Health of the East Coast population of India

NIMMAGADDA FOUNDATION

ACCESS health international

Dr. Rahul Reddy Kadarpeta

Johanna Kostenzer

Nimmagadda Foundation with a vision to create progressive, sustainable communities through a holistic and inclusive approach has chosen health as an area of prime importance and is working towards addressing the unmet health needs in the East Coast region of India (starting with the coastal region of Andhra Pradesh).

ACCESS Health International Inc, a not for profit organization, working towards affordable and quality health care, assists the foundation with implementation research to examine the existing health scenario and create necessary interventions according to the identified health needs to improve the health status of the East Coastal population.

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ACCESS Health International Inc., Centre for Emerging Market Solutions
Indian School of Bussiness, Hyderabad, India
www.accessh.org

Authors

Dr. Rahul leads the Health Care Needs Assessment project being executed in Prakasam district of Andhra Pradesh. He is the Program Manager with ACCESS Health International and works on Health systems financing and reforms. He has varied international experience in health systems research, and affordable, quality health care models in emerging economies.

He is a medical doctor and holds a Master's degree in International Healthcare Management from Management Center Innsbruck, Austria.

Johanna is an intern with ACCESS Health International working on the Health Care Needs Assessment project in Prakasam District, Andhra Pradesh, India.

She is currently a master student of International Healthcare Management at Management Center Innsbruck, Austria. Johanna holds a Bachelor's degree in Non-profit- Social- and Healthcare Management.

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Executive Summary

The East Coast of India is densely populated and is witnessing rapid economic growth. The health of the population in the region has suffered due to lack of appropriate and timely response to health needs related to disasters, rapid economic and demographic change. It now carries a high burden of communicable as well as non-communicable diseases coupled with vulnerabilities of environmental disasters and climate change.

The major health threats in the region are malaria, HIV/AIDS, tuberculosis and cardiovascular diseases. Diseases like dengue, chikungunya and diarrhoea are additional challenges. Stroke, cancer, age related ophthalmic diseases, road traffic accidents and injuries have now become the leading cause of morbidity and mortality.

Demographic shift, poverty and lack of awareness on health and disease, barriers to access affordable and quality health services, effects of climate change and natural disasters are attributable causes to this scenario.

The response to these challenges from public authorities and Non Governmental Organizations (NGOs) working in the region has not been adequate. Interventions to address the priorities and health needs of the population are the need of the hour. Strengthening public health delivery (management, planning and disease control) in the region is necessary. Provision of safe drinking water, mosquito nets, raising awareness on health and disease are measures which can control existing diseases. Initiatives to mitigate negative effects of chronic illnesses, alcohol abuse, and effects of climate change are needed. It is necessary to take measures for providing appropriate care by the implementation of policies to regulate service delivery, pricing and quality of care in the private and public health sector. Rationalizing high drug expenditure, creating awareness on abuse of pharmaceuticals and deleterious effects of treatments by informal health care providers are important steps to improve the population's health status.

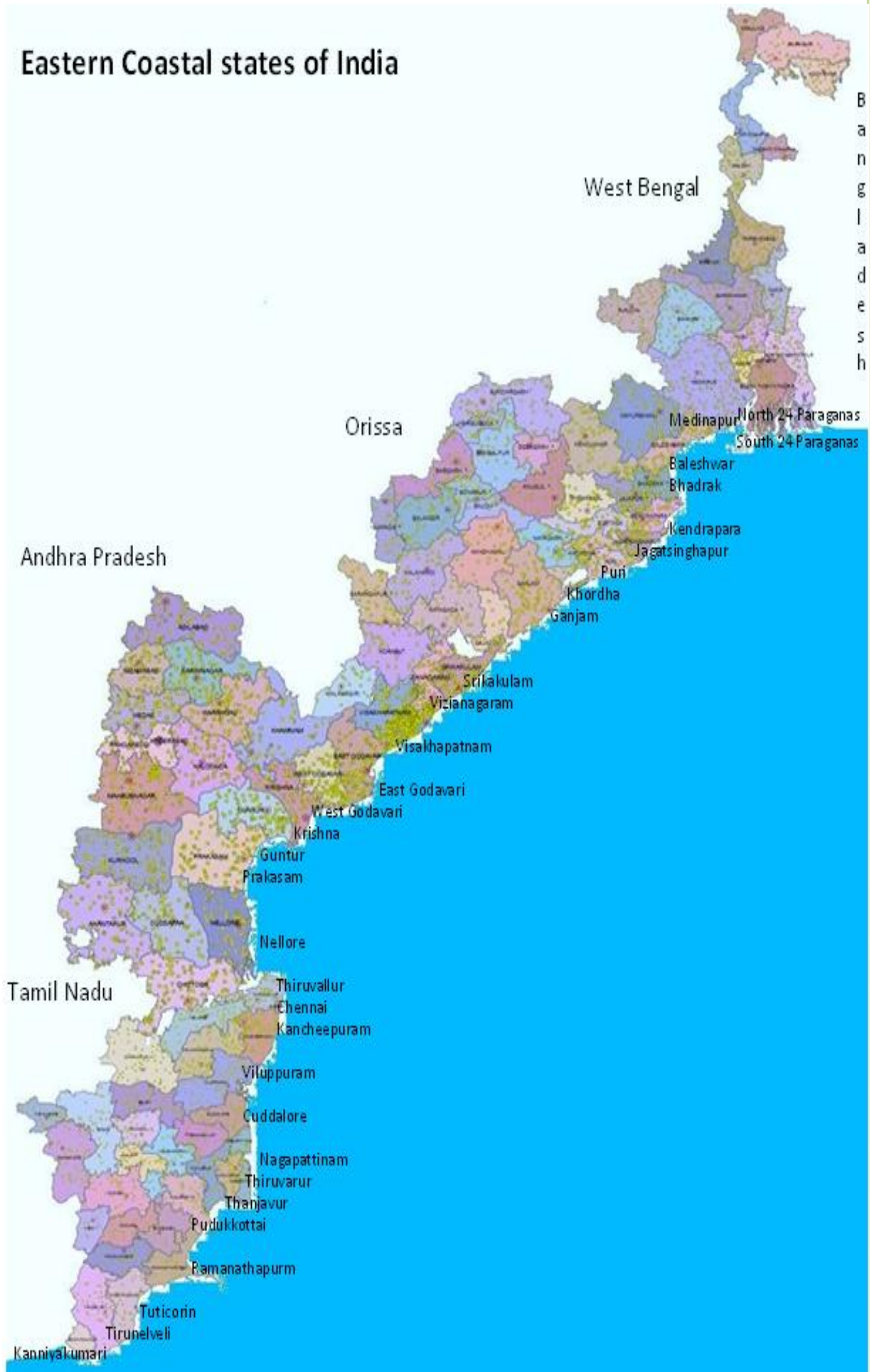
Introduction

India's East Coast is one of the most densely populated regions of the world. It is an important region for agriculture and economic activities. It is about 3500 km long and stretches covering four states. The state of Tamil Nadu is the most Southern and it is followed by Andhra Pradesh, Orissa and the state of West Bengal in the North. There are 32 coastal districts (13 in Tamil Nadu, 9 in Andhra Pradesh, 7 in Orissa and 3 in West Bengal).

The strip of coastal plains between the Bay of Bengal and the Eastern Ghats is highly fertile and one of the major regions for agricultural production of India. It is fed by four major rivers; Kaveri, Godavari, Krishna and Mahanadi. It receives good rainfall and is humid. With its four major ports and dense urban areas in port areas, especially Chennai, Vishakhapatnam and Kolkata, the region has experienced rapid growth due to migration and accelerated urbanization, fuelled by industrialization and economic activity over the past decades.

Coastal districts in Tamil Nadu and Andhra Pradesh have shown increased economic returns and improved standard of living of the population while Orissa and West Bengal fall short on such developments. The region is suffering due to mal-distributed, rapid, ill planned growth and development. Concerns are mounting on increasing socio-economic inequalities, rapid urbanization and shifting economic activity from agriculture to industry. The impact of such effects on health of the population due to emerging new diseases like HIV/AIDS, and the re-emergence of diarrhoeal diseases, malaria, polio, and TB etc. has been noticed. Frequent environmental disasters due to climate change have created irreversible damage to the coastal ecosystem and further increased the risk of mortality and morbidity in the region.

Understanding the present health status of the population in the region is inevitable to assess the damage already done and to plan for feasible interventions needed in the future. This report is a step to understand the situation of health status of the east coast population by examining the existing research. It summarizes the findings on existing disease burden and causes for ill health in the region, and the interventions that could have a positive impact on health.


Eastern Coastal states of India
West Bengal
Bangladesh
Orissa
Andhra Pradesh
Tamil Nadu
Medinapur
North 24 Paraganas
South 24 Paraganas
Baleshvar
Bhadrak
Kendrapara
Jagatsinghapur
Puri
Khordha
Ganjam
Srikakulam
Vizianagaram
Visakhapatnam
East Godavari
West Godavari
Krishna
Guntur
Prakasam
Nellore
Thiruvallur
Chennai
Kancheepuram
Viluppuram
Cuddalore
Nagapattinam
Thiruvarur
Thanjavur
Pudukkottai
Ramanathapurm
Tuticorin
Tirunelveli
Kanniyakumari

Research Methodology

The report is based on review of current literature and statistical data on health to illustrate the present scenario in the region and to understand issues of critical importance. Health and disease specific indicators from available National Health surveys (NFHS-3 and DLHS-3) were analysed. The strategy for the literature search included text-word terms relating to health care, disease patterns and climate change in coastal districts of Andhra Pradesh, Tamil Nadu, Orissa and West Bengal. The electronic databases PubMed, Science Direct, MEDLINE, Social Science Research Network as well as Google Scholar were used for the initial search which was based on titles and abstracts. Available qualitative as well as quantitative studies were hence collected to understand the issues from different perspectives. The studies were analyzed with focus on their main objectives, methods used, results and conclusion. Special attention was given to possible interventions described in the studies. Recent studies were given priority; studies which were published before the year 2000 were excluded from the review.

Limitations

The report focuses on review of only published research in the area of health in East Coastal regions of India. It presents only a minimal analysis of various national health data sets and indicators as available data is not comprehensive enough to bring out important inferences. The data was either limited to specific diseases, regions or only available for specific time periods limiting comparisons. Also research in coastal areas has been limited to issues dealing with disasters, climatic change, and coastal biodiversity etc., health being only a small component.

This preliminary review gives an overview of various important health and health care issues in coastal areas providing a strong impetus for further research in this sphere. Health and disease patterns, their association with changing climatic conditions, rapid demographic and economic developments, challenges in health care service provision specific to coastal areas etc. are areas of further research interest.

Demographic & Health Indicators

About 24% of India's population live in the coastal states (Andhra Pradesh (AP), West Bengal (WB), Tamil Nadu (TN) and Orissa). West Bengal is densely populated followed by Andhra Pradesh. All the four states have a decadal growth of population lower than the national average.

Demographic Indicators	INDIA	AP	WB	TN	ORISSA
Total Population (Census 2001) (in million)	1028.61	76.21	80.18	62.41	36.80
Schedule Caste Population (in million)	166.64	12.34	18.45	11.86	6.08
Schedule Tribe Population (in million)	84.33	5.02	4.41	0.65	8.15
Decadal Growth (Census 2001) (%)	21.54	14.59	17.77	11.72	16.25
Sex Ratio (Census 2001)	933	978	934	987	972
Population Below Poverty Line (%)	26.10	15.77	27.02	21.12	47.15
Female Literacy Rate (Census 2001) (%)	53.7	50.4	59.6	64.4	50.5

Source: Ministry of Health & Family Welfare, n.d.,a.

Health indicators in all states seem to fare better than the national average except for Orissa.

Health Indicators	INDIA	AP	WB	TN	ORISSA
Total Fertility Rate (SRS 2008)	2.6	1.8	1.9	1.7	2.4
Crude Birth Rate (SRS 2008)	22.8	18.4	17.5	16.0	21.4
Crude Death Rate (SRS 2008)	7.4	7.5	6.2	7.4	9.0
Infant Mortality Rate (SRS 2008)	53	52	35	31	69
Maternal Mortality Ratio (SRS 2004 - 2006)	254	154	141	111	303

Source: Ministry of Health & Family Welfare, n.d.,a.

The difference between the states is a reason of concern. States with lower percentage of below poverty line population and high female literacy levels perform better in health indicators, proving the importance of female literacy and financial ability to have a higher standard of living being conducive to good health. Tamil Nadu has a good health status correlating with high female literacy rate contributing to low fertility rate, low maternal and infant mortality rate in comparison to the other states. Orissa has a high percentage of tribal

and below poverty line (BPL) population and low female literacy levels related to high crude death rate (9%) and extremely high infant (69 per 1,000 live births) and maternal mortality ratio (303 per 100,000 live births) among the four states. Andhra Pradesh though has a lower percentage of BPL population; falls short on female literacy rate (50.4%) and records a high maternal mortality ratio (154 per 100,000 live births) and infant mortality rate (52 per 1,000 live births) when compared to Tamil Nadu and West Bengal [1].

Performance of coastal districts

There are variations in health indicators among the districts within the state and the coastal districts of the four states. This can be inferred from the rankings of all districts in India based on some health indicators [4] by JSK (Jansankhya Sthirata Kosh/ National Population Stabilization Fund)[1]. The majority of the coastal districts perform badly in the ranking; about (40%) of the districts are ranked from 200 to 350 (coastal districts from Orissa form this majority). Only 19% of the coastal districts fall below the rank of 50. These are the coastal districts from Tamil Nadu.

Coastal districts of Tamil Nadu have the best ranking outcomes on the basis of 3 or more ANC visits compared to the coastal districts of other states. Coastal districts of Tamil Nadu and Andhra Pradesh fare also well in under-5 mortality rate, with the exception of the districts Toothukudi, Viluppuram, Vizianagaram and Srikakulam. Best ranking outcomes in prevalence of contraceptive use are achieved by coastal districts of West Bengal. Coastal districts of Orissa have the worst ranking in indicators for under-5 mortality rate, women having more than 3 children and ANC visits.

Looking at the indicators within the states, coastal districts seem to fare low when compared to the other districts within the states (with few exceptions).

The following pages give a pictorial representation of some health indicators comparing the four states and also among the districts within the four states. (Note: Scale of colour gradients in the pictorial representation differs from state to state. It is advised to follow percentages for interstate comparisons of indicators.)

[1] The study "Ranking and Mapping of Districts" was done by Prof. Ram and Dr. Chander Shekhar of International Institute for Population Sciences (IIPS), Mumbai

The ranking of the East Coastal districts

Coastal districts studied	On the basis of women having 3 or more children	On the basis of contraceptive prevalence rate	On the basis of under 5 mortality rate	On the basis of 3 or more ANC visits	Overall ranking within the state	Overall ranking within the country
Andhra Pradesh					Total 23 districts	
Nellore	21	238	54	56	12	170
Prakasam	51	109	54	116	16	204
Guntur	18	51	28	69	8	157
Krishna	15	28	31	52	2	109
West Godavari	12	37	39	60	7	148
East Godavari	19	58	39	66	9	158
Visakhapatnam	40	115	153	138	20	231
Vizianagaram	37	107	390	88	18	221
Srikakulam	30	139	212	73	22	249
Tamil Nadu					Total 30 districts	
Kanniyakumari	13	287	24	11	2	12
Tirunelveli	78	258	148	54	10	44
Toothukudi	113	410	275	27	15	56
Ramanathapuram	105	348	99	23	29	138
Pudukkottai	107	297	76	10	24	113
Thanjavur	72	228	72	12	9	41
Thiruvarur	89	259	68	42	12	53
Nagapattinam	131	281	139	55	19	68
Cuddalore	94	249	104	45	21	76
Viluppuram	120	267	238	80	27	124
Kancheepuram	48	154	92	6	4	23
Chennai	14	40	167	20	1	1
Thiruvallur	35	143	92	57	8	38
Orissa					Total 30 districts	
Ganjam	266	360	447	282	18	348
Khordha	121	292	368	310	3	206
Puri	161	132	490	232	2	203
Jagatsinghapur	126	103	385	253	4	215
Kendrapara	210	184	480	270	9	260
Bhadrak	265	294	464	341	10	285
Baleshwar	200	191	380	318	7	251
West Bengal					Total 18 districts	
Medinipur	92	17	191	148	9	224
South 24 Paraganas	211	30	275	201	8	223
North 24 Paraganas	87	16	268	205	4	134

Source: Adapted from Jansankhya Sthirata Kosh, 2010 [4]

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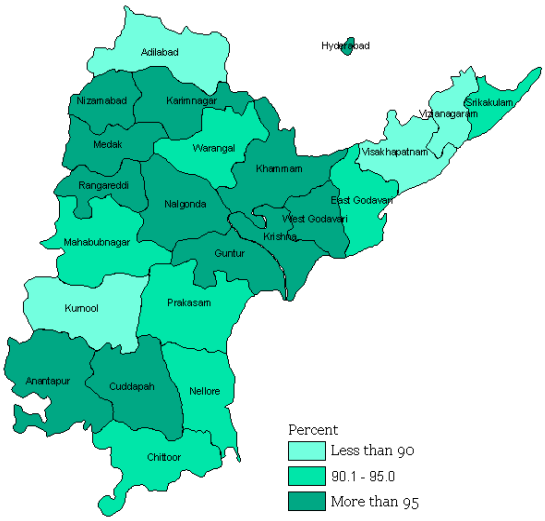
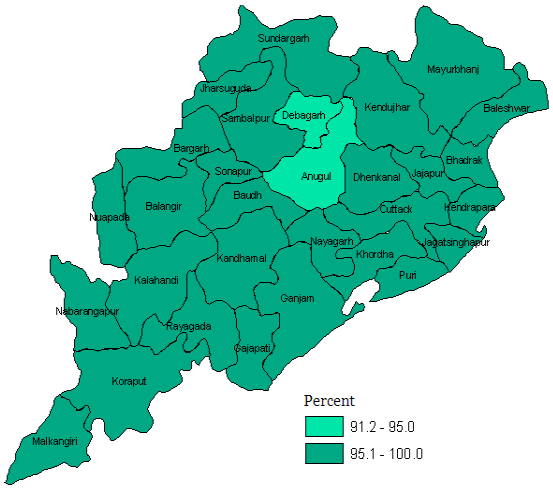
Vaccination coverage: Mother received at least one TT injection

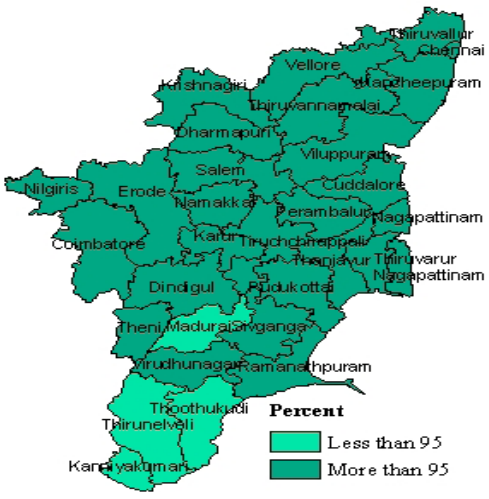
Vaccination coverage in majority of the districts is above 95%, except from coastal districts of AP, most Southern coastal districts of TN and Madenapor of West Bengal. With such high vaccine coverage, it can be inferred that the high maternal mortality rates in the states may be related to quality of ante natal, delivery and post natal services available or due to other reasons.



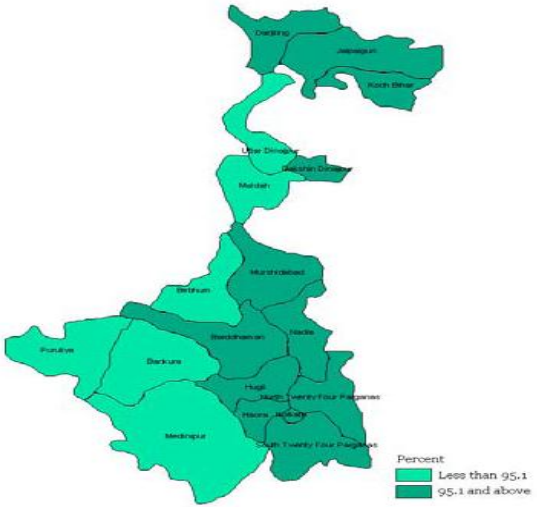
Andhra Pradesh



Orissa



Tamil Nadu

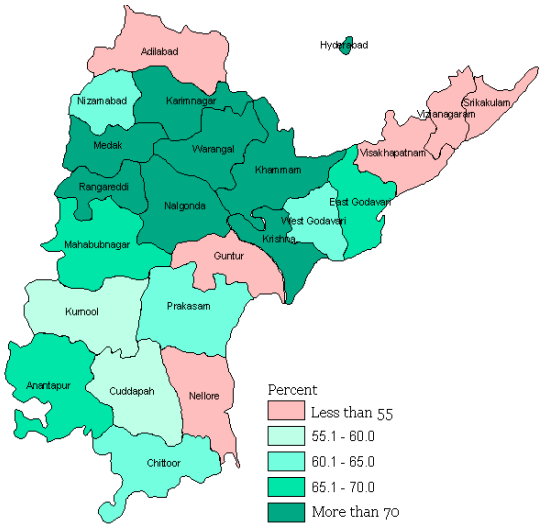


West Bengal

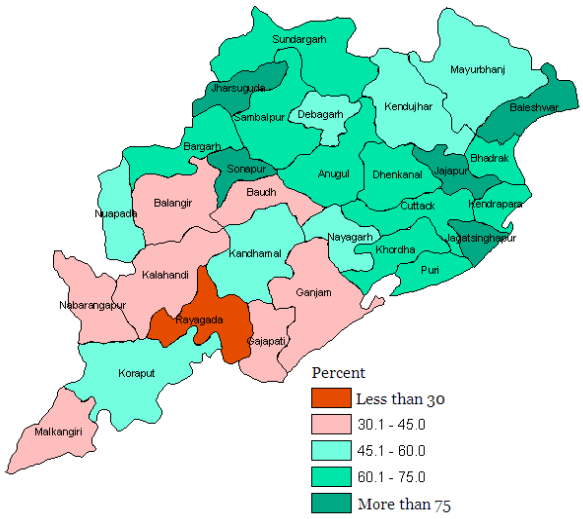
Source: State fact sheets, International Institute for Population Sciences, 2009 [3]

Full vaccination of children (age 12-23 months)

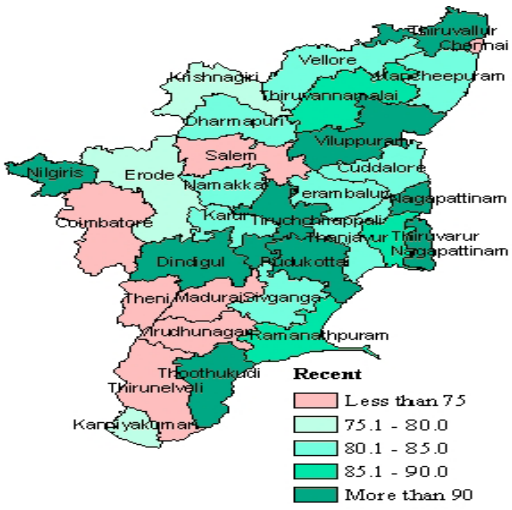
The percentage of full vaccination of children is low in most of the coastal districts with West Bengal as an exception as observed from the representations below.



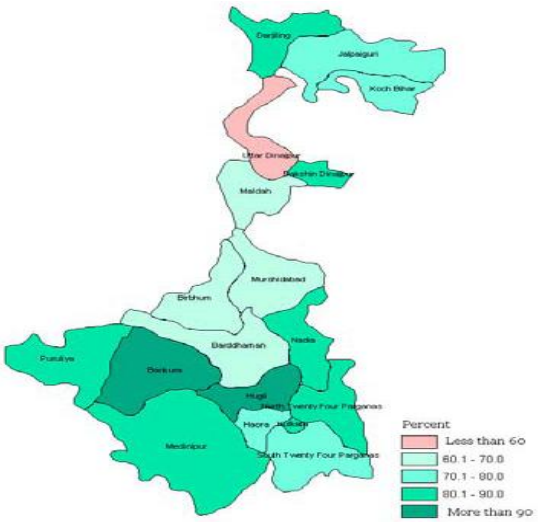
Andhra Pradesh



Orissa



Tamil Nadu

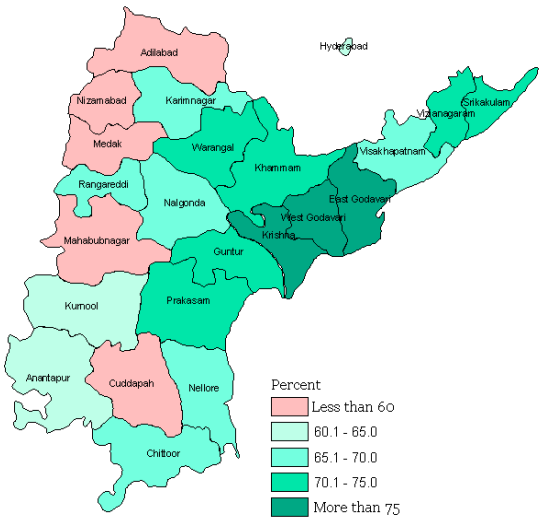


West Bengal

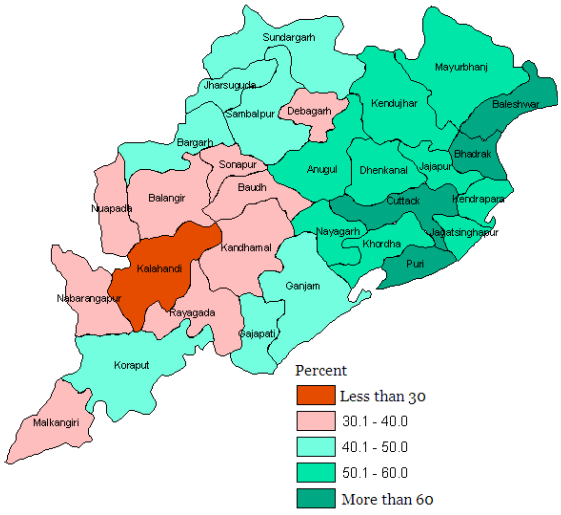
Source: State fact sheets, International Institute for Population Sciences, 2009 [3]

Contraceptive Use

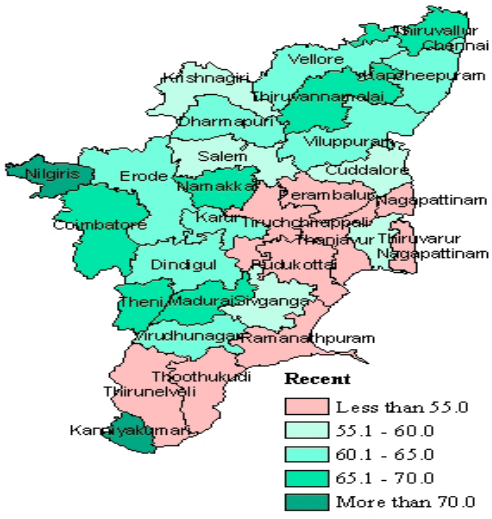
Contraceptive use is relatively high among the coastal population of West Bengal, with more than 70% in all districts. However, the other three states fall far behind in the use of contraceptives, especially coastal districts of Tamil Nadu, where contraceptive use lies below 55% in most districts.



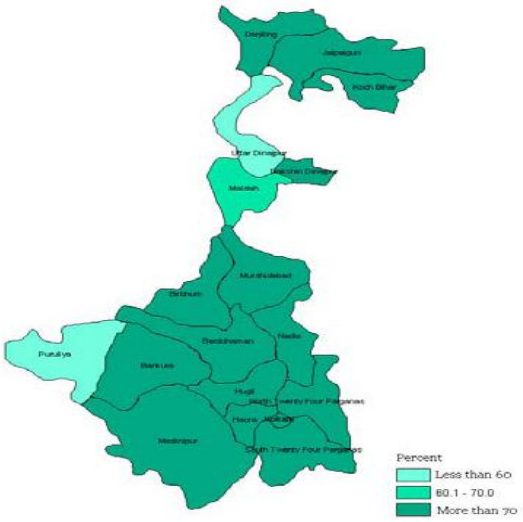
Andhra Pradesh



Orissa



Tamil Nadu

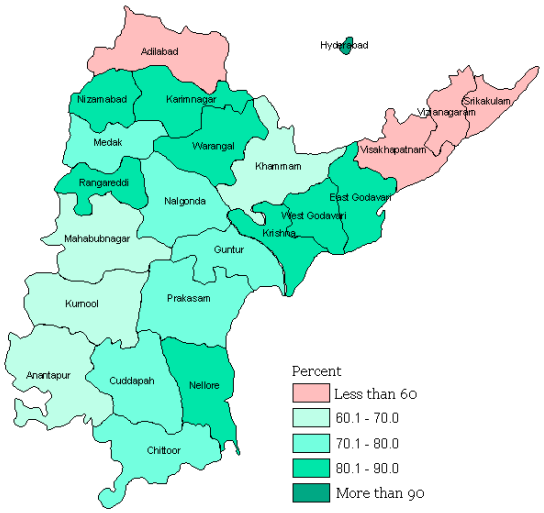


West Bengal

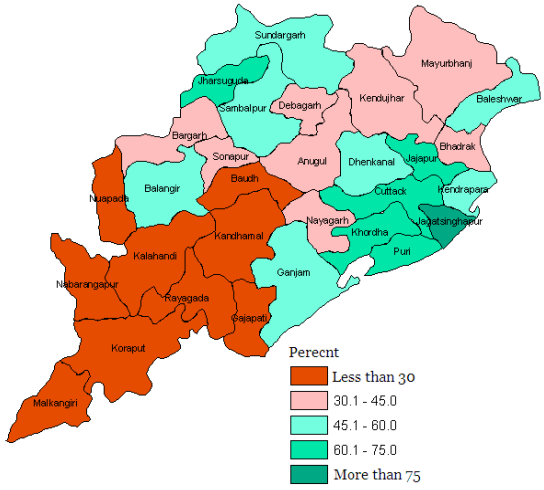
Source: State fact sheets, International Institute for Population Sciences, 2009 [3]

Institutional deliveries

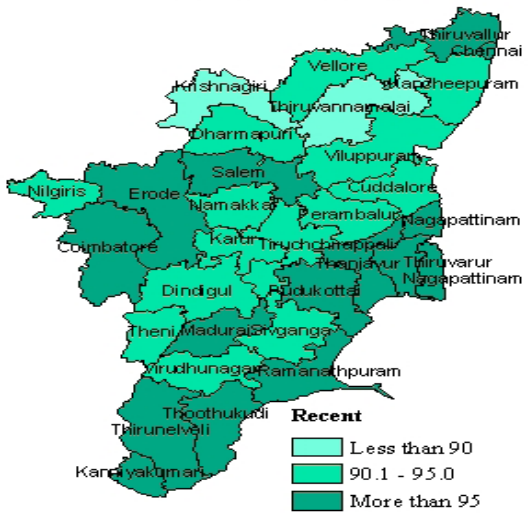
Tamil Nadu is the state where the majority of deliveries in coastal districts take place in health care institutions. In Northern coastal districts of Andhra Pradesh only 60% of the pregnant women give birth in health care facilities. In Orissa the majority of the coastal districts have less than 60% institutional deliveries and Bhadrak district has even less than 30%. In South 24 Paragans district of West Bengal only 30-45% of deliveries are institutional.



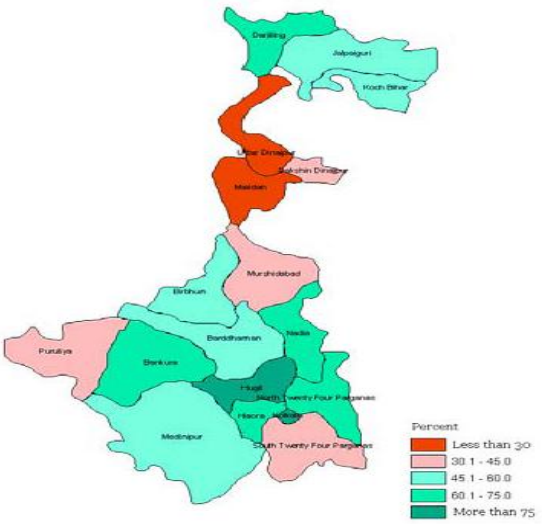
Andhra Pradesh



Orissa



Tamil Nadu



West Bengal

Source: State fact sheets, International Institute for Population Sciences, 2009 [3]

Burden of Disease

The East Coast region of India is affected by both communicable and non-communicable diseases. One third of the disease burden is due to communicable diseases. Particularly HIV/AIDS, hepatitis C, tuberculosis and malaria are highly prevalent [5], [6], [7]. All coastal districts in the four states fall into either 'category A'[2] or 'category B'[3] in HIV prevalence. All coastal districts in Andhra Pradesh, six in Tamil Nadu and two in Orissa are 'Category A'[4] districts in HIV according to the National AIDS Control Programme – III, India. Recently there has also been an observed risk for potential outbreaks of dengue fever and chikungunya [8], [9]. Lymphatic filariasis (LF) and geo-helminthiasis are endemic in Orissa and they still continue to be so even after continuous efforts through the disease control programs [10]. Leprosy still exists and affects particularly the poor in the coastal urban areas [11]. Anthrax, though not frequent, has been reported even in non-endemic coastal districts of Andhra Pradesh [12]. Water-borne diseases, such as cholera and typhoid have re-emerged in some areas. Diarrhoeas are highly prevalent in the cities, especially in slums and fishing settlements [13]. Dental caries is another health issue prevalent among children from the age of 5 to 15 years. A large proportion of poor suffer from malnourishment making them more prone to communicable diseases [14]. Especially high prevalence of malnutrition and iodine deficiency has been reported in coastal districts of West Bengal [15]. The nutritional status in children of Kora-Mudi in West Madenapore district was recorded to be critical. According to the WHO classification of severity in malnutrition, the overall prevalence of underweight, stunting and wasting was as high as ≥30%, ≥40 and ≥15% respectively [16]. Also in pre-school children of Lodha ethnic group of West Bengal, underweight and stunting was significant [17].

[2] For the purpose of planning and implementation of NACP-III, all the districts in the country are classified into four categories based on HIV prevalence in the districts among different population groups for three consecutive years. 'Category A' is defined as more than 1% ANC (ante natal clinic) prevalence in district in any of the sites in the last 3 years

[3] Category B has less than 1% ANC prevalence in all the sites during last 3 years with more than 5% prevalence in any HRG site (High risk group- STD/FSW/MSM/IDU).

[4] For more details check http://www.nacoonline.org

In addition, non-communicable diseases, injuries, substance abuse and accidents are highly prevalent. Cardiovascular disorders, stroke, cancer and injuries such as burns, fractures, bites etc. have become the leading causes of death among the coastal population, surpassing deaths due to communicable illnesses and conditions of pregnancy [18], [19]. Alcoholism has led to chronic liver disease and the addiction has pushed many families into poverty. In mental health, mainly depression has become an important health issue. Deaths due to intentional self-harm highlight a large unmet burden of depression and other mental disorders in the population [18]. Poisoning (96.9%) was the most common form of self-harm [20], and organophosphorous pesticide was found to be the most common method used (85.1%) [21].

Geriatric problems with agility, hearing and speech are common among the elderly [22]. Studies from Tamil Nadu and Andhra Pradesh have shown that visual impairment and blindness are also significant public health issues in coastal areas. Blindness due to cataract and uncorrected refractive errors is affecting the rural female and elderly population slightly more than the urban [23], [24].

Attributable Causes

Poverty, urbanization and demographic change play a crucial role in defining the disease pattern of coastal India. The prevalent diseases have several causative factors specifically related to the environment, occupation, lifestyle, socio-cultural issues, access to quality health care and attitude towards disease and treatment [14]. As the coastal population engages as agricultural labour, port work and shipping/fishing industry labour, it puts them at higher risk to contract water/vector-borne diseases [18]. Low level of technological development in the rural areas together with social, economic and gender inequities enhance the vulnerability of the largely illiterate, unskilled, and resource-poor communities [25].

Climate change and disasters are causes for increasing morbidity and mortality in the area. East Coast of India and especially coastal districts in Orissa are considered to be most disaster prone areas. With a population at growth, the threat of coastal vulnerability has increased tremendously [26]. Tropical storms like cyclones as well as storm induced flooding and surges cause massive damage to life and property. Water-washed diseases such as diarrhoea, cholera and typhoid, have resurfaced due to potable water scarcity and water contamination during frequent flooding [13], [27]. It is expected that morbidity will continue to increase in wake of disasters caused by climate change, threatening the ongoing efforts to contain diseases. In addition, change in transmission windows will affect the disease patterns of vector-borne diseases in Orissa, Andhra Pradesh and Tamil Nadu [27].

Pollution has become rampant in coastal areas and is the cause for many diseases. A large proportion of the rural population depends on agriculture and fisheries for their subsistence [28]. Increasing demand in those industries has taken the region by storm. Artificial inputs in the form of feed, fertilizers and drugs are used in fisheries to provide optimal growth of fish or shrimp, kill predators and control diseases. Such activities coupled with high pesticide and fertilizer use in agriculture are the main source for pollution of soil and groundwater. Wells,

which are closely located to aquaculture farms, are often heavily polluted, putting the population at high risk [29].

Water sources in urban areas are heavily contaminated with sewerage and other industrial pollutants. Rapid urbanization and migration has made these urban areas congested. Poverty and absence of urban planning has further led to the development of slums from where human and household wastes are led into open areas and water sources increasing the risk of disease to population living nearby and in surrounding areas. These areas are becoming major reservoirs of vector-borne disease, diarrhoea and typhoid [32]. Many are also exposed to arsenic contaminated ground water causing severe skin lesions and systematic manifestations like lung disease or neuropathy [30]. Pollution of sea waters is another challenge. Coastal waters of Visakhapatnam, Andhra Pradesh are heavily polluted and considered unsuitable for even non-contact recreation (boating etc.). Pollution is mainly caused by outflows and discharges of partially treated and untreated wastes and storm water runoffs from urban and rural areas. Sewage, plastic and mineral wastes due to the proximity to fishermen villages and the harbour are the other pollutants [31].

Life style changes and demographic shift have increased the number of people suffering from hypertension, diabetes and obesity. Smoking and alcoholism are crucial risk factors increasing the possibility of suffering from cardiovascular diseases and stroke [33]. Due to a rapid economic and social development along with the availability of basic health care, life expectancy has increased over the years. The proportion of the aging population is growing steadily contributing to age-related morbidities among the elderly population [18], [22].

Poverty is prevalent in all the states and especially high in Orissa. Port cities in the region have a majority of a poor and unemployed population. This makes them vulnerable and hinders their quality of life as they remain illiterate and access to information on health and disease is scarce. Low income and high inflation rates have deferred the poor to sustain optimum calorie intake contributing to malnutrition, further lowering immunity and increasing the possibility of co-infections and multi-morbidity. It is important to mention that people who are already suffering from one disease might be more vulnerable and likely to catch an additional one. Co-infection of HIV and tuberculosis is an example [6]. Poverty is also a barrier to access care from the system. Poor people are unable to pay for treatment especially when public provision is mal-distributed and inadequate.

Illiteracy and lack of awareness on potential health threats is another major problem in coastal areas. Many researchers opine that illiterates are unaware about symptoms, modes of transmission, prevention and treatment of diseases or have poor information about the disease and its causative factors. Especially in the case of visual impairments, people do not seek treatment, because they think it is a natural process of ageing and therefore do not see the importance of using health care services. Little awareness and absence of services in rural areas have resulted in low levels of appreciation of the benefits and need for seeking treatment through routine eye examination, use of spectacles and surgical services [23].

Lack of awareness on pregnancy related issues and delivery practices are the main cause for infant and maternal mortality being unacceptably high in East coastal regions. Each year, many women die from preventable causes related to pregnancy or child birth. A study carried out in South 24-Parganas, West Bengal examined the delivery practices in riverine and non-riverine blocks. It was found that the majority of deliveries take place at home, even more so in riverine areas (>80% non-riverine, >95% riverine). The study revealed that women having institutional deliveries were mostly wealthier, better educated and better connected with the formal healthcare sector as women who had home-deliveries [37]. Most of the home-deliveries were attended by elderly women of the family or community or by traditional birth attendants, the majority of which had not received appropriate training [38]. Home-deliveries further increase the risk of mortality when complications occur at the time of delivery.

In addition, poor self risk perception due to lack of awareness contributes to high risk behaviours like alcoholism, smoking, narcotic use and indulging in unsafe sex with multiple sexual partners, increasing the risk of the transmission of HIV and other sexually transmitted diseases (STDs). However, HIV testing rates are higher among people with an advanced educational level, especially in urban areas [6]. Literates in the region are generally better off in terms of access to health information. Mosquito-net use for example is higher among the educated population [34], [35]. Methods of family planning are utilized more by women who had access to higher education [36].

Gender disparities also play a major role in the development of diseases. Women are still socially, politically, culturally and economically lagging. A study carried out in West Bengal revealed that the majority of women desire sons [39]. Daughters are mostly considered as liability, while sons are seen as an asset. This preference also shows in the healthcare seeking behaviour. Boys are more likely to be taken early for medical care compared to girls. Qualified health professionals are consulted earlier and parents are also willing to travel longer distances for their sons. Also more money is spent on healthcare for boys [40]. These gender inequalities consequently reflect on the health status of the children. Girls are much more likely to be underweight, stunted and wasted [41]. The parent's educational status and child birth order are strong predictors of stunting among girls but not boys [42]. The perceived gender role also shapes the sexual behaviour of the youth, putting them at risk of unintended parenthood and HIV/STDs [43]. Even though the problem exists among the general population, commercial sex workers are especially at risk to be infected and hence transmit diseases further on [44], [45].

Barriers to seek treatment constitute a major problem in coastal regions of India. Familial and agriculture related occupational obligations, especially during planting and harvest time make it impossible for people to seek treatment [23], [35].

Lack of access to quality care impedes health service utilization at the right time. Lack or mal-distribution of available health infrastructure and resources in the region hence constitute a major challenge for dealing with health issues. Preventable diseases are increasing in number due to inefficient functioning of public health services on the one hand and also insufficient utilization of available health services on the other. There is a shortage of sub-centres (first point of contact in the public health delivery system) in West Bengal and Orissa [1]. Andhra Pradesh has only about half of all PHCs functioning on a 24-hour basis, with the exception of West Bengal, where only 25% offer this fulltime service.

Although public facilities are often closely located, they may be bypassed due to unavailability of a regular doctor. Recruitment problems in rural areas are the main reason for this lack. There is a shortage of multipurpose workers at sub-centres and primary health centres in every state except in Tamil Nadu. There is also a shortage of specialists, technicians, paediatricians and pharmacists in every state. Orissa has to deal with a huge lack of nurses/midwives, which might be a contributing factor to the high infant and maternal

mortality rate mentioned earlier [1]. A detailed table on health infrastructure and resource indicators in the Eastern coastal states can be seen on the following page.

The necessary equipment in order to prevent disease, like insecticide treated bed nets, is often not available and if present it is unaffordable for the poorer coastal population [35]. In addition, prescribed medicines may not be available in the public facility or in the village. Therefore, patients have to be prepared to pay upfront to go to urban areas for medicines from private pharmacies [46].

Financial reasons and high travel costs are other barriers for patients to use health services or to go for regular check-ups. High out-of-pocket (OOP) payments for health care in the private sector are a burden contributing to the avoidance of consulting a doctor. Estimates have shown that OOP expenditure amounts to about 5% of total household expenditure, with an even higher proportion in rural areas. 70% of these OOP payments are spent on medication, either because of self prescription or advice by the medical shop keeper or informal health care provider [47]. High payments for healthcare constitute a burden many households are not able to carry. Multiple spells of illnesses in the households, chronic morbidity among household members, inpatient care and childbirth lead to catastrophic medical expenses. Those expenditures influence the household's food consumption, children's education and medical treatment of other members. Also the location of the household and its size are important factors for health spending [48].

Health infrastructure and resource indicators

Health infrastructure and resource indicators	India	AP	WB	TN	Orissa
Health programmes at village level					
Villages having beneficiary under Janani Suraksha Yojana (JSY) (%)	73.7	92.6	94.3	74.5	51.0
Village where Health and Sanitation Committee formed (%)	28.7	67.4	17.7	73.4	3.3
Village *Pradhan*/Panchayat member aware of united fund (%)	29.4	86.6	41.1	76.4	11.1
Accessibility of the health facility					
Villages with Sub-Centre within 3 KMs (%)	71.4	62.1	85.5	83.7	80.7
Villages with PHC within 10 KMs (%)	71.2	67.9	86.3	78.5	83.6
Infrastructure, staff and services at Sub-Centre					
Sub-Centre located in government building (%)	55.7	21.9	45.8	72.2	59.9
Sub-Centre with ANM (%)	90.7	84.4	89.7	99.8	78.1
Sub-Centre with male health worker (%)	39.3	40.6	40.7	71.6	59.8
Sub-Centre with additional ANM (%)	20.0	28.0	1.2	2.8	51.5
ANM living in Sub-Centre quarter where facility is available (%)	57.9	63.3	14.7	59.9	81.3
Infrastructure, staff and services at Primary Health Centre (PHC)					
PHCs having Lady Medical Officer (%)	24.4	40.6	9.7	62.4	53.2
PHCs having AYUSH Medical Officer (%)	19.3	8.4	18.6	10.9	54.9
PHCs with at least 4 beds (%)	67.1	82.9	27.0	28.4	31.3
PHCs having residential quarter for Medical Officer (%)	54.5	25.7	82.8	22.2	53.4
PHCs functioning on 24 hours basis (%)	52.7	51.1	25.9	50.6	49.2
PHCs having new born care services (%)	86.8	95.8	73.3	93.5	55.4
PHCs having referral services for complicated pregnancy/delivery (%)	55.2	72.4	45.3	70.1	39.0
PHCs conducted at least 10 deliveries during last month (%)	49.9	54.2	33.3	59.4	26.4
Infrastructure, staff and services at Community Health Centre (CHC)					
CHCs having Obstetrician/Gynaecologist (%)	25.2	42.6	11.6	7.2	87.3
CHCs having 24 hours normal delivery services (%)	90.0	93.8	96.1	100.0	79.0
CHCs having functional Operation Theatre (%)	65.2	80.9	46.3	56.8	59.4
CHCs designated as FRUs (%)	52.0	88.9	17.9	46.7	53.7
CHCs designated as FRUs offering caesarean section (%)	18.7	35.3	22.5	0	15.5
FRUs having new born care services on 24 hour basis (%)	76.1	61.8	86.7	86.1	53.7
FRUs having blood storage facility (%)	9.1	28.5	10.0	1.8	15.5

Source: Adapted from Jansankhya Sthirata Kosh, 2010 [4]

Informal healthcare providers are consulted by many patients due to high OOP payments to qualified practitioners and the non functional base of the public health care facilities. Rural outpatient care is mostly provided by private rural medical practitioners (RMPs) who have often not received any training. Especially the poor in rural areas seek treatment with RMPs. They think that treatment will be less expensive than other alternatives although evidence stands against this perception. In addition, people go to informal providers because of the proximity and availability, and because they are unaware that informal providers have often not received adequate training. The RMPs only refer patients to public facilities or qualified private providers when cases go completely out of their control. This also means that patients hang on to RMPs' services until they get hospitalized and hence develop more complications. The cost of treatment as well as the burden of disease could be reduced for many hospitalized patients if their pre-hospitalization history with RMPs could be minimized [46].

Improper disease surveillance by public authorities and hence inappropriate response to disease and treatment outcomes has contributed to the increased risk of outbreaks, as lack of surveillance makes it difficult for authorities to design and implement necessary interventions [49]. There is a lack of an organized national system for monitoring risk factors of non-communicable as well as communicable diseases and also the Indian Council of Medical Research (ICMR) pointed out the need for a functioning surveillance system [50].

Interventions

Various interventions have been undertaken by the Indian public health authorities, NGOs and local charitable organizations in order to reduce the burden of disease and improve the health status of the East coastal population. They have not shown much improvement in tackling the problems due to an ad-hoc way of dealing with health issues. Existing policies are not implemented or sometimes not implemented correctly as enforcement is an additional problem [51].

As mentioned before, the main causes for the existing diseases are poverty, lack of awareness and inaccessibility to health services [30], [47]. It is hence necessary to fully implement sustainable and evidence-based measures in order to reduce inequalities and improve access to quality health services [51].

Low cost and feasible interventions which are context specific to address the unmet health needs are the need of the hour. For example the use of insecticide treated bed nets has been proposed for malaria. An important fact to consider is the ability of the poor to purchase mosquito nets, sprays and other useful equipment to prevent malaria. It is necessary to look for interventions like providing long lasting insecticide treated nets at a subsidized price or free of charge to the population at need [35].

Informal healthcare is an important issue that needs to be addressed. The care provided by RMPs remains completely uncontrolled as no effective regulatory mechanisms are in place. Therefore, the risk of doing harm is substantial, especially in severe cases. It is important to further establish adequate basic health care facilities with qualified health care providers who are available at all times at least for birth delivery and basic curative services. In addition it is advisable to include RMPs into the system. They could be trained and hence act as gatekeepers for primary health care [46]. One such training program for RMPs has been started by the Health Management Research Institute (HMRI) in Andhra Pradesh. RMPs undergo one year of training in basic primary care, first aid and stabilization during

emergencies/accidents. This training has been certified by the government and is called 'community paramedic training program'. The government plays an important role in providing the needed training by paying for it and creating avenues in public hospitals for provision of practical training. About 9000 RMPs have been trained so far [52].

The impact of such trainings has been positive. The involvement of trained traditional healers in TB control programs for example has improved compliance and outcomes as they act as important health care providers, especially for the tribal population. This has even been proven in a study carried out in Vizianagaram district, Andhra Pradesh [53]. Nevertheless, further research on such markets is needed and policies to regulate provision of care and especially informal healthcare are required [46].

Out of Pocket payment is an issue of prime importance as it is the major hindrance to seek appropriate care at the right time. Households are unable to recuperate the high costs from existing resources and hence slip deeper into poverty, especially when family members suffer from long-lasting, chronic diseases [48]. The best way to tackle this problem is to remove hindrances to access affordable, high quality care. One way would be to strengthen the public provision of care in terms of filling up vacancies, creating awareness on national health programmes and marketing the services to gain trust from the people. Improvement has been reached through contracting out public health services to private providers (not for profit organizations and civil society organizations). Successful results were reached in Orissa, where primary care services were allowed to be managed by NGOs. Also similar partnerships were established in urban slum areas in Andhra Pradesh. Such partnerships ensure co-operation between the public and private sector to tackle challenges existing in a particular region. Another way to decrease payments for health is to implement policies to rationalize high drug expenditure and to decrease harmful self medication or irrational prescription patterns by qualified private and informal health care providers [47].

Mitigation of financial risk for treatments has been taken up by governments of Andhra Pradesh (Aarogyasri) and Tamil Nadu (Kalingar scheme). Both states have introduced insurance schemes for the population below a specified annual income. The enrolled population can undergo cashless treatments for over 700 expensive surgical and medical treatments. The premium for all the enrolled members is paid for by the government and the scheme is implemented in both public and private hospitals all over the state. Rashtriya

Swathya Bhima Yojna (RSBY) is similar but a national scheme for people below poverty line in other states. There are many problems with the implementation of these schemes and reaching the poor especially in coastal and remote areas. Such issues need to be researched and quantified in order to be dealt with. As most of the problems in coastal areas are due to basic illnesses and long term chronic diseases, mechanisms to finance quality care can also be introduced. Integrated health care models, performance based payments for public doctors and health workers are feasible. Paying for primary care through capitation as done in some countries like Thailand could be explored. This would give an incentive for both private and public providers to compete and work towards cost efficiency, quality and creating awareness among patients.

Raising Health Awareness to educate the population about symptoms and modes of transmission of disease undertaken until now have not been considered as satisfactory, neither in terms of communicable nor non-communicable diseases [34]. Creating awareness on keeping surroundings clean and dry and self assessment of symptoms to seek care at the right time have helped in preventing illnesses, especially for economically poor and the under-privileged [35].

Information education communication (IEC) strategies are recommended to create more interest among the population to use health services and to seek appropriate treatment from qualified personnel [23], [36]. Actions using innovative health education methods, specific to context, culture and beliefs are strongly recommended and women should be targeted through formal as well as non-formal education programs. One such example carried out in Uttar Pradesh is presented below.

Example: Promoting healthy spacing between pregnancies

Birth spacing intervals are very short in India. Having a break of 3-5 years between pregnancies would be an effective way to reduce child and maternal mortality and morbidities. However, different beliefs, norms and misconceptions need to be changed in order to achieve behaviour change. A project was carried out in Meerut district in Uttar Pradesh to promote healthy spacing between pregnancies. Before interventions could be designed, focus group discussions and in-depth interviews took place to better understand socio cultural and programmatic barriers promoting short spaced pregnancies as well as early marriage. The key intervention hence comprised an educational campaign carried out by community workers using communication materials such as leaflets, posters, booklets and wall paintings addressing pregnant women, their husbands, mothers-in-law and community opinion leaders. Training of all community workers on topics for the educational campaign before its implementation was also part of the program. Each pregnant woman was visited by a community worker and got advice on birth spacing and postpartum care. The women were also provided with a booklet which they should share with husband and mother-in-law. In addition, the women were invited to attend group meetings. Also a focused educational campaign was launched to educate the husbands, including occasional group meetings. The educational campaign resulted in higher use of contraceptives, extension of birth spacing and it showed that differential audience specific education campaigns are feasible and effective [54].

Community participation is another strategy to create awareness and change the behaviour of the population. Community involvement in order to improve the health situation is a key feature. Programs with the aim of actively involving community members in the treatment process have been successful. The DOTS (directly observed treatment, short-course) strategy for example has brought tremendous success in case detection and treatment results among tuberculosis patients. This approach led to a substantial reduction in the TB burden in South India [7]. Community participation is also important when it comes to the prevention of disease transmission and the maintenance of good environmental sanitation and hygiene. The transmission of dengue fever, malaria as well as other infectious diseases can be reduced tremendously if vector control measures, as well as insect repellents and mosquito nets are being used. The further promotion of those measures is therefore strongly recommended [9]. Another way of involving the community in public health activities is a program in Khurda district, Orissa. Community reporting systems were established using women self-help groups in order to establish a system for disease surveillance. This not only had the effect of improving outbreak response, but also empowered and motivated community members to actively participate [49].

Example: The Ekjut trial

A participatory approach to influence the health of a largely tribal population in Jharkhand and Orissa, namely the Ekjut trial, led to an impressive impact on neonatal mortality. In rural areas, where newborn health outcomes were poor, 244 women's groups met monthly in groups of 15-20 in order to discuss problems related to pregnancy, childbirth and the post-natal period. The meetings were led by local facilitators who were trained in various communication methods. The facilitators were not health educators but they had received basic training. The discussions were focused on collective problem solving and planning and the overall aim was to share learning outcomes with the community and give support in implementing strategies to address problems in pregnancy and giving birth. The whole intervention cycle lasted for three years. The Ekjut trial led to substantial improvements in safe delivery practices for home delivery use rather than an increase in health service utilisation. It was found that local acceptability, community involvement beyond the groups as well as a participatory approach to the development of skills, knowledge and critical consciousness were important success factors. The women's group members described an increase in community mobilisation to deal with health problems and the members themselves became active health advocates in the community [55].

Provision of safe drinking water is needed to address water scarcity and contamination. As many people are not aware of the contamination of their home tube wells, awareness generation and motivation of the people for testing their water sources is important to prevent further exposure. The public system should tackle the issue by having surveillance systems in place to check contamination and water pollution. It should disseminate the information to people on unsafe levels of contamination in water. It is also inevitable to make arrangements for the availability of safe water sources [30]. Byyraju Foundation in East and West Godavari districts of Andhra Pradesh has established a water treatment facility. It supplies the surrounding villages with purified water at very low prices. This has decreased waterborne diseases in the area to a large extent.

Reorientation of the health delivery system to suite the epidemiological change constitutes another measure to tackle non-communicable diseases and mental health. Especially the primary healthcare system in India appears not to be very well equipped to deliver prevention and care for chronic illnesses and mental disorders. Therefore, an urgent reorientation of the health delivery system is needed to overcome these challenges [18]. Quality of life of the elderly population needs to be improved by strengthening health care activities related to geriatric health care, including care for visual disability in particular [22]. Visual impairment and blindness require further public health endorsements for cataract surgery, the surgical quality and postoperative monitoring to ensure good visual outcomes to eliminate needless impairment among already operated patients [24]. Integrated health care models, which tackle all issues related to the region, should be put forth. System wide thinking will also give a comprehensive view to optimize the available scarce recourses for prioritized health needs.

Disaster mitigation and adaptation to environmental risks in addition to the burden of communicable as well as non-communicable diseases will be an asset as recurring disasters are dangerous and cause severe morbidity and mortality [51]. Response options in order to protect the population from the effects of climate change are necessary [28]. Mitigation and adaptation measures are probably best implemented by including them into ongoing national hazard mitigation programs. A multi-level climate adaptation framework is needed, which works at national, state, city and neighbouring levels, bringing together state, private and civil society sectors [13].

Example: Hazard Risk Reduction

As the East Coast of India will be strongly affected by the consequences of climate change, it is important to join up with ongoing hazard risk reduction programs. The National Cyclone Risk Mitigation program, which is being implemented along the coastal states of India, is probably the most important ongoing one. It is supported by the World Bank and governments of Orissa, Andhra Pradesh and Gujarat have already made progress in its implementation in rural settlements. The program includes upgrading of cyclone forecasting, tracking and warning system, technical assistance for hazard risk management capacity building and cyclone risk mitigation investment. The latter involves the construction of cyclone shelters, shelterbelt plantation, mangrove regeneration etc. Management and monitoring is also an important part of the program. Each state has to set up an implementing agency which will then set up a project steering committee to consider the investment proposals and hence recommend them to the Ministry of Home Affairs for assistance [13], [56].

Continuous, sustainable and evidence-based initiatives have to be started but in the end it is up to the general population to contribute to the prevention of climate change. Therefore it is suggested to implement effective awareness raising campaigns regarding climate change [57], especially as the East Coast of India will be affected to a much bigger extent by global warming as other Indian regions. Also the danger of rising sea levels along the coast needs to be addressed. Projections indicate that the frequency of cyclones will decrease in the future, however, the intensity is supposed to increase [58]. It is hence important to educate local communities to facilitate their role in mitigating the damages of natural catastrophes. This could be part of a disaster preparedness programme [59]. It is also suggested to provide the population with disaster insurance services, offering multiple-hazard coverage for property and life risks [60].

Example: Insurance for assisting adaptation to climate change

The coastal state of Andhra Pradesh is affected by severe natural hazards, such as flooding, earthquakes, cyclones and so on. Therefore, micro-insurance services have been provided in this region since 2004, as part of the voluntary Disaster Preparedness Programme. It is a programme that also offers capacity building communities, government, civil society and media organizations. In partnership with the Oriental Insurance Company, multiple-hazard insurance coverage is provided for life and property risks to groups of women with a minimum size of 250 members. Subsidies from two different sources made the disaster insurance in Andhra Pradesh affordable to low-income women. Since 2000, the Indian regulatory authority has required insurers planning to operate in India to provide services to the low-income population, and many insurers seem to be willing to do so in order to access the broader. The advantages of this type of insurance are that it is feasible and targeting the most vulnerable [60].

No matter which measures are taken, it is important to note that interventions should always be grounded in ethno-cultural beliefs and practices and should be aimed at strengthening prevailing community coping strategies [61].

Conclusion

The health issues in coastal areas may seem similar to anywhere in India but the range of vulnerability and proportion of the population at risk are much higher in these areas. The East coastal population in India suffers due to communicable and non-communicable diseases. The specific attributes of effects of climate change and disasters make the attitude towards risk of disease and their solutions very different from the rest of the country. Poverty, lack of awareness on health and disease, lack of access to quality health care and functional public health programs further increase the risk of falling prey to disease. Self-medication and consultation with informal health care providers has complicated the situation. Attention to tackle the re-emergence of vector borne diseases, HIV/AIDS, co-morbid conditions related to age and lifestyle, mitigate the effects of disasters (flooding, mortality and impoverishment) and climate change (rising temperatures and sea levels, changing pattern of disease transmission) is the need of the hour.

Governments are taking measures to provide quality health care by risk pooling mechanisms which only transcend the financial barriers to access care. Regulation of service providers, informal health care providers and drug usage is also necessary. There are successful examples of good health and disease outcomes through rising awareness among population and engaging communities in sustainable developmental activities.

However, strengthening the public health system, disease prevention and health promotion activities as well as provision of safe drinking water, clean surroundings and sanitation facilities are inevitable to combat diseases. Further impeding the necessary action is limited knowledge on the existing health situation, hinting a need for further research on health issues in coastal areas to provide the best possible solutions for the population.

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