

COSTS AND BENEFITS OF ADDRESSING DIABETES AND SMOKELESS TOBACCO CONSUMPTION VIA COMMUNITY CLINICS

RUMANA HUQUE, EXECUTIVE DIRECTOR, ARK FOUNDATION, PROFESSOR OF ECONOMICS, UNIVERSITY OF DHAKA



Benefits and costs of addressing
Bangladesh's NCD burden



SMARTER SOLUTIONS
FOR
BANGLADESH



Costs and Benefits of addressing Diabetes and Smokeless Tobacco Consumption via Community Clinics

Bangladesh Priorities

Rumana Huque

Executive Director, ARK Foundation, Professor of Economics, University of Dhaka

© 2016 Copenhagen Consensus Center

info@copenhagenconsensus.com

www.copenhagenconsensus.com

This work has been produced as a part of the Bangladesh Priorities project, a collaboration between Copenhagen Consensus Center and BRAC Research and Evaluation Department.

The Bangladesh Priorities project was made possible by a generous grant from the C&A Foundation.

Some rights reserved



This work is available under the Creative Commons Attribution 4.0 International license ([CC BY 4.0](https://creativecommons.org/licenses/by/4.0/)). Under the Creative Commons Attribution license, you are free to copy, distribute, transmit, and adapt this work, including for commercial purposes, under the following conditions:

Attribution

Please cite the work as follows: #AUTHOR NAME#, #PAPER TITLE#, Bangladesh Priorities, Copenhagen Consensus Center, 2016. License: Creative Commons Attribution CC BY 4.0.

Third-party content

Copenhagen Consensus Center does not necessarily own each component of the content contained within the work. If you wish to re-use a component of the work, it is your responsibility to determine whether permission is needed for that re-use and to obtain permission from the copyright owner. Examples of components can include, but are not limited to, tables, figures, or images.

INTRODUCTION	1
GLOBAL AND BANGLADESHI CONTEXT OF NCDs	1
COMMUNITY CLINICS – A VEHICLE FOR NCD CONTROL	2
<i>Issue #1: Diabetes Control</i>	2
<i>Issue #2: Smokeless Tobacco Control</i>	3
COSTS AND BENEFITS OF INTERVENTIONS	5
INTERVENTION 1: SCREENING AND TREATMENT OF DIABETES THROUGH CCs	5
<i>Costs</i>	5
<i>Benefits</i>	6
INTERVENTION 2: NICOTINE REPLACEMENT THERAPY (NRT) AND PHARMACOTHERAPY OR CLINICAL INTERVENTION PROGRAMME FOR SMOKELESS TOBACCO (SLT) THROUGH CCs.....	7
<i>Costs</i>	7
<i>Benefits</i>	8
SUMMARY OF RESULTS AND CONCLUSION	10
REFERENCES	11
APPENDIX	14

Introduction

Global and Bangladeshi Context of NCDs

Non-communicable diseases (NCDs), principally heart disease, stroke, cancer, diabetes, and chronic respiratory diseases are the largest cause of mortality both globally and in the majority of low- and middle- income countries (LMICs). (Nugent, R., 2015) causing 63% of all deaths worldwide (Bloom et al., 2012). Despite increasing awareness and commitment to address chronic disease, concrete actions by global partners to plan and implement cost-effective interventions are inadequate. Most low- and middle- income countries are facing a rise of the burden of non-communicable diseases (NCDs) alongside the persistent burden of infectious diseases (Metta et al., 2014).

Hunter & Reddy (2013) found that the economic consequences of non-communicable diseases are very large, because of the combined burden of health care costs and lost economic productivity due to illness and premature deaths. A study commissioned by the World Economic Forum concluded that the world will sustain a cumulative output loss of \$47 trillion between 2011 and 2030 because of non-communicable diseases and mental illness, about \$30 trillion of which will be attributable to cardiovascular diseases, cancers, chronic pulmonary diseases, and diabetes.

Bangladesh is passing through a period of demographic transition where the burden of disease is shifting alarmingly from a disease profile dominated by infectious diseases to one increasingly characterised by non-communicable diseases (NCDs). The 2010 National NCD risk factor survey showed 99% of those surveyed had at least one NCD risk factor and 29% had more than 3 risk factors (Bangladesh NCD Risk Factor Survey, MOHFW, 2010). In Bangladesh, NCDs impose a huge health burden on its health system. Moreover, NCDs contribute to the nation's burden of poverty; retard national development and can widen the health inequities within country. Combined with the direct health care costs, the economic impact of early death and disability is potentially devastating on the individuals and the family. In 1986, NCD's represented 8% of total deaths compared to 52% of deaths due to communicable diseases. The burden of NCDs now surpasses infectious diseases in the country and now account for 61% of all adult deaths in Bangladesh (Editorial, BIRDEM Med J, 2012).

Community Clinics – A vehicle for NCD control

Since 2009, Bangladesh has established 14,000 community clinics (CCs) with each clinic covering 6000 population, to bring health care to the community doorstep. People can avail of health, family planning and nutrition services in CCs and within half-an-hour walking distance from their homes, even in remote areas. CCs have contributed significantly to the improvement of the antenatal and postnatal care, reproductive health, family planning services, and services to cure diarrhea, pneumonia and other childhood infections (WHO 2015).

An evaluation report by the Implementation Monitoring and Evaluation Division (IMED) of the Bangladesh Planning Ministry has noted that the number of people visiting community clinics is increasing due to the proximity of the clinics to their homes and the provision of free medicines for common ailments. A 2014 report also points out that 80% to 98% satisfaction among people who have used community clinic services¹.

Although, health care services are now closer to the door-step of households in Bangladesh through CCs, and the users are found to be satisfied and better-off as well, provision of NCD management services through CCs are yet to start. At the same time some services related to NCDs are cost-effective to provide at community levels (Nugent 2015). For example, though community clinic it is possible to provide aspirin therapy, hypertension management, secondary prevention for CVDs and diabetes, awareness building against tobacco consumption cost-effectively.

This note addresses two important issues in NCDs in Bangladesh – diabetes and smokeless tobacco control, suggesting that screening, treatment and information be provided through the already established network of community clinics.

Issue #1: Diabetes Control

Prevalence of diabetes mellitus in urban and rural populations are 10% and 7% respectively. The prevalence of diabetes was 0.7% in 1980, which increased to 11% in 2012 (BDHS, 2012). The trend of diabetes in rural areas has increased from 0.003% in 1976 to 6.8% in 2007 (Saquib et al, 2012). The International Diabetes Federation estimates that by 2025, 7.4 million people in Bangladesh will have diabetes, placing Bangladesh among the top ten countries for number of people living with diabetes (WHO, 2005). However, the majority of patients with diabetes are going undetected: only a small percentage of patients with diabetes are being cared for according to the internationally recommended guidelines; mostly in specialist clinics such as BADAS2 hospitals/health centres, and in

¹<http://www.searo.who.int/mediacentre/events/community-clinics-bangladesh-story/en/>

² Bangladesh Association of Diabetics (BADAS)

other privately managed specialist centres/clinics. This is why health care costs related to NCDs are significant. For the socio-economically disadvantaged, the out-of-pocket expenditure for NCDs can be catastrophic.

Bangladesh recognises NCDs as a major health threat and much progress has been made especially in policy development. Although Bangladesh has developed and adopted a comprehensive national strategic plan for prevention and treatment of NCDs in 2007 (revised in 2011), there has been limited progress in regard to implementation of the plan. Moreover, the care and prevention of Diabetes has not been effectively integrated into the core primary health care package. For example, the “Essential Services Package (ESP)”³ currently focuses on communicable diseases and limited curative care; it does not include the care for diabetes. In addition, the health care providers at Primary care levels are not trained to manage these conditions; consequently for these health issues, people routinely turn to unlicensed providers for treatment. While there are provisions of prevention of NCDs, there is a need for better management of people with NCD-diabetes at their various stages.

As the NCD burden grows, ensuring that health systems can adequately address NCDs becomes integral to augmenting the capacity of health systems to meet evolving health challenges. Health service delivery needs to adapt to transition from a predominantly acute care model to one that balances prevention with disease management and long-term palliative care. For this to occur, integrating NCD prevention and management into primary health care is essential.

Issue #2: Smokeless Tobacco Control

The term ‘smokeless tobacco’ (SLT) implies use of any unburned tobacco in the finished product that can be consumed orally or nasally. There is a great diversity of smokeless tobacco products and smokeless tobacco use patterns across the globe, and it refers to more than 30 different products, broadly categorized as ‘spit tobacco’ or ‘chewing tobacco’ (Gupta and Ray, 2003; Gupta and Sreevidya, 2004). Its use is relatively high in South and South-East Asia where one-third of tobacco is consumed in smokeless form (Palipudi et al, 2014). Tobacco is being chewed in multiple forms in South Asia: betel quid, leaf alone, leaf with lime, tobacco with areca nut preparation, and tobacco water, and the pattern of consumption varies across countries by differing socio-cultural norms, habits, peer influences, availability, accessibility and legislations in place.

Current SLT use prevalence is especially high (>15%) among adults in Myanmar, Bangladesh, India, Bhutan, Nepal, Pakistan and Sri Lanka (Ahmed et al, 1997). A quarter of adults in Bangladesh and India and a fifth in Pakistan use smokeless tobacco (Eriksen et al, 2012). SLT use is considered as the

³In Bangladesh, primary health care is being provided under the banner of Essential Services Package (ESP)

predominant form of tobacco use in Bangladesh (Hatsukami et al, 2014). Easy availability, low price and affordability, misconceptions regarding its useful health effects, increasing population, lack of tobacco control regulations and weak enforcement of existing regulations contribute to the increase in tobacco consumption in Bangladesh.

In Bangladesh and other South Asian countries, SLT is very popular. Though traditional values and social norms do not favor smoking by the young or by women, there is no such taboo against smokeless tobacco (Choudhury et al, 2007), being incorporated in traditional values, spirituality, beliefs, festivals, lifestyle, and rituals such as marriage and popular entertainment (Ashraf et al, 2009). Use of smokeless tobacco as a component of betel quid is an integral well-embedded traditional practice that is culturally accepted in Bangladesh (Flora et al, 2009), and an estimated 20–30% of women in the rural areas use SLT as a tradition (Imam et al, 2007), serve it to their guests in cultural celebrations (Rahman et al, 2012), and equate it to confectionary (Gupta and Sreevidya, 2004). One of the predominant reasons for increased consumption of SLT is the ‘social acceptability’ attached to its use.

Many myths and misconceptions are attached to SLT use which are deeply rooted, especially in the rural populations such as, SLT use helps to aid digestion if taken after meal, pain relief, curing toothache, headache and stomach ache, to cope with boredom, frustration and for mental relaxation purposes, relieving tension, aiding concentration, combating bad breath, protection from snake and scorpion venom, and its use less harmful than smoking tobacco (Kulkarni et al, 2012; Daniel et al, 2008). Some forms are believed to make women feel better from morning sickness during pregnancy, and as such pregnant women use tobacco water during pregnancy. Curiosity, peer pressure, and offers by friends and acquaintances contribute to initiation of SLT use (Hossain et al, 2010). Some parents even encourage their children to use SLT (Gupta and Ray, 2003). Such a permissive environment makes it easier to get addicted. This is reflected in GYTS, indicating high prevalence of SLT use among 13 to 15 year olds in Bangladesh (WHO, 2004; Zaman et al, 2013).

Though evidence is limited in Bangladesh, a number of studies show strong and consistent evidence to indicate significant risk of oral cancer and pharyngeal cancer, oral neoplasia, oesophageal cancer, and pancreatic cancer, poor oro-dental health, risk of hypertension and cardiovascular diseases, and adverse effects on reproductive health (especially during pregnancy with birth complications, fetal loss, low birth weight, prematurity) with SLT use in India and other Asian countries (Gupta and Ray, 2003; Mehrotra and Yadav 2015; Teo et al, 2006; Pandey et al, 2009).

Despite high prevalence of SLT use and associated morbidity and mortality, there are no cessation services available for SLT users in different tiers at public health care facilities in Bangladesh. National Heart Foundation, a leading hospital and research institute in Bangladesh, jointly with Hypertension clinic has recently started a tobacco cessation clinic.

Costs and Benefits of Interventions

Intervention 1: Screening and Treatment of Diabetes through CCs

Costs

There are currently about 7.0 million people in Bangladesh having diabetes (IDF, 2015), and this number is projected to rise to more than 10.0 million by 2030 (IDF 2015). For the purposes of this analysis we have taken the 7m number as the indicative figure of diabetes burden in Bangladesh, with only 3.4m of these cases accurately diagnosed (IDF, 2015). We propose a screening and treatment programme for diabetes. In our analysis, we target the population aged 25 year and above. We estimate that 40% of the population (adjusted for diabetics who have been already diagnosed) can be screened via community clinics over a period of 5 years at a cost of \$5 per person (Authors' assumption based on cost of screening, paper works, and documentation of diabetic people and set up referral, arranging diabetic screening days and camps etc.). Under these assumptions, this approach would screen 37m people and successfully diagnose 2.8m cases of undetected diabetes. The total cost of screening is \$185m USD.

We also propose that treatment options be available to those whose screenings detect diabetes. These patients will be referred to Upazilla Health Complex/ District Hospitals and will be provided treatment there. However, for information about life-style, medicine etc. patient with diabetes can consult in community clinics later. Later, they can also check their sugar level at community clinics by giving user-fees. While treatment of diabetic patient can be extremely simple to very expensive and complex, we assume the average patient will need relatively low-cost and lost-technology treatment of \$51 per year (IDF 2015). While cost-sharing can be introduced to reduce the budgetary pressure of the Government, in this study we assume that the entire cost will be borne by the Government. We assume that a diabetic patient detected at a community clinic and referred for secondary care will on average require treatment for 30 years.

As per our calculation about 2.8 million people will be detected as diabetic patients through screening in Community Clinics. Detected patients will be referred to Upazilla Health Complexes/District Hospitals where appropriate to receive the treatment. Treatment of 2.8 million diabetic patients will require approximately \$144.8 million per year. Hence total cost of screening at

CCs and treatment at Upazilla Health Complexes/ District Hospitals in first wave will be approximately \$330 million (approximately 0.2% of the total budget of the government for five years and less than 0.2% of the GDP of one year) in first. After first year detected patients will require \$144.8 million every year for the next 30 years.

Benefits

A combined strategy of screening of diabetes, followed by treatment when appropriate, can reduce DALYs by 3.8 years for each patient over the course of their life (Zia 2011). This is estimated from the difference of DALYs lost due to diabetes with complications and DALY loss due to diabetes without complications in rural areas taking the mid values estimated by Zia (2011). Hence a total of 10.8 million of DALYs will be saved due to screening and treatment of diabetes at early stages over the course of 30 year time horizon for the first cohort of people (screened and) treated. On average this translates to 0.13 DALYs averted every year. For 2.8m people, every year a total of 0.36 million DALYs will be averted among the target population. In line with the standard practice if we assume that 1 DALY gain is equivalent to per capita GDP of the corresponding economy, and that in Bangladesh per capita GDP is \$1,285.00 (World Bank, 2014), then the monetary benefit of saving 0.36 million DALY every year is equivalent to \$426.62 million every year. Given a very restrictive assumption that the per capita GDP will remain the same over the next 30 years, a monetary benefit worth of \$426.62 million will be generated at a cost of \$330.00 million in first year and \$144.8 million every year in subsequent years for 30 years.

At 3% discount rate, the net present value (NPV) of the total cost of the programme will be \$3,018.64 million while the NPV of the benefit will be \$9,060 million USD. The benefit cost ratio of the programme, if the discount rate is 3%, is 3, implying that for each dollar spending for treating diabetic patients, a return of 3\$ minimum is expected. Even, if we assume that the discount rate is 5% or 10%, benefit-cost ratio will be 2.96 and 2.84 respectively. Even if we safely assume that the actual benefit will be half of the calculated benefit (for example due to non-compliance with treatment), 0.065 DALYs per year per patient, the programme still represents value for money as the benefit-cost ratio will be 1.5, 1.48 and 1.42 for discount rate 3%, 5% and 10% respectively.

The results suggest that this first wave of screening followed by treatment should be considered very carefully by the government of Bangladesh. If initially the programme is taken for a period of five years and the detected patients are provided treatment on cost sharing basis of 50:50 after first year, then the budgetary pressure of the government will also decrease while because of the positive benefits of treatment, the patients will continue to receive care.

After first wave of the intervention (screening of the entire population aged more than 25 covered by the CCs, and treatment of those who detected), regular screening can be arranged in regular intervals which will detect new patients from the previously non-detected population and newly entered population in the age group.

For a country like Bangladesh, arranging special 'screening months' for diabetes through CCs and providing treatment through referral is likely the best strategy. To summarize:

- Diabetic screening and treatment programme through CCs will require approximately 330.0 million USD in first year and approximately \$145.00 million in subsequent years.
- Screening will take place in several defined months through CCs (every day 100 people will be screened and documented in each CC in those months). Government will bear the cost of screening.
- Those who will be detected as diabetic patients, they will be referred to the Upazilla Health Complexes/ District Hospitals for treatment. They will be provided treatment there.
- The allocation for detection of diabetes and treatment through CCs and Upazilla Health Complexes can be made through the Government Budget in five years which will not create significant budgetary pressure.
- Moreover, for funding and management, Government and relevant authorities can contact other governments and multinational organizations.
- Whatever may be the form of budget allocation for treating diabetes, it is important to address the issue as the incidence and consequences of diabetes are projected to increase over time.
- Overall, though the budget is quite high, the benefit cost ratio is also greater than 1 and in favor of the programme for most restrictive scenarios also: per capita GDP will remain the same 30 years, 10% discount rate and only half of the benefit will actually be materialized.

Intervention 2: Nicotine Replacement Therapy (NRT) and Pharmacotherapy or clinical intervention programme for Smokeless Tobacco (SLT) through CCs

Costs

The prevalence of Smokeless tobacco (SLT) usage is 27.9% in Bangladesh. (Sinha *et al*, 2012). Health hazards (like circulatory and respiratory disorders, Hypertension and cardiovascular diseases) are associated with the use of smokeless tobacco. (Bolinder *et al*, 1992). We propose a clinical tobacco intervention programme for SLT along with the provision of nicotine supplements products through CCs. Two possible solutions are behavioral therapy and awareness building (Hatsukami & Boyle

1997) and pharmacotherapy or clinical intervention programme by providing nicotine substitutable products and medicine (Jorenby *et al*, 1999).

Behavioral Therapy and Awareness building programme can be run through: school based campaign (Sussman *et al*, 1993) through providing training to the teachers, mass media campaign, counseling sessions in the CCs in weekly or monthly basis and, distributing leaflets and posters in the social and religious institutions (including mosque, temples, pagoda). On the other hand, pharmacotherapy or clinical intervention programme for Smokeless Tobacco (SLT) through CCs can be done by providing Champix (varenicline), Zyban/Bupropion SR or Tabex (Cytisine) and by providing Nicotine supplements like gum, inhalers, lozenges, nasal spray, skin patch at 50% subsidized price through CCs. Different studies like Jorenby *et al* (1999), Patel *et al* (2010) shows high efficacy rate of clinical intervention in the cessation of smokeless tobacco.

Approximately 44.7 million people in Bangladesh consume smokeless tobacco regularly. This study proposes to provide Nicotine supplements products through CCs to SLT consumers. Through CCs approximately 19.2 million SLT consumers can be provided clinical treatment. Here we assess the cost (and benefits below) of two potential treatments: nicotine gum and Zyban / Bupropion.

Clinical Tobacco Intervention Programme (CTIP) – Generalist Module (BC cancer agency, 2011) finds the cost of providing gum ranges from \$150 to \$400 for 12 weeks, with costs in Bangladesh expected to be at the lower end of this range. Thus, minimum the cost of providing gum to SLT consumers through CCs is 2,884.6 million USD.

Similarly, Clinical Tobacco Intervention Programme (CTIP) – Generalist Module (BC cancer agency, 2011) finds the cost of providing Medicine: Zyban/ Bupropion SR are \$123.00 for 12 weeks per person. The cost of providing Medicine: Zyban/ Bupropion SR to SLT consumers through CC are \$2365.4 million.

Benefits

Schneider *et al* (1983) shows a one-year 30% efficacy rate for nicotine supplement chewing gum, while Patel *et al* (2010) shows success rate of Zyban/ Bupropion SR is 50%.

Diseases attributable to smokeless tobacco consumption lead to an average loss of 7 years of life per user in Bangladesh (Nargis 2015). Even if we assume that (i) the patients will receive treatment on average when their age is 40 and (ii) the benefit they will then enjoy life expectancy at the national rate, 70 years; this means on average the benefit of the programme will be materialized after 23 years. Assuming the value of one DALY equals GDP per capita in 2015, the discounted monetary

benefit of the programme will be \$13,301 million USD for nicotine gum and \$22,169 million USD for Zyban / Bupropion SR at the 5% discount rate. This indicates a benefit-cost ratio of 4.6 for nicotine gum and 9.4 for Zyban / Bupropion SR. In fact, per capita GDP will definitely increase over time and be significantly larger in 23 years, suggesting the benefit-cost ratio could be much higher than those estimated here.

Nicotine Replacement Therapy (NRT) and Pharmacotherapy or clinical intervention programme for Smokeless Tobacco (SLT) through CCs not only provides a high benefit cost ratio, but also prevents SLT consumers from being affected from serious diseases like CVD, hypertension and cancer.

Summary of Results and Conclusion

The results of this analysis are summarized in Table 1 below (at the 5% discount rate, other discount rates are provided in the appendix). A couple of salient points arise from this overview. Firstly, diabetes treatment has a greater absolute benefit per person treated than smokeless tobacco control, though it is offset by a significantly higher cost. This is because diabetes requires continuous treatment, whereas nicotine replacement therapy is a ‘one off’ intervention. As a result, the BCRs for nicotine replacement therapy are higher than diabetes screening and treatment.

Secondly, the results suggest that Zyban is clearly the superior option for SLT control over nicotine gum, being both less costly per person and generating more benefits.

All of these interventions come at significant cost between \$2.3 to \$2.9 Bn USD in net present value terms or equivalent to 8-10% of a single year of government spending. However, with a gradual ramp up of both interventions to amortize costs over a longer time horizon, and cost share with both users and international organizations, the interventions presented here are within the realm of affordability for the Government of Bangladesh. Certainly both issues merit significant attention given the large and growing burden of these diseases.

Table 1: Costs and Benefits of Community Clinic Interventions to Address NCDs – 5% discount level

Intervention	Costs millions USD	Benefits millions USD	Cost per person treated	Benefits per person treated	BCR
Screening and treatment of diabetes via community clinics	\$2,403	\$7,106	\$846	\$2,502	2.96
Nicotine replacement therapy via community clinics - nicotine gum	\$2,885	\$13,301	\$150	\$692	4.61
Nicotine replacement therapy via community clinics - Zyban	\$2,365	\$22,169	\$123	\$1,153	9.37

References

- Ahmed S, Rahman A, Hull S. (1997) Use of betel quid and cigarettes among Bangladeshi patients in an inner-city practice: prevalence and knowledge of health effects. *Br J Gen Pract*; 47:431–34.
- Ashraf A, Quaiyum M A, Ng N, Minh HV, Razzaque A, Ahmed SM, et al. (2009) Self-reported use of tobacco products in nine rural INDEPTH Health and Demographic Surveillance Systems in Asia. *Global Health Action*; 19, Open Access.
- BDHS (2012) Bangladesh demographic and health survey 2004 Dhaka: National Institute of Population Research and Training, Mitra and Associates and Macro International.
- Bangladesh NCD Risk Factor Survey (2010) Bangladesh NCD Risk Factor Survey, DGHS, Ministry of Health and Family Welfare of Bangladesh
- Bolinder, G. M., Ahlborg, B. O., & Lindell, J. H. (1992). Use of smokeless tobacco: blood pressure elevation and other health hazards found in a large-scale population survey. *Journal of internal medicine*, 232(4), 327-334.
- Choudhury K, Hanifi SMA, Mahmood SS, Bhuiya A. (2007) Socio-demographic characteristics of Tobacco Consumers in a Rural Area of Bangladesh. *J Health Popul Nutr.*; 25:456-464.
- Daniel AB, Nagaraj K, Kamath R. (2008) Prevalence and determinants of tobacco use in a highly literate rural community in southern India. *The National Medical Journal of India.*; 21(4): 163-65.
- Flora MS, Mascie-Taylor CGN, Rahman M. (2009) Gender and locality differences in tobacco prevalence among adult Bangladeshis. *Tobacco Control*; 18: 445–450.
- Gupta PC, Ray CS (2003) Smokeless tobacco and health in India and South Asia. *Respirology.*; 8(4):419-431.
- Gupta PC, Sreevidya S. (2004) Smokeless tobacco use, birth weight, and gestational age: population based, prospective cohort study of 1217 women in Mumbai, India. *BMJ.*; 26: 1538-40.
- Editorial (2012) *BIRDEM Medical Journal*; 2(1): 3
- Eriksen M, Mackay J, Ross H. (2012) *The Tobacco Atlas*. Fourth Ed. Atlanta, Georgia: World Lung Foundation.
- Hatsukami, D. K., & Boyle, R. G. (1997). Prevention and treatment of smokeless tobacco use. *Advances in dental research*, 11(3), 342-349.
- Hatsukami D, Mitch Z, Prakash G, Mark P, Samira A. (2014) *Smokeless Tobacco and Public Health: A Global Perspective*. National Cancer Institute and the Centers for Disease Control and Prevention.
- Hossain MS, Kypri K, Rahman B, Arslan I, Akter S, Milton AH. (2014) Prevalence and Correlates of Smokeless Tobacco Consumption among Married Women in Rural Bangladesh. *PLoS ONE.*; 9(1): e84470.

- Imam SZ, Nawaz H, Sepah YJ, Pabaney AH, Ilyas M, Ghaffar S. (. 2007) Use of smokeless tobacco among groups of Pakistani medical students - a cross sectional study. *BMC Public Health*; 7: 231 -36.
- Jorenby, D. E., Leischow, S. J., Nides, M. A., Rennard, S. I., Johnston, J. A., Hughes, A. R., ... & Fiore, M. C. (1999). A controlled trial of sustained-release bupropion, a nicotine patch, or both for smoking cessation. *New England Journal of Medicine*, 340(9), 685-691.
- Kulkarni K, Hiremath LD, Manjula R, Mallapur A, Mannapur B, Ghattargi CH. (2012) Profile of tobacco consumption among females of more than 15years of age in field practice area of RHTC Kaladagi. *Medica Innovatica*.. Retrieved from <http://imsear.li.mahidol.ac.th/handle/123456789/143632>.
- Mehrotra R, Yadav S. (2015) Oral squamous cell carcinoma: Etiology, pathogenesis and prognostic value of genomic alterations. *Indian Journal of Cancer*. 119.30.39.102
- Nargis, N., Hussain, A. K. M. G., & Fong, G. T. (2014). Smokeless tobacco product prices and taxation in Bangladesh: Findings from the ITC Survey. *Indian journal of cancer*, 51(0 1), S33.
- Nargis, Nigar, et al. (2015)"Prevalence and Patterns of Tobacco Use in Bangladesh from 2009 to 2012: Evidence from International Tobacco Control (ITC) Study." *PloS one* 10.11: e0141135.
- Palipudi K, Rizwan SA, Sinha DN, Andes LJ, Amarchand R, Krishnan A, et al. (2014) Prevalence and socio demographic determinants of tobacco use in four countries of the World Health Organization: South-East Asia region: findings from the Global Adult Tobacco Survey. *Indian J Cancer*; 51:S24–32.
- Pandey A, Patni N, Sarangi S, Singh M, Sharma K, Vellimana AK, et al.(2009) Association of exclusive smokeless tobacco consumption with hypertension in an adult male rural population of India. *Tobacco Induced Diseases*; 5:15
- Patel, D. R., Feucht, C., Reid, L., & Patel, N. D. (2010). Pharmacologic agents for smoking cessation: a clinical review. *Clin Pharmacol*, 2, 17-29.
- Rahman MA, Mahmood MA, Spurrier N, Rahman M, Choudhury SR, Leeder S. (2012) Why Do Bangladeshi People Use Smokeless Tobacco Products? *Asia Pac J Public Health*; 27(2): 2197-209.
- Schneider, N. G., Jarvik, M. E., Forsythe, A. B., Read, L. L., Elliott, M. L., & Schweiger, A. (1983). Nicotine gum in smoking cessation: a placebo-controlled, double-blind trial. *Addictive behaviors*, 8(3), 253-261.
- Saquib N, Saquib J, Ahmed T, Khanam MA and Cullen MR (2012). Cardiovascular diseases and type 2 diabetes in Bangladesh: a systematic review and meta-analysis of studies between 1995 and 2010. *BMC Public Health*. 12: 434.
- Sinha, D. N., Gupta, P. C., Ray, C. S., & Singh, P. K. (2012). Prevalence of smokeless tobacco use among adults in WHO South-East Asia. *Indian journal of cancer*, 49(4), 342.
- Sinha, D. N., Rizwan, S. A., Aryal, K., Karki, K. B., Zaman, M. M., & Gupta, P. C. (2015). Trends of smokeless tobacco use among adults (aged 15-49 years) in Bangladesh, India and Nepal. *Asian Pac J Cancer Prev*, 16, 6561-8.

Sultana, P., Akter, S., Rahman, M., & Alam, M. (2015). Prevalence and Predictors of Current Tobacco Smoking in Bangladesh. *J Biometrics App*, 1(1), 102.

Sussman, S., Dent, C. W., Stacy, A. W., Sun, P., Craig, S., Simon, T. R., ... & Flay, B. R. (1993). Project towards no tobacco use: 1-year behavior outcomes. *American Journal of Public Health*, 83(9), 1245-1250.

Teo K K, Stephanie O, Steven H, Pandey MR, Vicent V, Hunt D, et al. (2006) Tobacco use and risk of myocardial infarction in 52 countries in the INTERHEART study: a case-control study. *Lancet*. 2006; 368: 647–58

WHO (2005). Estimates of disease burden for 2005.

World Health Organisation. Oral Tobacco use and its implications in South -East Asia. WHO SEARO, New Delhi. 2004.

Zaman MM, Bhuiya MR, Karim MN, Zaman M, Rahman MM, Akanda AW, et al. (2013) Clustering of non-communicable diseases risk factors in Bangladesh adults: An analysis of STEPS survey 2013. *BMC Public Health*; 15: 659-67.

Appendix

Table A1: Costs and Benefits of Community Clinic Interventions to Address NCDs 3% discount level

Intervention	Costs millions USD	Benefits millions USD	Cost per person treated	Benefits per person treated	BCR
Screening and treatment of diabetes via community clinics	\$3,019	\$9,061	\$1,063	\$3,190	3.00
Nicotine replacement therapy via community clinics - nicotine gum	\$2,885	\$22,722	\$150	\$1,182	7.88
Nicotine replacement therapy via community clinics - Zyban	\$2,365	\$37,870	\$123	\$1,969	16.01

Table A2: Costs and Benefits of Community Clinic Interventions to Address NCDs 10% discount level

Intervention	Costs millions USD	Benefits millions USD	Cost per person treated	Benefits per person treated	BCR
Screening and treatment of diabetes via community clinics	\$1,534	\$4,358	\$36.49	\$103.67	2.84
Nicotine replacement therapy via community clinics - nicotine gum	\$2,885	\$3,664	\$150	\$191	1.27
Nicotine replacement therapy via community clinics - Zyban	\$2,365	\$6,107	\$123	\$318	2.58

Bangladesh, like most nations, faces a large number of challenges. What should be the top priorities for policy makers, international donors, NGOs and businesses? With limited resources and time, it is crucial that focus is informed by what will do the most good for each taka spent. The Bangladesh Priorities project, a collaboration between Copenhagen Consensus and BRAC, works with stakeholders across Bangladesh to find, analyze, rank and disseminate the best solutions for the country. We engage Bangladeshis from all parts of society, through readers of newspapers, along with NGOs, decision makers, sector experts and businesses to propose the best solutions. We have commissioned some of the best economists from Bangladesh and the world to calculate the social, environmental and economic costs and benefits of these proposals. This research will help set priorities for the country through a nationwide conversation about what the smart - and not-so-smart - solutions are for Bangladesh's future.

SMARTER SOLUTIONS FOR BANGLADESH

For more information visit www.Bangladesh-Priorities.com

C O P E N H A G E N C O N S E N S U S C E N T E R

Copenhagen Consensus Center is a think tank that investigates and publishes the best policies and investment opportunities based on social good (measured in dollars, but also incorporating e.g. welfare, health and environmental protection) for every dollar spent. The Copenhagen Consensus was conceived to address a fundamental, but overlooked topic in international development: In a world with limited budgets and attention spans, we need to find effective ways to do the most good for the most people. The Copenhagen Consensus works with 300+ of the world's top economists including 7 Nobel Laureates to prioritize solutions to the world's biggest problems, on the basis of data and cost-benefit analysis.