BENEFIT-COST ANALYSIS

NON-COMMUNICABLE DISEASES

Screening and treatment for non-communicable diseases: the case for RAJASTHAN

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A Benefit-Cost Analysis of Screening and Treatment for Non-Communicable Diseases: the case for Rajasthan

Rajasthan Priorities
An Indian Consensus Prioritization Project

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Academic Abstract

India is currently undergoing an epidemiological transition, with rising morbidity and mortality due to non-communicable diseases (NCDs). Current interventions to address cardio-vascular diseases (CVDs) and cancers have not achieved levels of coverage that could effectively reverse this trend for various systemic reasons. Given the Government of India's overall objective to achieve Universal Health Coverage, there is a need to re-orient the approach more towards early detection, resulting in lowered treatment costs and improved treatment outcomes, through population-based NCD screening and treatment programs.

This paper examines four such interventions for individuals between 30-69 years that can be delivered through the existing primary health care network: (i) Secondary prevention of CVD through the use of a multidrug polypill; (ii) Diabetes screening and treatment with Metformin therapy; (iii) Cervical cancer screening and treatment through VIA/VILI screening (one time) followed by cryosurgery where appropriate; and (iv) Breast cancer screening through biennial clinical breast exam. The Benefit-Cost ratio (BCR) indicates that the two recommendations targeting heart disease: secondary prevention of CVD with polypill and Metformin therapy for diabetes control perform strongly on BCR. Cancer screening and treatment has a lower BCR. However, combining some of the interventions – which can easily be done in a primary care setting – would considerably reduce their delivery costs and raise the BCR. In addition, screening and early detection of cases has the potential to avert a larger number of deaths than has been estimated.

Although there are several health systems challenges associated with implementing such interventions – including issues associated with health system capacity and social issues such as gender discrimination – if India wants to achieve the goal of Universal Health Coverage, then screening and treatment of NCDs are important strategies to implement at scale.

Policy Abstract

The Problem

As with the rest of India, the epidemiological transition is well underway in Rajasthan. Self-reported morbidity due to non-communicable disease (NCDs) increased significantly in Rajasthan between three rounds of the National Sample Survey (1995, 2004 and 2014): (i) for cardio-vascular diseases (CVDs), self-reporting doubled from 1 to 2 cases per 1000 population; and (ii) for all NCDs combined, self-reporting went up from 3 to 20 cases per 1000 population. Despite the implementation of the National Program for the Prevention and Control of Cancer, Diabetes, CVD and Stroke (NPCDCS), data show that coverage of some of the key interventions continues to be low. For example, less than 20% of women have undergone any examination of the cervix, and less than 5% have undergone a breast exam, reflecting a combination of lower capacity within the system as well as low levels of awareness at the community level.

Interventions to address the NCD burden

Based on this, and on the recommendations of the World Health Assembly targets, WHO 'Best Buys' and available literature on burden of disease in India and tested cost-effective interventions, four NCDs have been selected for the cost-benefit analysis, for the period between 2018 and 2030:

- Secondary prevention of CVD through the use of a multidrug polypill for eligible persons aged 30-69 assessed as being at high risk and those with existing cardiovascular disease. The target would be to screen 70% of this population with the assumption of achieving 60% adherence to treatment. Global Burden of Disease (2017) estimates that CVD causes 334/100,000 deaths in Rajasthan, about 20% of which could be averted with the suggested regimen;
- Diabetes screening and treatment with Metformin therapy for eligible persons aged 30-69, with the aim of 50% coverage of the target group annually, and the assumption of achieving 65% adherence to treatment. Metformin is a well-recognized cost-effective treatment for pre-diabetes and diabetes, resulting in avoidance of diabetes in about 30%

of high risk individuals. Diabetes causes about 30/100,000 deaths in Rajasthan, about 40% of which could be averted by early detection and treatment with Metformin;

- Cervical cancer screening and treatment through VIA/VILI screening (one time) for all women in the age group 30-69 years, with the aim of covering 30% of women in the target group annually for the first 3-4 years and covering the cohort of women entering the 30 year age group thereafter. The intervention would also cover cryosurgery where appropriate. Cervical cancer causes about 11/100,000 deaths in Rajasthan, of which about 35% could be averted by screening and early detection;
- Breast cancer screening through biennial clinical breast exam (CBE) for all women in the age group 30-69, with the aim of covering 50% of women in the target age group each year and eventually achieving 100% coverage of all women in this age group. Breast cancer causes about 16/100,000 deaths in Rajasthan, of which 16% could be averted by early detection through CBE.

Benefit Cost Ratio

Analysis of the costs and benefits of the above interventions was conducted based on the following data: (i) Death and YLD numbers obtained from the Global Burden of Disease Study (2016); (ii) Data on burden of risk factors (hypertension, blood sugar levels) from National Family Health Survey (NFHS) – 4; (iii) Data on the private costs of health seeking (outpatient costs) from the National Sample Survey (NSS) 71st Round (2014); and (iv) Estimates of intervention costs and deaths averted have largely been taken from several sources widely cited in the literature. Final results of the analysis and major recommendations are as follows:

Benefit Cost Ratios of Selected Interventions

Intervention	Discount Rate	Benefit	Cost	BCR	Quality of Evidence
Intervention 1 - CVD	3%	1,587,181,012,604	55,076,649,100	28.8	Very Strong
	5%	1,118,857,206,136	48,263,141,262	23.2	
	8%	707,589,285,485	40,196,707,458	17.6	
Intervention 2 - Diabetes	3%	91,080,660,534	4,432,799,848	20.5	Very strong
	5%	64,207,813,555	3,972,623,804	16.2	
	8%	40,610,224,437	3,423,867,077	11.9	
Intervention 3 - Cervical Cancer	3%	97,981,790,195	50,717,425,832	1.9	Strong
	5%	65,233,386,106	46,935,778,459	1.4	
	8%	41,254,996,288	42,240,492,403	1.0	
Intervention 4 - Breast Cancer	3%	44,205,698,833	50,591,902,968	0.9	Medium
	5%	29,252,844,553	44,333,201,085	0.7	
	8%	18,322,049,773	36,923,595,690	0.5	

The two recommendations targeting heart disease: secondary prevention of CVD with polypill and Metformin therapy for diabetes control perform strongly on BCR. Cancer screening and treatment has a lower BCR. However, combining some of the interventions – which can easily be done in a primary care setting – would considerably reduce their delivery costs and raise the BCR. In addition, screening and early detection of cases (particularly breast cancer) has the potential to avert a larger number of deaths than has been estimated.

Key Takeaways

There are several key takeaways arising from the analysis:

(i) The evidence shows that ensuring adequate coverage of screening and treatment services at the primary level can detect NCDs early, reduce treatment costs and avert a large number of deaths in a cost-effective manner;

(ii) The Primary Health Center (PHC) is the most appropriate location for NCD screening and treatment, rather than outreach services through a community health worker;

(iii) Targets for screening and treatment coverage should be monitored stringently, as well as follow-up with regard to treatment adherence and further referral as necessary;

(iv) Given their potential for early detection, lowered treatment costs and improved treatment outcomes, allocations to NCD screening and treatment programs need to be enhanced substantially, and spent effectively.

In conclusion, although there are several health systems challenges associated with implementing such interventions – including issues associated with health system capacity and social issues such as gender discrimination – if India wants to achieve the goal of Universal Health Coverage, then screening and treatment of NCDs are important strategies to implement at scale.

1. Introduction

1.1 Prevalence of NCDs in India, overview

It is now widely recognized that the epidemiological transition is well underway in India. The World Health Organization (2014), based on Global Status Report on Non-Communicable Disease (NCDs) data, reported that NCDs account for more than 5.87 million or about 60% of all deaths in India, and two-thirds of all NCD deaths in the South-East Asia region. This is confirmed by the Global Burden of Disease study (2016), which found that Disability Adjusted Life Years (DALYs) due to NCDs have gradually exceeded those due to communicable, maternal, neonatal and nutritional diseases since 2003. The five leading causes of DALYs were ischemic heart disease, chronic obstructive pulmonary disease, diarrheal diseases, lower respiratory infections and cerebrovascular disease. The five leading risk factors were found to be child and maternal malnutrition, air pollution, dietary risks, high systolic blood pressure and high plasma glucose levels. Apart from this, 1,32,000 new cases of cancer cervix are detected in India every year, constituting one quarter of the global burden; and 200 women are estimated to die of cervical cancer every day (Ray and Varghese 2016).

1.2 Policy and program response to NCDs

The Government of India (GOI) has recognized this epidemiological shift away from a predominance of infectious diseases, and launched the National Program for Prevention and Control of Cancer, Diabetes, CVD and Stroke (NPCDCS) in 2011. Since then, most states have initiated some activities under the Scheme, with technical and financial support from the central government (NPCDCS website). However, much more needs to be done, since avertable mortality continues to be high, as also years lived with disability due to poor coverage of screening and treatment for common NCDs.

1.3 Structure and Purpose of the report

This report first argues for the need to tackle NCDs on an urgent basis, to mitigate the misery and costs associated with the current and growing burden of NCDs in the country

and in specific states. The report then presents the cost-benefit analysis for the four priority NCDs, and the rationale for scaling up their prevention, early detection and treatment. Finally, the report recognizes key concerns and challenges faced by state health systems, in terms of governance, capacity and quality of care; and recommends critical actions that need to be taken to address these challenges.

2. Why tackle NCDs in India

2.1 Economic impacts of NCDs and implications for poverty and marginalization

It is estimated that NCDs and mental health conditions will cost India $4.58 trillion between 2012 and 2030, with CVDs alone contributing about $2.17 trillion (Bloom et al 2014). With the continuing high prevalence of NCDs, India stands to pay a significant price for not addressing NCDs as a growing national crisis. Bloom et al (2014), calculating the economic impacts of two factors: (i) out-of-pocket expenditures for the treatment of NCDs, and (ii) reduction in labor supply due to NCD mortality, estimate that cancer, CVD, diabetes, respiratory disease and mental illness could together cost India 4.58 trillion dollars between 2012 and 2030.

Table 1: Economic Burden of NCDs in India 2012-2030

NCD Category	Economic loss (in trillions of 2010 dollars)
Diabetes	0.15
CVD	2.17
Respiratory diseases	0.98
Cancer	0.25
Total NCD excluding mental health conditions	3.55
Mental health conditions	1.03
Total	4.58

Source: Bloom et al, pp 8.

The economic impact of NCDs on households is well documented (WHO http://www.searo.who.int/entity/noncommunicable_diseases/advocacy/health_and_economic_burden_ncd_advocacy_docket.pdf; Mwai and Murithi 2016). Previous estimates of the WHO indicate that the share of household out-of-pocket expenditures has been growing,

from 33% in 1995 to 47% in 2004. More than 40% of household financing of NCD treatment is financed through borrowing and sale of household assets. An estimated 1.2-2 million people experienced catastrophic spending due to NCDs, and in 2002, an estimated 600,000-800,000 people were pushed into poverty due to CVD and cancer.

3. Rationale for selection of specific NCD interventions

3.1 NCD policy – what does it say and what is its approach?

The National Health Policy (2017) recognizes the scale of NCDs currently being experienced in the country and calls to halt and reverse it (Ministry of Health and Family Welfare 2017). It recommends the adoption of evidence-based, cost-effective approaches to NCDs, including population-based screening, followed by primary and secondary treatment through the public health network for selected NCDs. The NPCDCS specifically targets hypertension, diabetes and common cancers (cervix, breast and oral), and while making provision for services at the primary, secondary and tertiary levels, explicitly recognizes that early detection and management through population-based screening and treatment are the cornerstone of the program.

3.2 Need for further exploration of effective interventions against common NCDs

The National Health Mission (NHM) has published Operational Guidelines for the Prevention, Screening and Control of Common Non-Communicable Diseases (NHM 2014) which spell out in detail the modalities of the program, administrative arrangements, equipment, staffing and training needs, and technical aspects of program implementation. The Guidelines also estimate the costs per sub-center (since the outreach workers placed at the sub-center – Auxiliary Nurse Midwife (ANM) and Accredited Social Health Activist (ASHA) - is meant to be responsible for prevention and screening for the selected interventions) and aggregate the costs to the district-level. The initial cost of setting up the program is estimated at about 5.5 crore, with an annual operating cost of about 1 crore (this includes equipment, consumables, training, incremental salary of a trained worker, IEC, health cards and team incentives). The assumption is that a district would have a population

of about 200,000, of whom 37% would be >30 years of age and eligible for screening. This works out to less than Rs. 150 per person per year for prevention and screening; it does not include treatment costs for those identified with an NCD. The literature indicates that this seriously underestimates the costs of such a program; clearly, the projected financial requirements of NPCDCS are not empirically founded, nor (in the absence of treatment costs) are they complete. There is a need for decision-making on this program to be supported by hard evidence.

3.3 NCDs selected for analysis in this paper and rationale

Based on the recommendations of the World Health Assembly targets, WHO 'Best Buys' and available literature on burden of disease in India and tested cost-effective interventions, four NCDs have been selected for the cost-benefit analysis, for the period between 2018 and 2030:

- Secondary prevention of cardio-vascular disease through the use of a multidrug polypill for eligible persons aged 30-69 assessed as being at high risk and those with existing cardiovascular disease. The target would be to screen 70% of this population with the assumption of achieving 60% adherence to treatment;
- Diabetes screening and treatment with Metformin therapy for eligible persons aged 30-69, with the aim of 50% coverage of the target group annually, and the assumption of achieving 65% adherence to treatment. Metformin is a well-recognized cost-effective treatment for pre-diabetes and diabetes, resulting in avoidance of diabetes in about 30% of high risk individuals;
- Cervical cancer screening and treatment through VIA/VILI screening (one time) for all women in the age group 30-69 years, with the aim of covering 30% of women in the target group annually for the first 3-4 years and covering the cohort of women entering the 30 year age group thereafter. The intervention would also cover cryosurgery where appropriate;
- Breast cancer screening through biennial clinical breast exam (CBE) for all women in the age group 30-69, with the aim of covering 50% of women in the target age group each year and eventually achieving 100% coverage of all women in this age group.

4. Methodology and Data Sources

4.1 Costing Approach

The following steps were followed to estimate the costs of achieving the expected coverage of the recommended interventions:

(i) Intervention design was finalized based on available literature;

(ii) Each element to be costed was identified and estimated based on secondary data sources of costs generated in similar contexts;

(iii) Target population for each intervention was defined based on the available evidence. These numbers were extrapolated for the period 2018-2030 based on available population projections;

(iv) Total deaths due to each selected disease condition for the specified target population were estimated from the Global Burden of Disease 2017, and proportion of deaths possible to be averted by the selected intervention were estimated based on the available evidence in the literature;

(v) Coverage levels for each intervention were specified based on available evidence of realistic levels of coverage possible in India/LMIC settings;

(vi) The institutional arrangements/architecture for delivering the intervention was specified, based on known health systems delivery mechanisms;

(vii) Next the local unit costs of each element of the intervention were obtained from relevant and appropriate sources, from which the total costs of the intervention were generated. These costs also included the private costs of seeking out-patient care as well as opportunity costs of lost wages;

(viii) For each intervention, these aggregated costs were then multiplied by the total target population to estimate the total cost of each intervention, adjusted for specified coverage levels;

(ix) Costs were then discounted at 3%, 5% and 8%;

(x) Benefits were estimated based on the number of deaths averted by the selected intervention, the estimated number of years of life saved, multiplied by the value of one YLL.

4.2 Data Sources

Data for the calculations have been derived from the following sources:

(i) *Target population*: India's 2011 census was the main source used for estimating the population to be covered in 2018. Specifically, we used the estimates of age-specific data from the Ministry of Home Affairs website (data.gov.in).

(ii) *Death and YLD numbers* have been obtained from the Global Burden of Disease Study (2016) - Institute for Health Metrics and Evaluation. Global Burden of Disease database. IHME, University of Washington, Seattle. http://www.healthdata.org/gbd/data.

(iii) *Data on burden of risk factors* (hypertension, blood sugar levels) has been derived from National Family Health Survey (NFHS) – 4 database on state level health outcomes, service utilization, disease burden and risk factors http://rchiips.org/NFHS/pdf/NFHS4/RJ_FactSheet.pdf.

(iv) *Data on the private costs of health seeking* (outpatient costs) has been taken from the National Sample Survey (NSS) 71st Round (2014) http://mospi.nic.in/.

(v) *Estimates of unit costs of interventions* and deaths averted have largely been taken from the following sources: (a) Chow et al (Chow J, Darley S, Laxminarayan R. Cost-effectiveness of disease interventions in India. RFP DP 07-53, Resources for the Future, Washington DC; 2007). These estimates are based on costs in the Indian context, and have been used in other studies such as Jha P and Laxminarayan R. Choosing Health: An entitlement for all Indians; Center for Global Health Research, 2009 and Rao Seshadri S, Jha P, Sati P, Gauvreau C, Ram U and Laxminarayan R. Karnataka's roadmap to improved health; Azim Premji University, 2013; (b) Nugent R. Benefits and costs of the non-communicable disease targets for the post-2015 development agenda. Perspective paper, Copenhagen Consensus Center (updated January 6, 2017); (c) Gelband H, Jha P, Sankanarayanan R and Horton S. Cancer. Disease Control Priorities Project – 3, 2016

5. NCD Burden and Risk Factors in Rajasthan

Self-reported morbidity due to NCDs increased significantly in Rajasthan between three rounds of the National Sample Survey (1995, 2004 and 2014): (i) for cardio-vascular diseases (CVDs), self-reporting doubled from 1 to 2 cases per 1000 population in Rajasthan; and (ii) for all NCDs combined, self-reporting went up from 3 to 20 cases per 1000 population in Rajasthan (Paul and Singh 2017).

Table 2: Common risk factors for Non-Communicable Disease – Rajasthan

Indicators	Rajasthan			India
	Urban	Rural	Total	Total
Women who are overweight or obese (BMI_>25Kg/m^2) %	23.7	10.7	14.1	20.7
Men who are overweight or obese (BMI_>25Kg/m^2) %	19.7	10.6	13.2	18.9
Women: Blood sugar level – high (>140 mg/dl) %	3.9	3.3	3.5	5.8
Women: Blood sugar level – very high (>160 mg/dl) %	1.7	1.1	1.2	2.8
Men: Blood sugar level – high (>140 mg/dl) %	5.8	5.7	5.7	8.0
Men: Blood sugar level – high (>160 mg/dl) %	3.3	2.0	2.4	3.9
Women: Slightly above normal (Systolic 140—159 mm of Hg and/or Diastolic 90-99 mm of Hg) %	6.4	5.2	5.5	6.7
Women: Moderately high (Systolic 160—179 mm of Hg and/or Diastolic 100-109 mm of Hg) %	1.5	0.7	0.9	1.4
Women: Very high (Systolic _>180 mm of Hg and/or Diastolic _> 110 mm of Hg) %	0.6	0.5	0.5	0.7
Men: Slightly above normal (Systolic 140—159 mm of Hg and/or Diastolic 90-99 mm of Hg) %	11.6	9.7	10.2	10.4
Men: Moderately high (Systolic 160—179 mm of Hg and/or Diastolic 100-109 mm of Hg) %	2.0	1.6	1.7	2.3
Men: Very high (Systolic _>180 mm of Hg and/or Diastolic _> 110 mm of Hg) %	0.8	0.4	0.5	0.9
Examination of Cervix %	21.5	18.0	18.9	22.3
Examination of Breast %	5.2	4.7	4.8	9.8
Women who use any kind of tobacco %	6.4	6.3	6.3	6.8
Men who use any kind of tobacco %	43.8	48.2	46.9	57.0
Women who consume alcohol %	0.1	0.1	0.1	1.2
Men who consume alcohol %	19.4	14.5	15.9	29.2
Women who tried to stop smoking or using tobacco in any other form in the past 12 months %	38.6	36.4	37.0	29.3
Men who tried to stop smoking or using tobacco in any other form in the past 12 months %	24.5	26.3	25.8	30.6

Source: National Family Health Survey Round 4, 2015-16

Rajasthan presents a mixed picture with regard to risk factors for NCD. Overall, only about 14% of women and 13% of men were overweight/obese, although the rates are higher in urban as compared to rural areas. This is about a third lower than the all-India average. Less than 5% of women and 8% of men had high or very high blood sugar. Urban and rural rates are almost identical. About 7% of women and 12% of men were recorded to have various degrees of hypertension, with some variation among urban and rural rates. In the case of both elevated blood sugar and hypertension, the rates in Rajasthan are substantially less than the national average. Less than 20% of women have undergone any examination of the cervix, and less than 5% have undergone a breast exam, reflecting a combination of lower capacity within the system as well as low levels of awareness at the community level. Breast exam rates are about half the national average, although cervical exam rates are closer. Finally, consumption of tobacco in any form is significantly high for men, with almost half of all men consuming tobacco in some form.

The reason why it is important to start addressing NCDs in Rajasthan despite the lower level of risk as compared to all-India averages is that it is classified as one of the Empowered Action Group, which means that the state faces issues with regard to health system capacity, quality of care and access to services. As such, more focused and urgent efforts are required to overcome the challenges presented by the state's context.

6. Recommended Interventions

6.1 Assumptions

The following interventions have been selected based on the priorities expressed in the World Health Assembly targets and reiterated in the national program for the control of NCDs (NPCDCS). Some important assumptions on which all four interventions are based are:

(i) all the interventions will be delivered through the existing primary health care network, but located at the Primary Health Center (PHC) rather than the Sub-center as in the current NPCDCS design. The ANM/ASHA would still play an important part in terms of taking health messages to the communities they serve

and mobilizing targeted groups for on-going health programs as part of their job description;

(ii) all interventions will cover the age group 30-69 for ease of implementation at the field level. Uniform guidelines regarding target age group can be communicated for all programs at the same time;

(iii) available community level resources can be leveraged for information dissemination and mobilization of target groups such as Self-Help Group members, co-operative societies, panchayats etc. Such strategies have worked elsewhere quite successfully.

6.2 Estimated costs

Final costs applied, including treatment costs, private costs and opportunity costs are presented in Table 3.

Table 3: Cost Components of Selected Interventions – Rajasthan

Intervention	Assumption	Direct Medical Costs (INR)	Source
CVD screening and treatment with Polypill	70% coverage and 60% adherence to treatment.	3527.7	Nugent (2017) based on Lim et al (2007)
Diabetes screening and treatment with Metformin	50% coverage and 65% adherence to treatment. 25-31% respond to Metformin therapy within a year, for whom treatment is continued (mid-point of 28% used for analysis).	1523.03	Chow et al (2007), inflated to 2018 prices. Includes cost of manpower, testing and systems requirements and tablet Metformin taken twice a day.
Cervical cancer: 1 visit, 1 lifetime, cryosurgery for positive cases	30% screening coverage annually for the first three years with about 8% of women requiring cryosurgery. From 4th year onward, costs estimated for screening and treatment only for cohort entering the 30 year age group.	Screening: 2382.1 Cryosurgery: 2332.8	Costs of both screening and cryosurgery based on estimate by Goldie et al (2005), converted to INR and inflated to 2018 prices. Costs include selected costs associated with diagnosis and treatment, including those for false positive results, referral of women ineligible for cryosurgery to other centers, and treatment complications.
Biennial Clinical Breast Exam (CBE)	50% of eligible women screened each year, with 70% attending regular biennial re-screening.	119.13	Costs taken from Okonkwo et al (2008); estimates of re-screening attendance from Caleffi et al (2010).
Private Costs		409	NSS 71st Round; includes 50% of doctor's fee, diagnostic tests and medicines; and 100% of transport, food and incidentals (such as use of public telephone) - NSS 71st Round, MOSPI 2014).
Opportunity Costs		Male: 265 Female: 169	50% of daily wage rate estimates provided.

Source: National Family Health Survey Round 4, 2015-16

Note: Costs do not cover the cost of raising awareness; however, the CHW/outreach worker has IEC/BCC as a key component of her role. They are currently carrying out this task. Also, the costs estimated for the interventions are per person treated. Given that the costs of the CHW/outreach worker are small (salary), and NCD programs are one of several programs that they cover, spread over the large number of people reached – it is likely that the person cost of raising awareness would be small.

6.3 Cardiovascular disease

Several estimates have been attempted of deaths due to cardiovascular disease in India. Overall, CVD has been identified as being one of the leading causes of death. The Million Death Study (in collaboration with the Registrar General of India) estimated that, based on analysis of cause of death data for 2001-03, of the 10.5 million deaths in total per year, 20.3% of deaths in men and 16.9% of deaths in women were due to CVD. Further analysis of mortality data by the RGI in 2010-13 showed that mortality due to CVD constituted 23% of all deaths and 32% of adult deaths during that period (Gupta et al 2016). Age standardized CVD mortality rates were estimated at 349 per 100,000 in men and 265 per 100,000 in women (WHO 2014). The Global Burden of Disease database estimates the absolute number of people dying in India due to CVD was 1.13 million in 2010, and the proportion of Years of Life Lost (YLL) due to CVD was 9.8% (IHME 2017). Projections to 2030 predict an alarming rise in CVD deaths, accounting for 35.9% of all deaths, and 52% of all NCD associated deaths (Reddy and Mohan 2014). The same study estimates that about 2.7 million people die of CVD annually currently; this is projected to increase to 4.2 million by 2030. The number of people suffering from diabetes in expected to increase to 109 million by 2035.

In Rajasthan, deaths due to cardiovascular disease in the age group 30-69 years are estimated at 333.5/100000 and YLDs at 247/100000 (GBD 2016). Deaths due to diabetes in the age group 30-69 years are estimated at 29.5 per 100000 and YLDs at 919.4 per 100000 (ICMR 2017).

CVD in India is characterized by accelerated buildup, early onset and high case fatality (Reddy and Mohan 2016). With regard to diabetes, Indians display several unique features: young age at diabetes onset and at a lower BMI, high rates of insulin resistance, and a lower threshold for risk factors (Ramachandra et al 2005). The literature identifies four factors

contributing to both: (i) lack of policies relating to the social determinants of CVD and primordial control of risk factors including smoking, alcohol consumption, lack of physical activity and diet; (ii) poor quality of preventive management – that is, poor control of risk factors such as smoking, hypertension, high cholesterol, obesity and diabetes; (iii) low availability and/or substandard management of acute heart disease; and (iv) lack of appropriate long term care and lack of secondary prevention programs.

Selected Interventions

Based on this, the interventions selected to avert deaths due to heart disease are:

Secondary prevention of cardiovascular disease: The intervention would be to implement a screening program to identify those at high risk of CVD; and then put those with elevated blood pressure (as a proxy for measure of risk) on a polypill. High risk patients can be relatively easily identified either because they have already accessed health services, or through simple screening for common risk factors (tobacco use, blood pressure, weight, age and sex) at the primary care level. The goal is to achieve 70% coverage and 60% adherence to a polypill regimen for those at high risk of a cardiovascular event (Nugent 2017). The recent UMPIRE Trial has shown that treatment adherence was as high as 86% among study subjects, so 60% seems a realistic target (Poulter et al 2013). Using 'secondary prevention' – which means treating those with known disease or those at high risk with drug therapy – could effectively reduce death rates by as much as 1.5% per year (Lim et al 2007). The WHO has prepared guidelines for secondary prevention in resource-limited environments which generally include the use of four medications: aspirin, ACE-inhibitors, beta blockers and statins, which can be combined in a 'polypill'. The simplicity of this regime suggests it can be brought to scale in low-resource settings through primary health or outpatient facilities (Lim et al 2007; Watkins et al 2015). This protocol has been deemed a 'best buy' by the WHO, and is expected to be less demanding of system resources and cost-effective.

Table 4: Intervention design, deaths averted and costs: Secondary prevention of CVD with polydrug
Rajasthan

Metric	Value	Source	Remarks
Projected number of deaths due to CVD from 2018-2030 in age group 30-69	1.32 million	Global Burden of Disease estimates, 2017	Based on population projections from Census 2011
Secondary prevention screening coverage	70%	Nugent, R (2017)	
Percentage of deaths averted with polydrug over a 13 year period, assuming 60% adherence	20%	Lim et al 2007	As used by Nugent
Projected CVD deaths averted in 30-69 year olds (between 2018-2030) due to secondary prevention	0.26 million	Calculation/extrapolation from GBD data	Assuming 70% coverage of secondary prevention and 60% treatment adherence resulting in 20% of deaths averted
Number of individuals who would benefit from a polydrug treatment between 2018-2030, 30-69 year old	Screening: 240 million Treatment: 14 million	Author assumption	Based on National Family Health survey data on prevalence of hypertension among men and women aged 30-69 (using hypertension as a proxy for CVD)
Average cost per treated individual	M: Rs. 4,202 F: Rs. 4,106	Based on estimates of treatment costs, private costs and opportunity cost	See Table 3 above

Screening and treatment of diabetes: Verma et al (2012) recommend Metformin as a first line treatment for both diabetes and prediabetes. This has been confirmed by the UKPDS study, which found a risk reduction for any diabetes related end-point, for diabetes related death and for all- cause mortality with Metformin therapy (UKPDS 1998). Jha and Laxminarayan (2009) also recommended Metformin therapy as a best buy and the most

cost-effective method for averting preventable death in India. Analysis of national level data on burden of disease and cost effectiveness similarly identified Metformin therapy as the most cost-effective intervention for diabetes treatment and control in India (Chow et al 2007). Global evidence gathered by Watkins et al report on a few studies that assessed the cost-effectiveness of medical therapy for type 2 diabetes. In Mexico, de Leon-Castaneda and colleagues found that a variety of oral medication for diabetes were quite cost-effective (Watkins et al 2015). Overall, Metformin as a first line treatment for the control and treatment of diabetes has been found to be a cost-effective intervention.

The intervention assumes: (i) that 50% of the eligible target group will accept the invitation to be screened (WHO WHO/NMH/MNC/03.1); (ii) the numbers identified with elevated blood sugar are based on the NFHS-4 data; (iii) those identified with elevated blood sugar will be put on a regimen of 850 mg Metformin twice a day; (iv) about 65% of those identified will adhere to treatment (estimated from Garcia et al 2013); and (v) within one year, those who respond to Metformin treatment (about 25-31%), for whom treatment will be continued (Chow et al 2007).

Table 5: Intervention design, deaths averted and costs: Diabetes screening and Metformin treatment

Rajasthan

Metric	Value	Source	Remarks
Projected number of deaths due to diabetes in 2030 age 30-69	116,500	Global Burden of Disease estimates, 2017	Based on populations projections provided.
Screening and treatment coverage	50% annually		Assuming that about 65% of treatment adherence.
Percentage of deaths averted over a 13 year period with Metformin therapy	40%	Based on Chow et al (2007)	
Projected diabetes deaths prevented with Metformin therapy, assuming 65% adherence	15,150	Calculation	Assuming 40% deaths averted with 65% treatment adherence.
Number of individuals who would benefit from Metformin therapy between 2018-2030, 30-69 year old	Screening: 170 million Treatment: 7.2 million	Author assumption	Based on National Family Health survey data on prevalence of elevated blood sugar level among men and women aged 30-69.
Average cost per treated individual	M: Rs. 2,197 F: Rs. 2,101	Based on estimates of treatment costs, private costs and opportunity cost	See Table 3 above.

6.4 Breast cancer and cancer cervix

Both cervical and breast cancers are recognized as major killers of women: approximately 200 women are estimated to die every day across the country from cervical cancer alone. Breast cancer is the most common cancer among women, and in Low and Middle Income Countries (LMICs), due to increase in urbanization, change in child bearing patterns and an aging population. Late detection due to poor awareness of the early signs of disease result in very high mortality rates. This is exacerbated by limited diagnostic and treatment facilities

(Hisham and Yip 2004). Routine screening has been initiated under the government NCD program; however, coverage is very poor due to issues relating to poor awareness and poor program design - only about 18% of women in rural areas of Rajasthan have had a cervical exam, and about 4% have had a breast exam. There are many reasons apart from poor awareness why cancers that cause high mortality among women remain neglected, including lack of infrastructure, lack of trained staff and other systemic issues; as well as gender issues that operate at the household/community level that prevent women from seeking care in a timely manner. It is estimated that a 28-65% reduction in mortality due to breast cancer can be attributed to early detection (Berry et al 2005).

More recently (2012), with support from the World Bank, the Tamil Nadu Health Systems Project piloted a cervical and breast cancer screening program which has subsequently been scaled up across the state, Using simple technologies that require minimal infrastructure and training inputs for field staff, the project was able to demonstrate that screening and treatment for both could be implemented in a cost-effective manner and at scale (TNHSP 2016; Roy and Varghese 2016).

In Rajasthan, deaths due to cervical cancer in the 30-69 age group are estimated at 11.22 per 100000. Deaths due to breast cancer are estimated at 16.43 per 100000 (GBD 2016).

Selected Interventions

Based on this, the interventions selected to address the burden of cervical and breast cancers are the following:

Screening and treatment of cervical cancer: This intervention is based on the experience of using a simple technology – Visual Inspection with Acetic Acid-Visual Inspection with Lugol's Iodine (VIA/VILI) – which is a proven effective method for detecting cervical intraepithelial neoplasia in resource constrained settings (Blumenthal 1999; Satyanarayana et al 2014). Accuracy of VIA/VILI in detecting CIN 2-3 and invasive cancer were estimated at 86% specificity and 79% sensitivity (Sankaranarayanan et al 2005). The experience of the Tamil Nadu Health Systems project has been well-documented in this context, and the learning reveals that (i) the technology is such that existing infrastructure is sufficient, no specialized staff is required and the necessary materials and equipment are readily available at the primary level; (ii) the procedure itself is quick and easy to administer, the results are

available immediately and cryosurgery (if required) can be completed on the same visit; and (iii) the results were accurate with high level of sensitivity (85-90%).

The intervention assumes that: (i) about 30% of the eligible women will present for screening every year (this is based on the Tamil Nadu experience, where 20% of the women were screened annually; however, with greater outreach and awareness, this should increase to 30%); (ii) about 8% women in Rajasthan are likely to have cervical lesions, which require cryosurgery (this is based on evidence from Tamil Nadu and rural Andhra Pradesh which indicated a VIA/VILI screening positivity rate of 3.3% and 10.75% respectively. We assume a rate slightly higher than the mid-point between these two estimates) (Poli et al 2015; TNHSP 2016). This will be done on the same visit by the same trained health worker.

Table 6: Intervention design, deaths averted and costs: Cervical Cancer screening and treatment

Rajasthan

Metric	Value	Source	Remarks
Projected number of deaths due to cervical cancer 2017-2030	44,000	Global Burden of Disease estimates, 2017	Based on populations projections provided
Screening and treatment coverage	Annually 30% for the first 3 years, followed by 5% of target population for 10 years (estimate of new cohort of 30 year olds every year)		About 8% of those screened would need cryosurgery for which there is an additional cost, although the treatment would take place on the same visit.
Percentage of deaths averted with 1visit 1xlifetime, followed by cytology for positive cases	35%	DCP 3 Cancer chapter (2017)	
Projected cervical cancer deaths averted 2018-2030	15,500	Calculation	Assuming 35% deaths averted, cumulative over the period.
Number of women who would benefit from screening and treatment, 30-69 year old between 2018-2030	Screening: 18 million Treatment: 1.1 million	Author assumption	Estimated that around 8% of screened women in this age group are likely to require cryosurgery (DCP 3).
Average cost per screened individual	(i) Screening: Rs. 2,960 (ii) Cryosurgery: Rs. 2,333	From Goldie et al (2005), screening includes selected costs associated with diagnosis and treatment, including those for false positive results, referral of women ineligible for cryosurgery to other centers, and treatment	See Table 3 above

		complications. The cost of one visit visual inspection was estimated at $24.20 (2000 dollars), but this includes private costs already estimated separately. So reduced by 30% to $16.9. Cost of cryosurgery is estimated at $16.55 in 2000 dollars (then inflated to 2018 prices).To this is added the private cost and opportunity cost.	

Clinical breast exam: The efficacy of clinical breast exam (CBE) has been established in several different contexts. Kardinah et al (2014) found that, in LMIC settings, women present with larger tumors; in these settings, CBE is less expensive than mammography; and CBE can be performed by a trained health worker. For all these reasons, they recommend CBE, particularly in contexts where previous levels of screening are very low (as is the case in Rajasthan). This recommendation has been confirmed by others as well: 'Clinical breast examination is a very low-cost test that could improve the detection of breast cancer and could prompt breast ultrasonography' (Provencher et al 2016). The Canadian National Breast Screening Study showed that 25 year cumulative mortality after CBE or mammography were the same (Miller et al 2002). Evidence from India (Mittra et al 2010) and other resource constrained setting also found that CBE was able to detect more cancers at earlier stages (Moss 2008). In terms of frequency of screening, biennial screening was found to more cost-effective (Fuller et al 2015), and more realistic keeping in mind the capacity of health systems in the Indian context. Okonkwo et al (2008) predicted that biennial screening in India was at least as cost-effective as screening by mammography, and could potentially avert 16% of breast cancer deaths after reaching 'steady state'. The

Canadian Quality Council of Ontario found that participation in breast cancer screening ranged from 65% (2008-09) to 82% (2014-15), with 80% returning for repeat screenings. This is supported by Caleffi et al (2010) who found that 70% of women attend biennial rescreening regularly (evidence from similar settings in Brazil and elsewhere confirm this).

Table 7: Intervention design, deaths averted and costs: Breast Cancer screening and treatment

Rajasthan

Metric	Value	Source	Remarks
Projected number of deaths due to breast cancer 2017-2030	65,000	Global Burden of Disease estimates, 2017	Based on populations projections provided
Screening coverage	50% annually		
Percentage of deaths averted with biennial clinical breast exam (CBE)	16%	Okonkwo et al (2010) have projected that in a 'steady state' up to 16% of deaths can be averted by biennial CBE (Okonkwo pp 1295).	Important to note the feasibility and cost-effectiveness of alternative strategies for breast cancer detection (such as mammography) in resource-poor settings is poor.
Projected breast cancer deaths averted by CBE	7,000	Calculation	Assuming 16% deaths averted and 70% of women regularly re-screened biennially.
Number of individuals who would benefit from CBE	84.5 million	Author assumption	Based on current population of women aged 30-69 and calculation of additional women added each year for next 13 years
Average cost per person screened	Rs. 697	Based on estimates of screening costs, private costs and opportunity cost	See Table 3 above

7. Results

Final results of analysis and major recommendations:

Table 8: Benefit Cost Ratio for Selected Interventions

Intervention	Discount Rate	Benefit	Cost	BCR	Quality of Evidence
Intervention 1 - CVD	3%	1,587,181,012,604	55,076,649,100	28.8	Very Strong
	5%	1,118,857,206,136	48,263,141,262	23.2	
	8%	707,589,285,485	40,196,707,458	17.6	
Intervention 2 - Diabetes	3%	91,080,660,534	4,432,799,848	20.5	Very strong
	5%	64,207,813,555	3,972,623,804	16.2	
	8%	40,610,224,437	3,423,867,077	11.9	
Intervention 3 - Cervical Cancer	3%	97,981,790,195	50,717,425,832	1.9	Strong
	5%	65,233,386,106	46,935,778,459	1.4	
	8%	41,254,996,288	42,240,492,403	1.0	
Intervention 4 - Breast Cancer	3%	44,205,698,833	50,591,902,968	0.9	Medium
	5%	29,252,844,553	44,333,201,085	0.7	
	8%	18,322,049,773	36,923,595,690	0.5	

The two recommendations targeting heart disease: secondary prevention of CVD with polypill and Metformin therapy for diabetes control perform strongly on BCR. Cancer screening and treatment has a lower BCR. There are several issues to keep in mind:

(i) The perspective of the costing exercise has been to estimate the cost to the individual of seeking and maintaining treatment. However, the cost to the government of providing these interventions will be considerably less since the primary health care network is already in place. Hence, total costs estimated for each intervention could be as much as a third lower for existing government systems.

(ii) There are considerable economies of scope that are possible by combining these programs. For example, in the Tamil Nadu case, patients were screened for both hypertension and diabetes on the same visit. Similarly, nurses at the PHC can conduct the VIA/VILI and CBE on the same visit. A uniform target age group across all interventions also facilitates this type of combination. Thus, the private and opportunity costs are considerably reduced, and the BCR could go up significantly;

(iii) Deaths averted due to cancers are probably an underestimate, since in the Indian context most cancers (particularly of women) are diagnosed late for various social reasons. This means that the current death rate is based on late diagnosis and poorer prognosis. Early detection through screening would mean more timely treatment and improved survival;

(iv) Irrespective of cost considerations, the focus on women's cancers is important as a gender issue, given the social determinants of health and the barriers to care faced by women. Special programs and facilities for women who would otherwise neglect or be unable to seek care have social value that cannot be measured in economic terms alone.

8. Challenges

There are broader health systems issues that could pose challenges to implementation of the recommended interventions, and need to be addressed. In Rajasthan, these include:

(i) A review of the State NHM Project Implementation Plans (PIPs) for 2014-2018 indicate that: (a) more than two-thirds of the budget is dedicated to salaries and infrastructure/equipment; and (b) activities are skewed towards strengthening curative care centers such as the State and District NCD cells and Critical Care/Cancer Care Units rather than towards primary care interventions such as population-based screening; This is reflected in the low coverage of cervical and breast examinations as shown in the NFHS-4 data. The stated priority of the NHM as well as the evidence presented in this paper indicate that early detection through population-based screening is not only the most effective approach but also serves the objectives of enhancing access and equity.

(ii) The current design of the screening program calls for the ANM/ASHAs to perform multiple functions, including raising awareness, testing for hypertension and diabetes, conducting VIA/VILI and breast exam, and referring cases from the field. It is well-known that the ANM/ASHAs already have a full schedule of activities relating to maternal and child health and communicable disease programs. Adding this responsibility would jeopardize not only the pace of the screening program but also its quality. Loss to follow-up of those referred from the field would be high, raising ethical issues. Having the PHC as the location for screening, detection and treatment would mitigate these problems, since trained staff nurses would conduct the screening, the doctor would be available to confirm positive cases and start them on treatment or refer them further if necessary. The NHM has itself recognized the need for privacy for VIA/VILI, which is not possible in a sub-center; this is true also of CBE.

(iii) Clarity is required on the level of program coverage to be achieved. The NPCDCS specifies annual screening for hypertension and diabetes, and screening for cervical and breast cancer once in five years. However, the literature indicates that (a) annual screening of all those who are eligible is unrealistic, and a more specific plan needs to be put in place to ensure 100% coverage within a reasonable time period (around 2-3 years); (b) there are different screening protocols for cervical and breast cancers, some more intensive than others. The protocols described in this paper are found to be cost-effective and appropriate for resource-constrained settings. For example, conducting cervical cancer screening once every five years may not yield significantly better results than one time screening; (c) a monitoring plan needs to be in place to ensure treatment adherence and reduce loss to follow-up, which can be a significant problems. Neither has found mention in any of the available documents.

(iv) The PIPs also indicate that: (a) consistently, the approved budget is far less than what has been requested, and far less than the recommendation of the NHM Guidelines; and (b) allocated moneys are underspent – in fact, Rajasthan was identified as one of four states with the highest unspent balance (Jagwani 2014). As discussed earlier, the NHM Guidelines are an underestimate of the cost of screening and treatment for the selected interventions; and the state falls short of even that lowered benchmark. This needs to be addressed urgently.

9. Key Takeaways

The Government remains committed to providing UHC, including for NCDs. In order to fulfill this commitment, Government of Rajasthan will need to consider the following learnings from the analysis presented in this paper:

(i) The evidence shows that ensuring substantial coverage of screening and treatment services at the primary level can detect NCDs early, reduce treatment costs and avert a large number of deaths in a cost-effective manner. This means that the priority of the state's NPCDCS needs to shift away from strengthening referral centers at the district and state levels and towards strengthening capacity at the primary level for screening and treatment;

(ii) The PHC is the most appropriate location for screening and treatment services. There is already a doctor available, as well as diagnostic services (including laboratory) and trained nurses. Leaving screening in the hands of ANM/ASHA in the field would mean that (a) identified cases would still need to come for confirmation to the PHC, with possible loss to follow-up; (b) quality of care could suffer, given their already heavy workload; (c) in the case of cervical and breast cancer, ensuring privacy in the sub-center could prove problematic;

(iii) Targets for screening and treatment coverage should be monitored stringently, as well as follow-up with regard to treatment adherence and further referral as necessary. Currently, treatment adherence and follow-up are not tracked routinely. Without such data, (a) it is not possible to estimate whether the intervention is achieving the expected benefits; and (b) there is an ethical risk that those identified with a potentially life-threatening condition are going untreated;

(iv) Given their potential for early detection, lowered treatment costs and improved treatment outcomes, allocations to screening and treatment programs need to be enhanced substantially, and spent effectively. Currently the program is underfunded, and available funding is underspent. Administrative and other bottlenecks – including systemic issues such as gaps in human resource availability, procurement delays and the like - should be identified and addressed through effective monitoring to ease constraints to flow of funds.

In conclusion, although there are several health systems challenges associated with implementing such interventions, screening and treatment of NCDs at scale are important strategies for achieving UHC. The Union Budget 2018 has proposed large-scale insurance for secondary and tertiary level treatment of NCDs; however, the strategies implemented at the primary level proposed in this paper would be a critical piece that could avert a large proportion of NCD morbidity and mortality at a fraction of the cost.

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Sector Expert Review

Rajasthan Priorities
An India Consensus Prioritization Project

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Globally, Non -Communicable Diseases (NCDs) are the leading cause of mortality accounting for 70% of the total mortality or nearly 40 million deaths each year. Nearly, 80% of premature deaths (between 30-69 years of age) are caused by only four disease groups namely, cardiovascular diseases (~18 million deaths), cancers (~9 million deaths), respiratory diseases (4 million deaths) and diabetes (~2 million deaths). Nearly 75 percent of NCD deaths – and 82 percent of premature NCD deaths (i.e. those occurring before the age of 70) – occur in low- and middle-income countries (LMICs)[i]. In India, NCDs contribute to nearly 60% of all cause mortality claiming nearly 5.87 million lives each year. The prevalence of obesity and overweight is also showing a rapid increase in the country. Age standardized prevalence of obesity (BMI≥ 30) has increased by 22 % in the span of four years (2010-2014).[ii]

The National Programme for the Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) was initiated in 100 districts in 2010, and expanded to about 468 districts in 2012. [iii]

During the 12th Five Year Plan, the activities under the programme include strengthening of health infrastructure by setting up of NCD clinics, providing necessary manpower for programme activities, health promotion activities, screening, early diagnosis, treatment and referral of patients suffering from these diseases through public health delivery system. [iv]Recently, as a part of the Comprehensive Primary Health Care initiative the MoHFW, GoI, has issued guidelines to strengthen Sub- Centres as Health and Wellness Centres (H&WC), staffed by appropriately trained primary health care team. [v]The Medical officer of the Primary Health Centre would oversee the functioning of the SC/HWC that falls in that area. that risk assessment, screening, referral, and follow up for selected NCDs amongst all women and men aged 30 years and above, would be included in the set of services being offered as part of comprehensive primary health care.

The focus of the NPCDCS guidelines under the Comprehensive Primary Health Care is to initiate a population level screening of all men and women above 30 years of age. This would begin with a categorization of individuals in to high risk and low risk using an assessment checklist

and score card by by the Accredited Social Health Activtist (ASHA). All the high-risk individuals will then be counselled to go through screening on a designated day in a designated facility. While screening for Diabetes, hypertension, CVD and breast cancer can be done outreach, screening for cervical cancer should be done at least at the Sub-Centre. It should be supported and supervised by a trained Lady Health Visitor/ Staff Nurse or even a Medical officer. Once the screening is completed for the respective NCDs the high-risk individuals are required to be referred to relevant higher facility for diagnosis and management.

Though the NPCDCS guidelines elaborates on the screening and referral of high-risk individuals, there is a need to issue specific guidelines and standard treatment algorithms for management of such individuals. This will require several deliberations and brainstorming of the exiting guidelines, cost effective interventions and strategies that are feasible of a resource constraint setting like India.

[i] WHO. Global Action Plan for the Prevention and Control of Non-Communicable Diseases

[ii] http://www.searo.who.int/india/topics/noncommunicable_diseases/ncd_situation_global_report_ncds_2014.pdf

[iii] http://nhm.gov.in/images/pdf/NPCDCS.pdf

[iv] http://nhm.gov.in/images/pdf/publication/Planning_Commission/12th_Five_year_plan-Vol-3.pdf

[v] http://nhsrcindia.org/sites/default/files/Report%20of%20Task%20Force%20on%20Comprehensive%20PHC%20Rollout.pdf

Rajasthan is the largest Indian state. It has a diversified economy, with mining, agriculture and tourism. Rajasthan has shown significant progress in improving governance and tackling corruption. However, it continues to face acute social and economic development challenges, and poverty remains widespread. What should local, state and national policymakers, donors, NGOs and businesses focus on first, to improve development and overcome the state's remaining issues? With limited resources and time, it is crucial that priorities are informed by what can be achieved by each rupee spent. To fulfil the state vision of "a healthy, educated, gender sensitive, prosperous and smiling Rajasthan with a well-developed economic infrastructure", Rajasthan needs to focus on the areas where the most can be achieved. It needs to leverage its core competencies to accelerate growth and ensure people achieve higher living standards. Rajasthan Priorities, as part of the larger India Consensus – a partnership between Tata Trusts and the Copenhagen Consensus Center, will work with stakeholders across the state to identify, analyze, and prioritize the best solutions to state challenges. It will commission some of the best economists in India, Rajasthan, and the world to calculate the social, environmental and economic costs and benefits of proposals.

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