



Strengthening public health in South Africa: Building a stronger evidence base for improving the health of the nation

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An assessment of the relative burden attributable to selected risk factors¹ provides an important evidence base for prioritising risk factors that should be targeted for public health interventions. Selecting interventions should be based on a robust and transparent process of scientific evaluations of their effectiveness, as well as assessment of their cost-effectiveness, local applicability and appropriateness, and likely effects on health inequalities.^{2,3} Establishing such an evidence base is an ongoing process that is still at an early stage in South Africa. A recent review of disease control priorities for developing countries (DCPP)⁴ examined the global evidence regarding the effectiveness of interventions for major health burdens. Despite acknowledging the lack of intervention trials in developing countries, this DCPP review provides a unique resource for identifying interventions that might be useful in South Africa.

High-quality research into public health interventions has been growing steadily in South Africa. In the area of HIV prevention, for example, ground-breaking studies have been conducted on microbicides,⁵ male circumcision,⁶ and the

gender transformative Stepping Stones programme.⁷ The Intervention with Microfinance for AIDS and Gender Equity (IMAGE) study⁸ is a unique trial that addressed structural gender and economic dependencies facing women and demonstrated the use of this as a means for reducing intimate partner violence. Further support for such innovative and rigorous research is needed.

Synthesising available evidence through systematic review is also an important process in harnessing knowledge as it develops. A major milestone in this process was the 10th anniversary of the South African Cochrane Centre, which has contributed to the systematic evaluation and synthesis of findings from clinical and public health trials.⁹ This initiative is helping to develop a culture of evidence-informed decision-making in South Africa, but, as recently observed in a study of the World Health Organization recommendations,³ much effort is needed to strengthen the use of evidence in policy making.¹⁰ Ideally we would need to undertake methodologically rigorous research to refine understanding of each risk factor to health in South Africa; systematically seek evidence of effective, suitable and sustainable interventions; and ensure carefully considered, high-quality evaluation designs with sufficient power and follow-up and including data on costs, adverse events/harm, quality of life, morbidity and mortality. The reality is that the knowledge gaps remain enormous. Furthermore, little work has been done to assess the cost-effectiveness of interventions in the South African setting, with some exceptions such as the evaluation of hypertension guidelines¹¹ and the prevention of mother-to-child transmission of HIV.¹²

It is essential for South Africa to continue building the public health evidence base so that appropriate interventions can be identified to reduce the burden of disease. Health, disease and well-being are complex states influenced by a wide range of factors such as gender, socio-economic development, health care access and delivery, physical environment, and inequity; and identifying interventions will transcend the boundaries of many disciplines and involve the work of many professionals.¹³ However, does South Africa have to wait for the knowledge gap to be filled before taking action on the findings of the South African Comparative Risk Assessment (SA CRA) and other burden of disease information? Drawing on the DCPP and other reviews, it is possible to begin the process of assessing where we are in the evidence chain; identifying

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where public health action can fruitfully be taken; and deciding where further studies are needed.

To facilitate this process, the findings and recommendations from 17 risk factor assessments for the SA CRA are consolidated in Table I. This lists the risk factors that were evaluated, the proportion of DALYs estimated to be attributable to the risk factor, and recommendations for intervention. The risk factors are organised into clusters that may share common causal pathways and are ranked according to their contributions to the burden of disease. The recommendations are informed by the international evidence, but also include interventions considered to have high potential or that address a particular need in the country. A grading of the strength of the evidence of the effectiveness for the identified interventions is provided by indicating whether a Cochrane review¹⁴ has shown the intervention to be effective (*), or whether the DCP¹⁵ has recommended the intervention as effective (+) or cost-effective (‡). This review of the evidence cannot be considered exhaustive. Furthermore, limited data on the effectiveness of some of the interventions in the South African setting means that further work on local applicability and suitability will be needed. It must also be acknowledged that the more complex and structured the intervention, the less scope there is for assessing the effectiveness of interventions.

An integrated intervention framework

From Table I, it becomes clear that reducing exposure to many of these risk factors cannot be achieved by the health sector alone. Given the nature of the risk factors highlighted in this study, interventions will need to span three spheres: the social sphere, the health sphere, and the development sphere.

The social sphere

The three leading risk factors to health in South Africa (unsafe sex, interpersonal violence and alcohol use) are related to complex social factors and behaviours. Their substantial contribution to the burden of disease highlights the urgent need to build social cohesion and the political, community, religious and economic leadership in building the rights-based vision embedded in the South African Constitution. A sense of humanity (*ubuntu*) and a culture of respecting human rights and valuing life need to be fostered between individuals, between individuals and communities, and between individuals and societal institutions. Research to develop effective interventions, including structural interventions, needs to be encouraged.

The health sphere

The health sector has a central role in ameliorating the risk factors through a population-based approach to promote healthy lifestyles on the one hand, and early diagnosis and cost-effective management of risk factors and disease on the other.¹⁵ In the context of chronic disease prevention, the WHO refers to a healthy lifestyle in terms

of no tobacco use, good nutrition and increased physical activity.¹⁶ South Africa has made good progress on tobacco control at the macro-policy level.¹⁷ This has included legislation on advertising and distribution, restrictions on smoking in public places, increased taxation, health warnings on cigarette packages, and health-promoting campaigns. Indications are that the prevalence of smoking has dropped, although not for middle-class young people. Lessons from this experience need to be used to develop strategies to influence eating habits, increase levels of physical activity, and reduce alcohol use. Interventions are needed to make healthy choices easier for individuals. For example, make smoking more costly to individuals and increase the availability and decrease the price of fresh fruit and vegetables. At an individual level, risk factors for chronic diseases tend to coexist and have a synergistic impact on health. Consequently, it is essential that a complete assessment of an individual's risk profile be taken into account to identify the absolute risk for disease based on a comprehensive risk profile. Moderate reductions in several risk factors can therefore be more effective than major reductions in one,¹⁸ and this approach has been shown to be cost-effective for South Africa.¹¹

The development sphere

Poverty results in the inequitable distribution of disease, and there is consensus that sustainable development cannot be achieved where rates of incapacitating illness are high. Consequently, health was singled out as one of the five priority areas in the implementation plan drawn up at the World Summit on Sustainable Development in Johannesburg in 2002.¹⁹ The reduction of poverty is not an automatic consequence of development, particularly in the context of current globalisation trends in which the incomes of the rich continue to grow at a faster rate than those of the poor. Reducing poverty is a critical up-stream strategy for reducing risk factors for poor health such as undernutrition and unsafe water and sanitation. Specific policies and strategies in this regard are therefore needed, including the provision of basic services. It is also essential to ensure that development is sustainable so as to avoid harmful health effects such as pollution, and so ensure that the environment can provide for future generations. Noticeable efforts to extend the provision of water have been made in South Africa in recent years, and legislation regarding the lead content in petrol has been introduced. However, action is still needed to expand water and sanitation provision to marginal communities and rural areas, and to reduce exposure to indoor smoke from solid fuels. Efforts to reduce air pollution, particularly from industrial and motor vehicle emissions, are also needed. Poverty reduction strategies are complex and need careful monitoring and evaluation, inclusive of their impact on health. However, the importance of even small-scale intervention in this sphere should not be underestimated, as highlighted by the findings of several recent trials.^{8,20}



Intersectoral and multi-pronged approaches that operate at multiple levels will be required, including the individual and family level; the community level involving institutional or organisational structures; and the macro level, including public policy and legislation. At the macro level, it is also important to consider the negative effects of globalisation and how these might be mitigated. The health services can play an important role in the context of intersectoral interventions. Szreter has alluded recently to the important redistributive role of the social provision of health care in the context of progressive public health approaches.²¹ However, the publicly funded health services in South Africa, which provide health care to the majority of the population, face enormous challenges. These include human resource deficits; access to health

facilities in some areas; the management of health services, including the provision of drugs and other consumables, staff training, etc.; the poor integration of services provided by vertical programmes; and the financing of health care, including the maldistribution of health care resources in South Africa. These challenges need to be addressed in order to improve risk management in primary care, let alone deliver the health promotion activities needed, particularly for the poor. Review²² of our efforts to prevent mother-to-child transmission of HIV, for example, suggests that unless concerted and focused actions are taken, reductions in child mortality and meeting the Millennium Development Goals will remain elusive.

Table I. Selected risk factors, their rank, attributable DALYs as a percentage of total DALYs and potential interventions and recommendations, SA CRA 2000

Risk factor	Rank (% total DALYs)	Potential interventions and recommendations
Sexual and reproductive health		
Sexually transmitted disease burden/Unsafe sex	1 (31.5%)	<ul style="list-style-type: none"> • Strengthen the prevention of mother-to-child transmission programme,[†] and improve antenatal screening for syphilis. • Strengthen population-based interventions that target risky sexual behaviour, particularly among youth.[†] • Maintain promotion and distribution of condoms.[†] • Promote voluntary counselling and testing (e.g. through mass media[†]) and provider-initiated testing and counselling for HIV. • Strengthen STI control by promoting syndromic management[†] including the private sector (and review guideline). • Strengthen screening for cervical cancer, and promote regular utilisation of screening services. • Consider the promotion of male circumcision. • Improve access to highly active antiretroviral treatment,[*] placing particular emphasis on the current lack of human resources and infrastructure. • Improve access to cotrimoxazole in adults and children with HIV.[*] • Support research into microbicide and vaccine development. • Better understand underlying determinants to develop more effective interventions.
Violence		
Interpersonal violence: child sexual abuse, intimate partner violence	2 (8.4%)	<ul style="list-style-type: none"> • Seek effective strategies to change cultural norms regarding violence, gender and sexual relations through interventions such as working with young men, reducing media violence and establishing adult recreational programmes. • Increase positive adult involvement through family mentoring programmes to develop positive role models and build skills for non-violent conflict resolution,[†] set up home-school partnership programmes to promote parental involvement for primary school children and after-school programmes, to extend adult supervision of children. • Early interventions such as increasing preschool enrichment programmes,[†] and reducing unwanted teenage pregnancy may also be important. • Strengthen communities through education and child care (e.g. school-based programmes to reduce aggressive behaviour,[†] provide incentives to youth to complete secondary schooling,[†] academic enrichment programmes for children aged 12 to 19 years, etc.). Initiate social development programmes including social development training aimed at nurturing community cohesion and strengthening social capital.[†] Multi-sectoral efforts to reduce alcohol and substance abuse.[†] • Reduce income inequalities through job-creation programmes and initiatives such as micro-financing projects (particularly targeting women).



Table I. (continued) Selected risk factors, their rank, attributable DALYs as percentage of total and potential interventions and recommendations, SA CRA 2000

Risk factor	Rank (% total DALYs)	Potential interventions and recommendations
Interpersonal violence (continued)		<ul style="list-style-type: none"> • Improve the criminal justice and social welfare systems. Strengthen police and judicial systems to ensure more equitable access, protection and legal recourse. This must include better services for victims, witnesses and suspects as well as more streamlined and efficient investigation and judicial procedures. Set up temporary foster care programmes for chronic delinquents and therapeutic foster care for young children,[†] and home visitation services aimed at reducing child maltreatment.^{†‡} Prioritise community policing to develop safe environments and enforce the Firearms Control Act to decrease the number of guns in society.[‡] • Develop capacity for an appropriate health sector response – train health professionals to screen, examine, assist, support and refer victims of intimate partner violence or child sexual abuse[†] and adults abused as children. • Better understanding of the underlying determinants of violence to develop more effective interventions.
Addictive substances		
Alcohol harm	3 (7.0%)	<ul style="list-style-type: none"> • Regulate coherent liquor outlet policy including reduced hours for sales.^{†‡} • Increase alcohol excise tax.[‡] • Improve the enforcement of existing legislation/regulation regarding drinking and driving (e.g. random breath testing^{†‡}), minimum purchase age of alcohol (to address under-age drinking). • Restrict alcohol marketing, e.g. banning alcohol advertisements, and increase active forms of alcohol counter-advertising.^{†‡} • Universal abolition of the 'dop' system. • Strengthen the institutional support structures for recovering alcoholics including brief interventions^{†‡} at primary health care. • Programmes to prevent drinking during pregnancy.
Tobacco smoking	4 (4.0%)	<ul style="list-style-type: none"> • Tobacco legislation includes all recommendations of the WHO Framework Convention on Tobacco Control – but there is a need to further tighten, enforce and monitor the impact of tobacco regulation.^{†‡} • Implement smoking cessation programmes in primary care clinics.^{†‡} Target pregnant women[†] – particularly coloured women, who have among the highest female smoking prevalence in the world.
Physical inactivity and nutrition-related risk factors related to chronic diseases		
Excess body weight (high BMI)	5 (2.9%)	<ul style="list-style-type: none"> • Develop policies, legislation and action around the supply, availability, manufacturing, processing, marketing, advertising and pricing of food,[†] e.g. ensure wide availability and affordability of healthy foods; limit the salt content of manufactured foods through legislation and accompanying population-wide education;^{†‡} reduce the saturated fat content of food;^{†‡} limit the promotion of unhealthy food to children.[†] • Develop locally suitable health messages about preventing and reducing excess body weight, and ensure consistent messages on television, radio, and the print media.[†] • Implement community programmes to educate people about safe and effective prevention and management methods, and create environments that facilitate behaviour change towards healthier body weights.[†] • Promote regular and suitable exercise (including walking, callisthenics, stair stepping, stationary cycling, jogging, ball games) combined with dietary change for weight loss and improved health in persons with excess body weight.^{†‡} • Recognise the risks of obesity and the extent of excess body weight in children and adolescents. Prioritise research for effective prevention and reduction programmes in children and adolescents.[†] • Develop school programmes that integrate nutrition and physical activity into core curricula and/or lifestyles programmes, and healthy nutrition into school food/snack services.[†]



Table I. (continued) Selected risk factors, their rank, attributable DALYs as percentage of total and potential interventions and recommendations, SA CRA 2000

Risk factor	Rank (% total DALYs)	Potential interventions and recommendations
High blood pressure	8 (2.4%)	<ul style="list-style-type: none"> • Consider population-based approaches such as reduced salt[*] in bread and other commonly consumed food products. • Improve the diagnosis and management of high BP in primary care, as part of an absolute risk management approach. • Incorporate BP control into healthy lifestyle interventions. • Reduce alcohol intake. • Reduce overweight and obesity amongst hypertensives.[*]
Diabetes	9 (1.6%)	<ul style="list-style-type: none"> • Develop and evaluate healthy lifestyle programmes with emphasis on good nutrition, reduced overweight and obesity and increased physical activity. • Optimise primary care diagnosis and management of raised blood sugar included in absolute risk management,^{††} including organisational interventions.[*] • Provide cost-effective care for complications of diabetes.^{†‡}
High cholesterol	10 (1.4%)	<ul style="list-style-type: none"> • Consider population-based approaches to reduce dietary fat,[*] such as food information and awareness. • Improve the diagnosis and management of high cholesterol in primary care – as part of a total risk management.
Low fruit and vegetable intake	11 (1.1%)	<ul style="list-style-type: none"> • Tax and agricultural policies to promote production and availability of fruit and vegetables.[†] • School programmes that integrate nutrition in curricula and healthy nutrition into school feeding schemes.[†] • Develop and evaluate social marketing strategies to promote regular eating of fruit and vegetables. • Promote home and community vegetable/produce gardens.
Physical inactivity	12 (1.1%)	<ul style="list-style-type: none"> • Promote school, workplace, health care provider, and community physical activity programmes through educational interventions reaching large populations.[†] • Promote physical activity within a total risk management approach in primary care, and as part of secondary prevention after cardiovascular events or diabetes diagnoses.[*] • Develop locally-suitable health messages related to physical activity in co-operation with stakeholders so that consistent messages can be used on television, radio, and the print media.[†] • Promote professional advice and guidance with continued support to encourage people to be more physically active.[*] • Modify town, road and building designs to promote physical activity through safe walking, cycling, and use of stairs, and to improve access to public transportation.[†] • Assess and address the role of crime, violence and cultural beliefs as potential inhibitors of physical activity.
Childhood and maternal undernutrition		
Undernutrition	6 (2.7%)	<ul style="list-style-type: none"> • Strengthen poverty alleviation programmes. • Promote food gardens. • Strengthen clinic-based and community-based nutrition interventions. • Growth monitoring linked with education of mothers about healthy nutrition, particularly in poor settings.[†] • National monitoring of nutritional status and identification of 'at risk' communities. • Promote exclusive breastfeeding for first 6 months for HIV-negative mothers.^{††} Avoid mixed feeding for HIV-positive mothers – exclusive breastfeeding for first 3 months if formula feeding is not a safe and sustainable option.
Iron deficiency	13 (1.1%)	<ul style="list-style-type: none"> • Identify communities that remain at risk and would benefit from iron supplementation, and in the context of high HIV prevalence, it is essential to assess the individual woman as iron supplementation should not be given to HIV-positive pregnant women. • Monitor impact of food fortification programme.[†]



Table I. (continued) Selected risk factors, their rank, attributable DALYs as percentage of total and potential interventions and recommendations, SA CRA 2000

Risk factor	Rank (% total DALYs)	Potential interventions and recommendations
Vitamin A deficiency	14 (0.7%)	<ul style="list-style-type: none">• Identify clinics/districts where vitamin A supplementation is low and improve implementation of this intervention.• Monitor impact of the food fortification programme.[‡]
Environmental risks		
Unsafe water, sanitation and hygiene	7 (2.6%)	<ul style="list-style-type: none">• Improve access to safe and sustainable sanitation[†] and water facilities,^{†‡} particularly in poorly served urban and rural communities.• Promote hand-washing and improved hygiene.^{†‡}• Research the effectiveness of deworming programmes.
Indoor air pollution	15 (0.4%)	<ul style="list-style-type: none">• Move to cleaner burning fuels[†] such as electricity and gas, improved stoves,^{†‡} housing design with improved ventilation[†] and behavioural changes such as:<ul style="list-style-type: none">• Improve stove maintenance practices.[†]• Open ventilation for longer periods of time during burning of fossil fuels.• Move children to a location away from the stove during burning.[†]• Reduce the duration of solid fuel burning.• Reverse ignition process for coal (place coal underneath the easier burning material).• Promotion of outdoor burning in poor rural areas.
Lead	16 (0.4%)	<ul style="list-style-type: none">• Implement and monitor the regulation of lead content of paint and petrol.[†]• Improve public awareness of the sources and hazards of lead in homes, industry, 'cottage industries', cultural/traditional practices.• Set standards in South Africa for children's blood lead levels and develop protocols to respond to children with elevated blood lead levels.[‡]• Reduce occupational exposure (including para-occupational exposure and lead use in the informal sector).
Urban air pollution	17 (0.3%)	<ul style="list-style-type: none">• Create awareness of the health risks of urban air pollution.• Promote the use of public transport including land use strategies.• Move away from dirty fuels such as coal, wood and paraffin to cleaner fuels such as liquefied petroleum gas (LPG) and electricity and expand use of environmentally benign energy sources such as solar or wind power.• Air pollution control regulation to reduce the emissions from power plants[†] and industry[†] as well as volatile organic compounds at petrol filling stations.• Regulation on the use of two-stroke engines, open burning of wastes and the uncontrolled burning of forests and agricultural fields.• Monitoring and regulation of emissions from industry and traffic.[†]

*Supported by a Cochrane systematic review of effectiveness.

†Recommended by DCPD as effective.

‡Recommended by DCPD as cost-effective.

Strengthening public health through evidence and information

National efforts to develop and institutionalise public health in South Africa, and to monitor health outcomes, are necessary to improve the promotion of population health. The first South African National Burden of Disease (SA NBD) study synthesised extensive population health data and highlighted the substantial quadruple burden of disease comprising the simultaneous burden of chronic diseases, conditions related to underdevelopment, injuries and HIV/AIDS. Such information has been important in prioritising the conditions that should be addressed in order to improve the health of the nation and was used in the SA CRA to quantify the contribution of selected

modifiable risk factors that drive the burden of disease. The challenge now is to identify appropriate interventions to address these risk factors and where effective interventions have already been adopted, for example, prevention of mother-to-child transmission, to ensure that they are implemented appropriately. Table II outlines the steps that are required for policy makers, researchers and wider society to engage with the evidence and information and to work in partnership to improve the health of individuals, households and communities. The Western Cape Burden of Disease Reduction Project²³ of the provincial government has initiated a process that will provide an important model on translating research and evidence into policy and practice. This project is using an ecological model of the determinants of health, divided



Table II. Taking forward the SA CRA – steps for policy makers

- Promote discussion of the findings and recommendations of the CRA within national, provincial and local government departments, civil society and the private sector.
- Identify cost-effective interventions to reduce exposures to risk factors responsible for substantial disease burden and initiate reviews or primary research where evidence for the effectiveness of interventions is lacking.
- Prioritise interventions based on local applicability and acceptability. Key questions to address here include:
 - whether the interventions could work in the South African setting (feasibility)
 - what it would take to make them work
 - their impacts on equity, and
 - cost of sustaining such interventions.
- Formulate intersectoral policies for risk reduction at individual, community and macro-levels and across the social, health and development spheres.
- Develop national, provincial and district level implementation plans for interventions within programmes and allocate resources to achieving these.
- Develop strategic alliances to champion and advocate the processes at multiple levels.
- Monitor and evaluate policy and programme implementation and their effects on key health determinants and indicators.

Source: Adapted from Epping-Jordan *et al.*, 2005,²⁴ and Lavis *et al.*, 2004.²

into the up-stream and down-stream factors, and is currently focused on the more up-stream factors such as multiple deprivation. It has used the burden of disease methodology as an aid to prioritise and will use the public health approach of monitoring any interventions that are adopted.

Government needs to consider establishing and financing a mechanism, for example, a Public Health Foundation, to lead a public health initiative with the specific objective of improving population health through reducing the underlying risks to health. Underpinning any effort to improve the health of the nation is the institutional capacity to collect, analyse and utilise population health data at national, provincial and local levels, and to draw on the available evidence in the process of identifying appropriate interventions. Stronger capacity to review and synthesise such information, including modelling, is also required. For future risk factor assessments, for example, it would be useful to model the avoidable burden so as to assess the potential gains in health from reducing particular risk exposures, as well as the cost-effectiveness of doing so. Building such technical capacity needs to be done systematically and should be accompanied by strong advocacy for health and equity and co-ordination of concerted efforts in the various spheres. Such an investment in the health of the nation, in tandem with appropriate health services, should deliver positive returns beyond the health realm.

References

1. Norman R, Bradshaw D, Schneider M, *et al.* and the SA CRA Collaborating Group. A comparative risk assessment for South Africa in 2000: Towards promoting health and preventing disease. *S Afr Med J* 2007; 97: 637-641 (this issue).
2. Lavis JN, Posada FB, Haines A, Osei E. Use of research to inform public policymaking. *Lancet* 2004; 364 (9445): 1615-1621.
3. Oxman AD, Lavis JN, Fretheim A. Use of evidence in WHO recommendations. *Lancet* 2007; 369: 1883-1889.
4. Jamison DT, Breman JG, Measham AR, eds. *Disease Control Priorities in Developing Countries*. 2nd ed. Washington: Oxford University Press and The World Bank, 2006.
5. Ramjee G, Shattock R, Delany S, McGowan I, Morar N, Gottemoeller M. Microbicides 2006 conference. *AIDS Res Ther* 2006; 3: 25.
6. Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, Puren A. Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial. *PLoS Med* 2005; 2(11): e298. Epub 2005 Oct 25. Erratum in: *PLoS Med* 2006; 3(5): e298.
7. Jewkes R, Nduna M, Levin J, *et al.* Evaluation of Stepping Stones: A Gender Transformative HIV Prevention Intervention. Medical Research Council Policy Brief. Cape Town: Medical Research Council, 2007.
8. Pronyk PM, Hargreaves JR, Kim JC, *et al.* Effect of a structural intervention for the prevention of intimate-partner violence and HIV in rural South Africa: a cluster randomised trial. *Lancet* 2006; 368: 1973-1983.
9. Volmink J, Siegfried N, Robertson K, Gülmezoglu AM. Research synthesis and dissemination as a bridge to knowledge management: the Cochrane Collaboration. *Bull World Health Organ* 2004; 82(10): 778-783.
10. Hill S, Pang T. Leading by example: a culture change at WHO. Comment. *Lancet* 2007; Published online, 9 May 2007, DOI:10.1016/S0140-6736(07)60676-X.
11. Gaziano TA, Steyn K, Cohen DJ, Weinstein MC, Opie LH. Cost-effectiveness analysis of hypertension guidelines in South Africa: Absolute risk versus blood pressure level. *Circulation* 2005; 112: 3569-3576.
12. Skordis J, Natrass N. Paying to waste lives: the affordability of reducing mother-to-child transmission of HIV in South Africa. *J Health Econ* 2002; 21(3): 405-421. Erratum in: *J Health Econ* 2002; 21(5): 927.
13. Smedley BD, Syme SL, eds. *Promoting Health: Intervention Strategies from Social and Behavioural Research*. Washington, DC: National Academy Press, 2000.
14. The Cochrane Collaboration. *The Cochrane Library Database of Systematic Reviews*. Issue 2. Chichester: Wiley, 2007.
15. Steyn K. Conceptual framework for chronic diseases of lifestyle in South Africa. In: Steyn K, Fourie J, Temple N, eds. *Chronic Diseases of Lifestyle in South Africa 1995-2005*. Technical Report. Cape Town: Medical Research Council, 2006.
16. World Health Organization. *Preventing Chronic Diseases: A Vital Investment*. Geneva: World Health Organization, 2005.
17. Saloojee Y. Tobacco control in South Africa. In: Steyn K, Fourie J, Temple N, eds. *Chronic Diseases of Lifestyle in South Africa 1995-2005*. Technical Report. Cape Town: Medical Research Council, 2006.
18. Jackson R, Lawes CMM, Bennett DA, Milne RJ, Rodgers A. Treatment with drugs to lower blood pressure and blood cholesterol based on an individual's absolute cardiovascular risk. *Lancet* 2005; 365: 434-441.
19. Von Schirnding Y. The World Summit on Sustainable Development: reaffirming the centrality of health. *Global Health* 2005; 1(1): 8.
20. Manandhar DS, Osrin D, Shrestha BP, *et al.* and Members of the MIRA Makwanpur trial team. Effect of a participatory intervention with women's groups on birth outcomes in Nepal: cluster-randomised controlled trial. *Lancet* 2004; 364: 970-979.
21. Szeiter S. Rethinking McKeown: the relationship between public health and social change. *Am J Public Health* 2002; 92(5): 722-725.
22. Rollins N. Eliminating HIV and AIDS in infants and young children: Can an integrated approach to maternal and child survival make it a reality? 3rd South African AIDS Conference, 5-8 June 2007, Durban.
23. Myers JE, Naledi NT. Overview of the Western Cape Burden of Disease Reduction Project, Vol. 1. Identification of appropriate interventions targeting upstream risk factors of the principal components of the Provincial Burden of Disease and Recommendations for Policy. Cape Town: Provincial Government of the Western Cape, 2007.
24. Epping-Jordan JE, Galea G, Tukuitonga C, Beaglehole R. Preventing chronic diseases: taking stepwise action. *Lancet* 2005; 366: 1667-1671.