8]. Tobacco reduction is the largest contributor to mortality reductions for women in Western Europe and high-income Asia Pacific and men in North Africa/Middle East, Central Sub-Saharan Africa, and Central Asia.[8] Because there is substantial regional variability in these projections, regions and countries will need to develop, prioritize, implement, and evaluate context-specific approaches to addressing these targets. Projections of future trends can be helpful for setting priorities in certain regions. Although the order of importance of reaching the individual risk factors varies somewhat by region, the uncertainty intervals largely overlap and the best scenario for reaching the 25 by 25 goal is to accomplish all 4 key risk factor targets.

Although the analyses focused on the 4 main risk factor targets, attention needs to be called to the other targets that involve improving the capacities of healthcare systems to accomplish CVD risk reduction. Two of the WHO targets that could not be modelled, include (1) 50% of eligible persons receiving drug therapy and counseling including glycemic control to prevent heart attacks and strokes, and (2) 80% availability of the affordable basic technologies and essential medicines, including generics, required to treat major NCDs in both public and private facilities. It is also important to recognize in interpreting the projections that many of the 8 WHO global targets are inter-dependent. For example, to achieve the 2025 WHO targets for BP and DM, major efforts to strengthen healthcare systems will be required.

Policy Implications

There are several policy implications of these findings. First, these results demonstrate that the greatest reduction in premature mortality can be achieved for most regions of the world by targeting a combination of risk factors. Second, more ambitious risk factor targets will be needed for fasting plasma glucose and BMI if they are to make a substantial contribution to risk reduction. A more ambitious tobacco target would also influence non-cardiovascular related deaths, such as those secondary to cancer and chronic lung disease, which were not included here.

In order to reduce BP, all three pillars of the global strategy for the prevention and control of NCDs will be important to address: surveillance, prevention, and health care delivered through strengthened health systems. These recommendations are described in detail in prevention guidelines produced by multiple organizations [10-15], and the WHO in its Package of Essential Non-Communicable Disease Interventions for Primary Health Care.[11] Prevention strategies and goals for reducing population mean levels of blood pressure, including the including the WHO target of a 30% relative reduction in mean population intake of salt/sodium intake, are an important component that can be provided largely by population wide interventions and policies aimed to improve healthfulness, availability, and affordability of the local and regional food supply.

Third, projections of future mortality based on the best available data on risk factor exposure and relative risk can serve as a useful summary measure when WHO Member States and other stakeholders are setting priorities. To achieve the 25 x 25 mortality goal (Table 3), policy decisions will need to reflect not only the cost-effectiveness of an intervention targeting a particular risk factor, but local trends in the absolute level of exposure to that risk factor. Additional investments in health surveillance will therefore be an essential component of evidence-based decision-making.[12, 13]

Evidence-based prevention and treatment of CVD in low/middle income countries

Although the model was unable to incorporate the impact of healthcare system changes in primary and secondary prevention, improving access to evidence-based approaches to the management of risk to prevent and treat CVDs will be critical to achieving the 2025 goal. Risk-based management for identification and treatment of individuals at high-risk for CVD and stroke events has been outlined by the WHO in its Package of Essential Interventions for NCDs (PEN) in low resource settings. Strategies include non-lab based CVD risk assessment, simplified treatment protocols based on drugs listed on the WHO Model List of Essential Medicines, regular audits of the adequacy of human resources, availability of equipment and laboratory reagents, adherence to clinical protocols, and maintenance of stock registers. Performance assessments show that implementation of the total-risk approach in primary health care can lead to significant improvement in blood pressure and diabetes control and to reductions in cardiovascular risk. In collaboration with ministries of health, the WHO has initiated similar projects in primary care in approximately 30 resource-constrained settings.[13]

Strengths and Limitations

The data and results from the GDB2013 study that were used provide, to date, the most robust estimates of the global and regional burden of cause-specific mortality and risk factor prevalence. Mortality data from 1990 through 2013, as well as modeled estimates of risk factor exposure, were used to create these projections. However, this analysis has limitations.

First, the regional figures appear to have an inflection point present at 2014. The prediction of future mortality begins in the year 2014 because mortality data was only available through 2013 at the time of the analysis. In our time series figures, we have elected to show both estimates of mortality from 1990-2013 as well as the results of our model. This inflection

point reflects the fact that, for the purpose of comparison, we are showing results of the GBD2013 study (in black) and result of our projection model (in colors) within the same figure.

Second, the projections reflect counterfactual scenarios based on the theoretical minimum risk assumed for each risk factor rather than the effect of specific interventions. Therefore these estimates reflect the combined impact of prevention and treatment, rather than being limited to treatment of individuals already at elevated risk. This assumption reflects the fact that both prevention and medical care will play an essential part in reducing the burden of CVD.

Third, we created models for risk factor targets a) that were limited to those agreed upon by United Nations Member States in 2013 and b) for which there was sufficient global data on exposure levels. Fourth, we restricted these analyses to reductions in premature CVD and stroke deaths. Other NCD goals, including reductions in cancer, DM, and respiratory diseases, were not estimated, but are also essential to achieving the overall NCD goal. Fifth, while joint effects were accounted for in the scenario in which all targets are met, for the BMI scenario only the direct effect of BMI was estimated on mortality, separate from its effects through BP and fasting plasma glucose. The inclusion of all the downstream effects of high BMI would have shown this strategy to have an even larger impact. Because of this decision however, the combined risk factor scenario was able to correctly account for the joint effects of the selected risk factors without overestimating the benefit of intervening on multiple metabolic risk factors.

Conclusions

By 2025, over 5 million premature deaths from CVD among men and 2.8 million among women are projected worldwide. Estimates of the number of people with premature death from CVD and the probability of dying in 2025 vary across the globe. These data demonstrate wide variation in estimated future trends in risk factor prevalence and premature CVD mortality that will require region-and country-specific priority setting to achieve the 25 x 25 goal. Cost-

effective population wide intervention strategies exist to reduce BP, tobacco, obesity, and DM but have not been widely implemented. Aggressive strategies to achieve multiple WHO targets, especially for raised blood pressure and tobacco control, will be required to meet the 25 x 25 overall goal. Success is possible if the individual WHO targets are met and healthcare systems are strengthened. Achieving these goals can only be accomplished if countries and regions set priorities, implement cost-effective population wide strategies, and collaborate in public-private partnerships across multiple sectors.

Acknowledgments

Many thanks to AHA Staff members Diana Vaca McGhie and Melanie B. Turner for their contributions to the organization of the writing group and development of this manuscript.

TABLE 1. Trends in Global Cardiovascular Health

	Global Prevalence			
	1980		2008-2012	
Metric	***Men***	***Women***	***Men***	***Women***
Tobacco use, %[14]	41.2 (40.0, 42.6)	10.6 (10.2, 11.1)	31.1 (30.2, 32.0)	6.2 (6.0, 6.4)
Mean SBP, mmHg[15]	130.5 (127.3, 134.0)	127.2 (124.1, 130.6)	128.1 (126.7, 129.4)	124.4 (123.0, 125.9)
Raised Blood Pressure, % [15]	33 (28, 39)	29 (25, 34)	29 (27, 31)	25 (23,27)
Phys. inactivity, %[16]	N/A	N/A	19.8 (13.4-32.1)	26.8 (18.5-38.9)
Obesity, %[17]	4.8 (4.0, 5.7)	7.9 (6.8, 9.3)	9.8 (9.2, 10.4)	13.8 (13.1, 14.7)
Diabetes, % [18]	8.3 (6.5, 10.4)	7.5 (5.8, 9.6)	9.8 (8.6, 11.2)	9.2 (8.0, 10.5)

TABLE 2. Absolute Numbers of Premature Cardiovascular Deaths in 2013 and Estimates in 2025 for Adults age 30 to 70 years by Super- Region

Region	Sex	Premature Cardiovascular Deaths, 2013 (95% uncertainty interval)	Premature Cardiovascular Deaths in 2025 if Current Risk Factor Trends Continue (95% uncertainty interval)	Percentage Change in Mean Number of Deaths, 2013-2025	Premature Cardiovascular Deaths in 2025 if Risk Factor Targets are Achieved (95% uncertainty interval)	Percentage Change in Mean Number of Deaths, 2013-2025
Global	Women	2128134 (1814857,2366726)	2769945 (2321954,3044866)	30%	2159217 (1827170,2393080)	1%
Global	Men	3736540 (3483303,4009003)	5009492 (4632942,5389257)	34%*	3539896 (3316386,3804971)	-5% ǂ
High-income	Women	164786 (148636,205642)	138356 (124811,172797)	-16%	127186 (114450,158685)	-23%
High-income	Men	362839 (342716,383975)	293289 (276513,311016)	-19%*	266359 (250676,283268)	-27%*
Central Europe, Eastern Europe, and	Women	223696 (207857,243869)	281455 (245400,302032)	26%*	227418 (195576,246731)	2%

Central Asia						
Central Europe, Eastern Europe, and Central Asia	Men	475936 (461227,490469)	553462 (531778,574519)	16%*	410376 (389566,430121)	-14%* ǂ
Sub-Saharan Africa	Women	200443 (177291,240632)	296141 (257813,347694)	48%*	237249 (207346,282389)	18%
Sub-Saharan Africa	Men	231248 (216576,247674)	350375 (327371,374645)	52%*	289286 (269767,311035)	25%* ǂ
North Africa and Middle East	Women	147122 (130915,163220)	194795 (173397,217242)	32%*	168165 (149818,187378)	14%
North Africa and Middle East	Men	220032 (204031,238444)	295956 (274405,319530)	35%*	247057 (228401,267836)	12% ǂ
South Asia	Women	639046 (469768,794972)	916908 (665308,1130215)	43%	736819 (532380,910343)	15%
South Asia	Men	1097544 (904270,1317289)	1717276 (1418260,2039056)	56%*	1223642 (1020301,1457277)	11% ǂ
Southeast Asia, East	Women	626804	788050	26%	535645	-15% ǂ

Asia, and Oceania		(537293,720433)	(672937,899995)		(461842,609289)	
Southeast Asia, East Asia, and Oceania	Men	1163003 (1017097,1282170)	1568704 (1373123,1748215)	35%*	912417 (814746,1000303)	-22%* ǂ
Latin America and Caribbean	Women	126235 (115538,147773)	154240 (140363,179209)	22%	126736 (115135,147858)	0%
Latin America and Caribbean	Men	185937 (175438,196925)	230430 (217845,242639)	24%*	190760 (180293,201545)	3% ǂ

* Indicates that 95% uncertainty interval for number of deaths in 2013 and 2025 do not overlap; ǂ indicates that 95% uncertainty interval for numbers of deaths in 2025 scenarios do not overlap

TABLE 3. Cost Effective Population Level Strategies to Achieve Targets

WHO Risk Factor Targets and 25 x 25 Goals	Strategies for Population Wide Intervention
Tobacco	
A 30% relative reduction in prevalence of current tobacco use in persons aged 15+ years	• Higher taxes on tobacco products to reduce use and fund tobacco control programs[12, 19] • Smoke-free indoor workplaces, public places and public transport [12, 19, 20] • Mass media campaigns about the danger of tobacco and tobacco smoke including cigarette package warnings, especially those that are graphic and health related [12, 19] • Complete bans on all forms advertising, promotion and sponsorship of tobacco products [12, 19]
High Blood Pressure & Sodium Reduction	
A 25% relative reduction in the prevalence of raised blood pressure or contain the prevalence of raised blood pressure, according to national circumstances A 30% relative reduction in mean population intake of salt/sodium intake	• Enact government policies to reduce sodium in packaged foods. [21, 22] • Mass-media campaigns and voluntary action by food industry to reduce sodium consumption. [23] • Implement public awareness programs on diet and physical activity [24] • Drug therapy (including glycemic control for diabetes mellitus and control of raised blood pressure using a total risk approach) and counselling to individuals who have had a heart attack or stroke and to persons with high risk (≥ 30%) of a fatal and nonfatal cardiovascular event in the next 10 years [24]

Unhealthy Diet & Physical Inactivity	
Halt the rise in diabetes and obesity A 10% relative reduction in prevalence of insufficient physical activity	• Replace trans fats with unsaturated fats [24] • Implement public awareness programs on diet and physical activity [24] • Fiscal methods that increase the price of foods high in saturated and industrially produced trans fats and sugar; food labelling; and marketing restrictions of unhealthy food products, especially to children and young people.[25] • Restrict advertising to children [24] • Drug therapy (including glycemic control for diabetes mellitus and control of raised blood pressure using a total risk approach) and counselling to individuals who have had a heart attack or stroke and to persons with high risk (≥ 30%) of a fatal and nonfatal cardiovascular event in the next 10 years [24]

Population wide interventions must be considered to impact progress towards the modifiable risk factor targets.

REFERENCES

1. World Health Organization, Draft comprehensive global monitoring framework and targets for the prevention and control of noncommunicable diseases. Available at: http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_8-en.pdf?ua=1. Accessed on: May 15, 2015.
2. Zoghbi WA, Duncan T, Antman E, Barbosa M, Champagne B, Chen D, Gamra H, Harold JG, Josephson S, Komajda M, Logstrup S, Mayosi BM, Mwangi J, Ralston J, Sacco RL, Sim KH, Smith SC, Vardas PE, Wood DA**.** Sustainable Development Goals and the future of cardiovascular health: a statement from the Global Cardiovascular Disease Taskforce. *J Am Heart Assoc*. 2014;3:e000504.
3. Smith SC, Jr., Chen D, Collins A, Harold JG, Jessup M, Josephson S, Logstrup S, Jur C, Sacco RL, Vardas PE, Wood DA, Zoghbi WA**.** Moving from political declaration to action on reducing the global burden of cardiovascular diseases: a statement from the global cardiovascular disease taskforce. *Circulation*. 2013;128:2546-2548.
4. Smith SC, Jr., Collins A, Ferrari R, Holmes DR, Jr., Logstrup S, McGhie DV, Ralston J, Sacco RL, Stam H, Taubert K, Wood DA, Zoghbi WA**.** Our time: a call to save preventable death from cardiovascular disease (heart disease and stroke). *Circulation*. 2012;126:2769-2775.
5. World Health Organization, NCD Global Monitoring Framework. Available at: http://www.who.int/nmh/global_monitoring_framework/en/. Accessed on: May 15, 2015.
6. Ezzati M, Obermeyer Z, Tzoulaki I, Mayosi BM, Elliott P, Leon DA**.** Contributions of risk factors and medical care to cardiovascular mortality trends. *Nat Rev Cardiol*. 2015.
7. Global, regional, and national age-sex specific all-cause and cause-specific mortality for 240 causes of death, 1990-2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet*. 2015;385:117-171.
8. Roth GA, Nguyen G, Forouzanfar MH, Mokdad AH, Naghavi M, Murray C**.** Estimates of Global and Regional Remature Cardiovascular Mortality in 2025. *Circulation*. 2015;In Press.
9. Lim SS, Vos T, Flaxman AD, Danaei G, Shibuya K, Adair-Rohani H, Amann M, Anderson HR, Andrews KG, Aryee M, Atkinson C, Bacchus LJ, Bahalim AN, Balakrishnan K, Balmes J, Barker-Collo S, Baxter A, Bell ML, Blore JD, Blyth F, Bonner C, Borges G, Bourne R, Boussinesq M, Brauer M, Brooks P, Bruce NG, Brunekreef B, Bryan-Hancock C, Bucello C, Buchbinder R, Bull F, Burnett RT, Byers TE, Calabria B, Carapetis J, Carnahan E, Chafe Z, Charlson F, Chen H, Chen JS, Cheng AT, Child JC, Cohen A, Colson KE, Cowie BC, Darby S, Darling S, Davis A, Degenhardt L, Dentener F, Des Jarlais DC, Devries K, Dherani M, Ding EL, Dorsey ER, Driscoll T, Edmond K, Ali SE, Engell RE, Erwin PJ, Fahimi S, Falder G, Farzadfar F, Ferrari A, Finucane MM, Flaxman S, Fowkes FG, Freedman G, Freeman MK, Gakidou E, Ghosh S, Giovannucci E, Gmel G, Graham K, Grainger R, Grant B, Gunnell D, Gutierrez HR, Hall W, Hoek HW, Hogan A, Hosgood HD, 3rd, Hoy D, Hu H, Hubbell BJ, Hutchings SJ, Ibeanusi SE, Jacklyn GL, Jasrasaria R, Jonas JB, Kan H, Kanis JA, Kassebaum N, Kawakami N, Khang YH, Khatibzadeh S, Khoo JP, Kok C, Laden F, Lalloo R, Lan Q, Lathlean T, Leasher JL, Leigh J, Li Y, Lin JK, Lipshultz SE, London S, Lozano R, Lu Y, Mak J, Malekzadeh R, Mallinger L, Marcenes W, March L, Marks R, Martin R, McGale P, McGrath J, Mehta S, Mensah GA, Merriman TR, Micha R, Michaud C, Mishra V, Mohd Hanafiah K, Mokdad AA, Morawska L, Mozaffarian D, Murphy T, Naghavi M, Neal B, Nelson PK, Nolla JM, Norman R, Olives C, Omer SB, Orchard J, Osborne R, Ostro B, Page A, Pandey KD, Parry CD, Passmore E, Patra J, Pearce N, Pelizzari PM, Petzold M, Phillips MR, Pope D, Pope CA, 3rd, Powles J, Rao M, Razavi H, Rehfuess EA, Rehm JT, Ritz B, Rivara FP, Roberts T, Robinson C, Rodriguez-Portales JA, Romieu I, Room R, Rosenfeld LC, Roy A, Rushton L, Salomon JA, Sampson U, Sanchez-Riera L, Sanman E, Sapkota A, Seedat S, Shi P, Shield K, Shivakoti R, Singh GM, Sleet DA, Smith E, Smith KR, Stapelberg NJ, Steenland K, Stockl H, Stovner LJ, Straif K, Straney L, Thurston GD, Tran JH, Van Dingenen R, van Donkelaar A, Veerman JL, Vijayakumar L, Weintraub R, Weissman MM, White RA, Whiteford H, Wiersma ST, Wilkinson JD, Williams HC, Williams W, Wilson N, Woolf AD, Yip P, Zielinski JM, Lopez AD, Murray CJ, Ezzati M, AlMazroa MA, Memish ZA**.** A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *LANCET*. 2012;380:2224-2260.

10. Yang Q, Cogswell ME, Flanders WD, Hong Y, Zhang Z, Loustalot F, Gillespie C, Merritt R, Hu FB**.** Trends in cardiovascular health metrics and associations with all-cause and CVD mortality among US adults. *JAMA*. 2012;307:1273-1283.
11. World Health Organization. Package of essential NCD interventions for primary health care: cancer, diabetes, heart disease and stroke, chronic respiratory disease. Available at: http://www.who.int/cardiovascular_diseases/publications/pen2010/en/. Accessed on: July 23, 2015.
12. World Health Organization. From Burden to "Best Buys": Reducing the Economic Impact of Non-Communicable Diseases in Low- and Middle-Income Countries. Available at: http://www.who.int/nmh/publications/best_buys_summary.pdf. Accessed on: June 17, 2015.
13. World Health Organization (WHO). Global status report on noncommunicable diseases 2014. Available at: http://apps.who.int/iris/bitstream/10665/148114/1/9789241564854_eng.pdf?ua=1. Accessed on: July 9, 2015.
14. Ng M, Freeman MK, Fleming TD, Robinson M, Dwyer-Lindgren L, Thomson B, Wollum A, Sanman E, Wulf S, Lopez AD, Murray CJ, Gakidou E**.** Smoking prevalence and cigarette consumption in 187 countries, 1980-2012. *JAMA*. 2014;311:183-192.
15. Danaei G, Finucane MM, Lin JK, Singh GM, Paciorek CJ, Cowan MJ, Farzadfar F, Stevens GA, Lim SS, Riley LM, Ezzati M, Global Burden of Metabolic Risk Factors of Chronic Diseases Collaborating G**.** National, regional, and global trends in systolic blood pressure since 1980: systematic analysis of health examination surveys and epidemiological studies with 786 country-years and 5.4 million participants. *LANCET*. 2011;377:568-577.
16. World Health Organization. Global Health Observatory Data Repository. Prevalence of insufficient physical activity among adults data by WHO region. Available at: http://apps.who.int/gho/data/view.main.2482?lang=en. Accessed on: July 9, 2015.
17. Finucane MM, Stevens GA, Cowan MJ, Danaei G, Lin JK, Paciorek CJ, Singh GM, Gutierrez HR, Lu Y, Bahalim AN, Farzadfar F, Riley LM, Ezzati M, Global Burden of Metabolic Risk Factors of Chronic Diseases Collaborating G**.** National, regional, and global trends in body-mass index since 1980: systematic analysis of health examination surveys and epidemiological studies with 960 country-years and 9.1 million participants. *LANCET*. 2011;377:557-567.
18. Danaei G, Finucane MM, Lu Y, Singh GM, Cowan MJ, Paciorek CJ, Lin JK, Farzadfar F, Khang YH, Stevens GA, Rao M, Ali MK, Riley LM, Robinson CA, Ezzati M**.** National, regional, and global trends in fasting plasma glucose and diabetes prevalence since 1980: systematic analysis of health examination surveys and epidemiological studies with 370 country-years and 2.7 million participants. *Lancet*. 2011;378:31-40.
19. Mozaffarian D, Afshin A, Benowitz N, Bittner V, Daniels S, Franch H, Jacobs D, Kraus W, Kris-Etherton P, Krummel D, Popkin B, Whitsel L, Zakai N**.** Population approaches to improve diet, physical activity, and smoking habits: a scientific statement from the American Heart Association. *Circulation*. 2012;126:1514-1563.
20. Jamison DT, Summers LH, Alleyne G, Arrow KJ, Berkley S, Binagwaho A, Bustreo F, Evans D, Feachem RG, Frenk J, Ghosh G, Goldie SJ, Guo Y, Gupta S, Horton R, Kruk ME, Mahmoud A, Mohohlo LK, Ncube M, Pablos-Mendez A, Reddy KS, Saxenian H, Soucat A, Ulltveit-Moe KH, Yamey G**.** Global health 2035: a world converging within a generation. *Lancet*. 2013;382:1898-1955.
21. Pearson TA, Palaniappan LP, Artinian NT, Carnethon MR, Criqui MH, Daniels SR, Fonarow GC, Fortmann SP, Franklin BA, Galloway JM, Goff DC, Jr., Heath GW, Frank AT, Kris-Etherton PM, Labarthe DR, Murabito JM, Sacco RL, Sasson C, Turner MB, on behalf of the American Heart Association Council on E, Prevention**.** American Heart Association Guide for Improving Cardiovascular Health at the Community Level, 2013 Update: A Scientific Statement for Public Health Practitioners, Healthcare Providers, and Health Policy Makers. *Circulation*. 2013.
22. Asaria P, Chisholm D, Mathers C, Ezzati M, Beaglehole R**.** Chronic disease prevention: health effects and financial costs of strategies to reduce salt intake and control tobacco use. *Lancet*. 2007;370:2044-2053.
23. Cecchini M, Sassi F, Lauer JA, Lee YY, Guajardo-Barron V, Chisholm D**.** Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness. *Lancet*. 2010;376:1775-1784.
24. World Health Organization (WHO). Global action plan for the prevention and control of noncommunicable diseases, 2013-2020. Available at:

http://apps.who.int/iris/bitstream/10665/94384/1/9789241506236_eng.pdf?ua=1. Accessed on: July 9, 2015.

25. Beaglehole R, Bonita R, Horton R, Adams C, Alleyne G, Asaria P, Baugh V, Bekedam H, Billo N, Casswell S, Cecchini M, Colagiuri R, Colagiuri S, Collins T, Ebrahim S, Engelgau M, Galea G, Gaziano T, Geneau R, Haines A, Hospedales J, Jha P, Keeling A, Leeder S, Lincoln P, McKee M, Mackay J, Magnusson R, Moodie R, Mwatsama M, Nishtar S, Norrving B, Patterson D, Piot P, Ralston J, Rani M, Reddy KS, Sassi F, Sheron N, Stuckler D, Suh I, Torode J, Varghese C, Watt J. Priority actions for the non-communicable disease crisis. *Lancet*. 2011;377:1438-1447.