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How to Improve Public Health Systems

Lessons from Tamil Nadu

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Abstract

Public health systems in India have weakened since the 1950s, after central decisions to amalgamate the medical and public health services, and to focus public health work largely on single-issue programs—instead of on strengthening public health systems' broad capacity to reduce exposure to disease. Over time, most state health departments de-prioritized their public health systems.

This paper describes how the public health system works in Tamil Nadu, a rare example of a state that chose not to amalgamate its medical and public health services. It describes the key ingredients of the system, which are a separate Directorate of Public Health—staffed by a cadre of professional public health managers with deep firsthand experience of working in both rural and urban areas, and complemented with non-medical specialists—

with its own budget, and with legislative underpinning.

The authors illustrate how this helps Tamil Nadu to conduct long-term planning to avert outbreaks, manage endemic diseases, prevent disease resurgence, manage disasters and emergencies, and support local bodies to protect public health in rural and urban areas. They also discuss the system's shortfalls.

Tamil Nadu's public health system is replicable, offering lessons on better management of existing resources. It is also affordable: compared with the national averages, Tamil Nadu spends less per capita on health while achieving far better health outcomes. There is much that other states in India, and other developing countries, can learn from this to revitalize their public health systems and better protect their people's health.

How to Improve Public Health Systems:
Lessons from Tamil Nadu[1]

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When I arrived in Berlin, I heard the words 'sanitary' and 'health' everywhere, but I really did not understand those words. What I eventually came to understand was that these words …referred to an entire administrative system that was organised to protect the public's health…. and to improve the nation's welfare

(Nagayo Sensai, architect of the Japanese public health system, c. 1871)[1]

Introduction

Public health systems in India have weakened since the 1950s, when the central government decided to amalgamate the medical and public health services, and to focus heavily (with donor support) on single-issue public health programs. The amalgamation was intended to improve coordination between services, but inadvertently marginalized public health services. The focus on single-issue programs sought to concentrate resources on some important diseases and public health concerns ─ but this detracted from maintaining strong integrated public health systems which can proactively deliver a range of preventive health services to reduce people's *exposure* to disease, including implementing health and sanitary regulations to protect environmental health. These processes have been discussed in greater detail in Das Gupta (2005) and Das Gupta et al. (2009).

Over time, most state health departments have come to focus their public health work largely on implementing the single-issue programs, which include programs to control specific diseases, disease surveillance, family planning, and maternal and child health.[2] They de-prioritized their public health systems, and their administrative and workforce capacity for delivering broader public health services eroded at both the managerial and grassroots levels. This has resulted in an unnecessarily high toll of morbidity for people of all ages and socio-economic strata, and elevated child mortality. Health resources are deployed to treat people who should never have been exposed to disease in the first place.

In this paper, we describe how the public health system works in Tamil Nadu, a rare example of a state that chose not to amalgamate its medical and public health services. We describe the key ingredients of the system, which are (a) a separate Directorate of Public Health, with (b) its own budget, (c) legislative underpinning for its work, (d) a professional public health cadre managing a team of non-medical specialists and lower-grade staff working solely on public health. We illustrate how this helps Tamil Nadu to conduct long-term planning to avert outbreaks, manage endemic diseases, prevent the resurgence of diseases after they have been controlled, manage disasters and emergencies, and support local bodies to protect public health in both rural and urban areas. We discuss areas that need strengthening in this system. We conclude with a discussion of the lessons that other states can draw from Tamil Nadu, to re-vitalize their public health systems.

The ultimate measure of effective public health service delivery is that *nothing happens* ─ no major disease outbreaks occur. Its hallmark is planning to avert potential outbreaks, and constant vigilance to ensure non-recurrence of diseases. This needs a long-term perspective (and ring-fenced financing) which is difficult to sustain in the absence of the above components, given the political pressures to cure the ill and fight only visible fires such as epidemics that have already broken out.

Tamil Nadu offers a model of strong public health administration, in which a wide range of actors ─ from the public health managers and technical staff such as entomologists, to laborers who do spraying and collect rats' fleas ─ work together as members of a team dedicated to public health protection. Through their teamwork, they come to learn much about the functioning of the whole system, beyond their own specific tasks ─ and this is in turn further strengthens the team's ability to function effectively, as illustrated below. It is noteworthy that Tamil Nadu's performance on public health indicators is well above what would be expected based on its per capita expenditures on health.

Tamil Nadu's approach not only helps protect public health, but also helps build the state's developmental infrastructure. The state is industrializing rapidly, and the contribution of better public

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health to this effort is illustrated by the fact that it is possible for an area like Hosur ─ long dreaded for endemic plague and cholera ─ to seek to develop into a large industrial complex.[3]

In discussing the strengths of Tamil Nadu's approach, we have used examples from several other states to illustrate the negative consequences of having merged public health with medical services. This should not be interpreted as reflecting negatively on these specific states, which include some of India's most progressive and well-administered states. (Nor do we imply that all is well with the Tamil Nadu public health administration, as discussed below.) What the examples illustrate are problems common to most states, which result from decades of gradual erosion of state public health systems' capacity to plan and implement public health services. Many public health specialists in these states are deeply aware of these problems, but face serious structural constraints in redressing them.

This paper explores the merits of Tamil Nadu's separation of the organization and financing of medical and public health services. With a dedicated Directorate of Public Health, it can deliver an integrated set of services that gain from the synergies between different aspects of public health service delivery, and avoid the fragmentation that results from organizing public health services around single-issue programs. We describe the Tamil Nadu approach, and how it fares in delivering key public health interventions and programs, in both rural and urban areas. The last section presents some data comparing Tamil Nadu's health indicators with those of other states, but this effort is constrained by the difficulty of measuring the effectiveness of public health systems. Finally, we discuss how replicable the model is for other states.

We do not intend to imply that the Tamil Nadu model is the only effective approach to organizing a public health system, and we point to areas where the system has frayed and needs strengthening. What this paper seeks to illustrate is the basic organizational principles whereby public health systems can be made more effective within the existing administrative and fiscal resources available to most states in the country.

1. The Tamil Nadu model of managing public health services

We describe in this section the key components of the Tamil Nadu public health system. These are (a) an organizational focal point for policy and planning with (b) its own budget, (c) legislative underpinning for its work, (d) its own workforce. We describe briefly below how this is organized in Tamil Nadu. An organogram of the Directorate of Public Health is in Appendix 1.

a. Policy and planning: a Directorate of Public Health with its dedicated workforce

Public health has its own dedicated Directorate in the State Health Department, in place since 1922. The department has three key Directorates which are organizationally on an equal footing under the Health Secretary: the Directorates of Public Health, of Medical Services, and of Medical Education. Each of these Directorates has its own dedicated budget and workforce. Each service stream has its own career paths and incentives, and offers the possibility of rising to the same level within the health department — thereby precluding the status dominance of medical specialists over public health specialists which is common elsewhere in India.

The Directorate of Public Health is staffed by a professional cadre of trained public health managers, who are promoted to the Directorate after long years of experience of planning and oversight of public health services in both rural and urban areas. Other technical staff in the Directorate, such as the entomologists and statisticians, also obtain strong hands-on experience in the districts before being promoted to state-level positions in the Directorate.

This means that the Directorate of Public Health is run by highly experienced staff with a deep understanding of how to run these services, and what is required in order to keep them functioning smoothly. Interestingly, the medical cadre staff begin their career in a Primary Health Center ─ where

they obtain hands-on experience of public health management under the supervision of the public health cadre ─ before being promoted to the higher medical centers ─ making the medical cadre more appreciative of public health needs and approaches, and of the work of public health professionals.

This system makes possible the proactive planning and effective disaster management described in section 2. This contrasts sharply with many other states, where the planning and management of public health services is done by staff of an amalgamated health service, which means that people in charge of public health planning may be clinicians or staff of the general administrative services.

b. Dedicated funding: a separate and substantial budget

The Directorate is able to sustain its proactive public health work because it has a dedicated budget, which enables it to carry out all the activities related to planning and implementation of services. Firstly, the Directorate is able to ensure that its workforce includes not only the managerial and grassroots health workers (male and female) mandated by the central government, but also a wide range of technical staff such as entomologists and public health laboratory staff, as well as the field staff and laborers needed for environmental sanitation measures such as clearing vector-breeding places. Thus for example, Tamil Nadu has 120 entomologists, whereas many states have just a few, seriously hampering their efforts at controlling a wide variety of vector-borne diseases. Secondly, it provides the budget for ensuring service delivery, including supporting the planning process, conducting research, and the funding for implementation. It also enables the Directorate to maintain needed technical units, such as the plague surveillance unit whose significance is discussed below.

By contrast, the public health workforce has weakened in many other states. For example in Karnataka, Health Officers used to be seconded by the Health Department to municipalities, but this position has been abolished except for the 5 cities large enough to classify as Corporations (Krishnan 2005:46). This is a severe blow for urban health. Activities at Karnataka's plague surveillance unit in Kolar (near the plague focus at the tri-state junction) have ground to a halt since the abolishing of the post of laborers.[4] The Director of Health Services, who in the early 2000s was a public health specialist highly committed to public health, fought for years to fill the many vacancies in the post of entomologist. To his despair, many women were hired when the vacancies were filled: "These staff need to go to the forest at night to study insects, and they have hired ladies!!!"[5] This illustrates how even if there is excellent public health expertise in top positions, it can be difficult in the absence of a separate Directorate and budget to put together an effective team for implementing needed services.

Apart from having a *separate* budget for public health in Tamil Nadu, the size of the public health budget is large relative to spending on secondary/tertiary medical care and medical education. As Table 1 shows, the Directorate of Public Health has consistently had larger budgets than the two other Directorates in the Health Department (the Directorate for Medical Services and the Directorate for Medical Education) ─ though its relative share has fallen over time. The public health budget covers population-wide health services as well as primary health care. In terms of staffing and staff costs the share of the Directorate of Public Health is even larger (Table 2), because the proportion of its budget spent on equipment, medicines, etc is lower.

c Legislative and regulatory underpinnings for public health services

Public health service provision in Tamil Nadu is greatly facilitated by the fact that it has a Public Health Act.[6] Such an Act enables proactive measures to avert health threats. It specifies the legal and administrative structures under which a public health system functions, assigns responsibilities and powers to different levels of government and agencies, and specifies their source of funding for discharging these duties. Secondly, it sets out powers for protecting people's health, including powers of regulation and of inspection — and the responsibility to use these powers to monitor *any* situations or activities ("public health nuisances") that could potentially threaten public health, and seek to redress them if needed. Thirdly, public health laws set standards, such as those for food hygiene, slaughterhouse and market hygiene, water quality, and local government activities for sanitation and

environmental health. They also specify who is responsible for assuring that these standards are met, as well as the procedures for assuring that they are met.

The most crucial advantage of the Public Health Act in Tamil Nadu over other available legislation with public health implications is that it includes a very broad definition of a public health "nuisance". This includes any situation that poses a credible public health threat), a few examples of which are premises or animals kept in unhealthy conditions, stagnant water or ill-maintained drains, accumulation of refuse, and factories that are poorly designed or maintained. Health Officers are empowered to detect nuisances following a complaint from a citizen, or by using their powers of entry and inspection. The Act empowers Health Officers and local bodies to contain nuisances, including by direct action if the offender does not take action as requested.

This wide definition of potential health threats and associated powers gives the Public Health Act more sweeping powers to act proactively to protect public health than the Penal Code and Epidemic Act, which essentially provide powers to act after a severe health threat has materialized. It also offers advantages over the Municipalities Act and Panchayati Raj Act, since its provisions are much more detailed and comprehensive, and apply uniformly across the state instead of just in specific areas.

Although the Tamil Nadu Public Health Act needs updating, it nevertheless provides crucial underpinning for public health service provision. It provides the legislative basis for all the planning and policy implementation work of the Directorate of Public Health, ranging from its efforts to avert potential public health threats to its work to address existing threats. For example, the annual district plans for responding to public health threats posed by floods are drawn up under the legislative authority of the Public Health Act.

This is in sharp contrast with most other states, which lack such an Act. In Karnataka, the old Public Health Acts are still on the books from the colonial era for the different parts of the state which belonged earlier to the Madras Presidency and the Mysore princely state. They have not yet been consolidated into an Act applicable across the state and are in disuse. The same is true of Kerala. This makes it easier to get away with creating health hazards, such as meat sellers dumping their waste in or near drinking water sources (Krishnan 2005:70).

d. *Workforce - training, incentives, and responsibilities of public health managers*

The public health managerial cadre is given careful training. They are oriented towards an administrative and management role rather than a clinical role, and towards examining health issues from a population-wide perspective instead of focusing on the needs of a specific patient. After obtaining their medical degree, those who choose to enter this service are given three months pre-placement training in public health, and must within four years obtain a post-graduate diploma or degree in public health.[7] They are prohibited from private medical practice, and indeed given the non-clinical nature of their work they are unlikely to attract patients.

This cadre has faster promotion avenues than the medical cadre, and enjoys considerable administrative responsibility and authority — all of which helps keep them incentivized.

They obtain all-around exposure in managing public health and environment health matters during their career. Their first posting as Municipal Health Officer (MHO) puts them in charge of public health services of a city or large town. From there they are promoted to Deputy Director of Health Services (DDHS), which puts them in charge of a whole district. Thereafter they are promoted to the Directorate of Public Health, where there are various posts culminating in that of the Director. They can also opt to teach for a while, which has the important benefit of giving future public health managers an opportunity to learn from their hands-on experience.

The DDHS is supported at the district[8] level by an entomologist (District Malaria Officer), a statistician (Assistant Director, State Bureau of Health Intelligence), a District Maternal and Child Health officer,

and a Technical Gazetted Personal Assistant to DDHS promoted from the ranks of Health Inspector.[9] Below this is the Block Primary Health Center, headed by the Block Medical Officer and supported by a contingent of clinical as well as public health staff. The latter consist of a Community Health Nurse and a Block Health Supervisor, who respectively supervise the teams of female reproductive and child health workers and male Health Inspectors down to the level of the Primary Health Centres (PHC) and health subcenters. These supervisors are promoted from amongst the cadre of workers they supervise.

The DDHS manages all the workers at the district and block levels downwards who work on rural health, including all the staff of the Primary Health Centers and subcenters. Primary health care is provided by the Block Medical Officer (BMO) and the Medical Officer of the PHC (MO-PHC), but they are also oriented towards population-wide issues. For example, when cases of communicable diseases present themselves in the health centers, they are expected to have their Health Inspectors follow up to investigate contacts and sources of infection, to prevent further spread of the disease. They are the supervisors of all the Block public health workers, but belong to the medical cadre. Their first posting is under the DDHS, and most opt to spend the rest of their career in the medical cadre as clinicians or teachers. Before being posted as BMO/ PHC-MO, they are given 15 days' intensive training for their public health supervisory duties, and the course covers public health acts and food safety, environmental health issues, national health programs, prevention and control of epidemic outbreaks, administrative and financial powers, and health education of the community.

In addition, the MHOs report to the DDHS on public health matters in the municipalities of the district. The DDHS has the residual responsibility to address public health threats in all urban areas in the district, should the matter not be satisfactorily resolved by the urban health staff for any reason (see below). The DDHs is also responsible for oversight and delivery of the single-issue programs across the district, including maternal and child health care. Thus the DDHS is responsible for the health of the district as a whole, and not just for the rural areas, as is the case in many states.

The DDHS is responsible for organizing an annual cycle of work, corresponding to the potential threats of the upcoming season. Every February they prepare the district's Epidemic Contingency Plan, including plans for responding to natural disasters such as floods and cyclones. In May, they carry out preparatory measures for the summer, including anti-diarrhoeal measures such as ensuring adequate supplies of disinfectants and water purifying agent, and distributing information to communities about how to avert diarrhoeal outbreaks.[10] In June, they undertake preventive measures against diseases such as malaria and chikungunya, including activities such as drain cleaning to prevent mosquito breeding, creating community awareness of the need to remove potential vector-breeding sources, spraying as needed, and providing technical support to local bodies in their vector control activities. Monsoon Preparedness work is carried out for both annual monsoon seasons, including preparation for prevention and control of diarrhoeal disease and floods.

The DDHS and the Directorate of Public Health play an important role in reducing the potential for the single-issue programs to dominate the public health agenda of the state, as they do in many other states. They are trained to be oriented towards population-wide health concerns, and responsible only for managing population-wide health services and primary health care services. They are not required to also manage secondary and tertiary medical services, unlike the merged health departments and district health officers in other states. Moreover, the Directorate staff all have prior experience of managing public health services on the ground, and understand the importance of services other than the single-issue programs. Thus the DDHS is allowed to focus on preventive and primary health care, and is held accountable by the Directorate of Public Health for delivering both these types of service. However, as discussed below, the single-issue programs have undermined the role of the Health Inspectors in providing environmental health services at the grassroots.

2. *How does Tamil Nadu's approach strengthen the delivery of public health services?*

Through its management of public health services, Tamil Nadu is able to respond proactively to avert potential health threats, and respond quickly and effectively when confronted with disasters and emergencies. A few examples of this follow.

a. *Long-term planning to avert outbreaks*

As mentioned above, the hallmarks of effective public health service delivery are (a) planning to reduce exposure to *potential* disease threats, and (b) *continued vigilance* to ensure non-recurrence of disease as long as the potential threat remains. This approach manifests itself in a multiplicity of ways in Tamil Nadu ─ one of which is the advance planning described above, for managing the disease threats of the upcoming season.

Another example is disaster management which relies on averting a public health disaster instead of scrambling to respond to it once the disaster has struck. Thus for example, *anticipatory planning* is carried out every year to prepare for controlling disease in the wake of potential recurring natural disasters such as floods and cyclones. This is part of the annual cycle of work planning described above, and prepares every member of the team for their role in responding to the natural disaster.

Such routine preparation is very helpful when totally unanticipated disasters strike, such as the tsunami that hit Tamil Nadu in 2004. The state was able to respond to this quickly despite the fact that it was such a massive and freak disaster, because the training of its public health staff gives them the basic tools to respond to any kind of public health hazard. This is helped by the high level of clarity amongst all members of the team including specialist technicians such as entomologists, about the needed actions and the roles of the different actors, including the roles of other public agencies. This is reflected by the state's Chief Entomologists:[11]

> "In a flood, a sheet of water flows into waterbodies so water sources become highly contaminated with human and animal excreta, etc., so the first task is to purify the water sources. This is done by the local body, but the Health Department staff monitors the water quality and chlorination level. If there are internally displaced people, then arrangements have to be made in their camps for toilets and for food sanitation in the kitchens where their food is prepared. Fly control is undertaken. If water begins to stagnate, mosquito control is carried out. The bodies of dead animals and humans are disposed of by the local bodies in collaboration with the Revenue Department (the authorized department for declaring the number dead and digging mass graves) and under the supervision of the District Collector. If the disposal of bodies is not done promptly, the Health Department has to notify the local bodies and higher authorities of this public health nuisance, and mobilize their support in removing the nuisance. This is normally done by the Health Inspectors, along with vector control measures.

> When the tsunami hit, there was contamination everywhere ─ our main focus was on water source chlorination, disinfection of the environment around all habitations using bleaching powder and lime, and all actions for assuring sanitation and hygiene in the camps for displaced people. We selected the sites for the Revenue Department to construct latrines, and oversaw the arrangements for the safe disposal of waste. NGOs helped the local bodies dispose of dead bodies, under Revenue Dept supervision and the Health Department provided the technical expertise on how deep to dig the graves and prepare them with lime to minimize the scope for contamination. Fly breeding began, and we undertook fly control measures. We checked donated food for basic safety. Health Department staff (including DDHS and their teams and 10 entomologists) from other areas were brought in to help with the environmental sanitation arrangements as well as providing outpatient care."

The World Health Organization (2006) noted that despite the scale of the freak disaster, the state public health authorities' response was rapid and highly-organized, and the state Government was able to carry out the relief measures largely on its own (WHO 2006: 19).

> "The gigantic response from the public health sector was the hallmark of the Government of Tamil Nadu's riposte to the tsunami….The presence of a well-trained public health cadre enabled massive mobilization and deployment of people and material in a smooth manner….this resulted in one of the

truly remarkable achievements of the relief effort – the complete avoidance of any kind of epidemic." (WHO 2006:81,83)

This is in sharp contrast to most other states' response to public health emergencies and natural disasters. For example, after the recent hurricane in West Bengal, that state's health authorities' task was essentially to provide chlorine and other disinfection agents, and medical care[12] ─ not the wide range of relief and disease-prevention activities described above ─ and disease outbreaks followed. After Orissa was hit by a massive cyclone in 1999, a health team from Tamil Nadu was called in to assist with the health emergency in the worst-hit area, where cholera had already set in when they arrived. Even more striking is the example below of Maharashtra and Gujarat states' response when they were struck by plague.

A different example of anticipatory planning is the fact that in Tamil Nadu, the DDHS deputes a Health Inspector to each government medical college, in order to protect their environmental health conditions. These colleges pose potential health threats, such as the possibility of diseases spreading from them, since they are the top referral points for difficult cases of communicable diseases. The Health Inspector's tasks include assuring sanitary conditions and vector control. The Directorate of Public Health also takes action if needed in Chennai, if the Corporation does not step up to its responsibilities. For example, when there was an outbreak of leptospirosis in a government medical college in Chennai and the Dean said they had no manpower to control it, the Directorate of Public Health posted Health Inspectors from nearby districts to carry out the preventive measures.

The consequences of not taking this small step are evidenced, for example, in the repeated dengue outbreaks in Delhi and Kerala that originated in medical colleges. This arose from the fact that mosquitoes were breeding in the colleges in ongoing construction sites, or in other places such as water-coolers.[13] Public health experts in Kerala attribute the resurgence of communicable diseases in that state to the neglect of public health services (John et al 2004; Krishnakumar 2009).

b. Eradicating diseases and preventing their resurgence

Tamil Nadu has worked to eradicate diseases, sometimes long ahead of national efforts. For example, it had eradicated guineaworm by 1982, whereas the national eradication program started in 1994.

Even more impressive are its efforts to prevent resurgence of diseases which retain their potential to manifest themselves again. A striking example of this is the maintenance of a state plague surveillance unit, in an area known to have plague foci among wild rodents near the border with Karnataka and Andhra Pradesh states. This is despite the fact that the last episode of plague in South India was in the early 1960s.[14] This unit studies the fleas on wild rats, to detect a threat of a plague outbreak. When the plague outbreak took place in Western India in 1994, a team was sent from this unit to help control the outbreak, along with their plague laborers experienced in finding rats and isolating their fleas. They were amongst the sole remaining repositories in India at the time, of hands-on expertise of how to deal with plague.[15]

This is in sharp contrast to Maharashtra state, which also has a known sylvatic plague focus. The state plague surveillance unit was abolished in 1987, because there had been no confirmed cases of plague for decades.[16] When an earthquake took place near the plague focus in 1993, the central government warned the state health department of the possibility of disturbing the wild rats and creating conditions for a plague outbreak, but this was ignored. As Garrett (2000:20-28) summarizes, cases of plague were reported around the earthquake area but not contained there so it spread to Gujarat where it found fertile ground in the spectacularly insanitary conditions prevailing in Surat at the time. Neither the state nor the central governments instituted quarantine until after the outbreak was well advanced, so people were allowed to leave the earthquake area and later flee by the trainloads from Surat to the rest of India. After the outbreak had escalated, vigorous efforts were made to contain it and clean up the city.

Plague surveillance was re-established in Maharashtra in 1994, and in Himachal Pradesh in 2002 ─ in both cases *after* outbreaks of plague had occurred.[17] Meanwhile, the Tamil Nadu state plague surveillance institute (the Institute of Vector Control and Zoonoses at Hosur) has been expanded to cover other vector-borne and zoonotic diseases, and gives practical training to entomologists and other public health professionals.[18] It was recently given a large grant from the state government for facility maintenance and upgradation.

c. Management of endemic diseases

The strength of Tamil Nadu's public health management is illustrated also by their routine work to contain endemic diseases, such as malaria. Malaria control requires multi-pronged efforts, including (1) controlling vector breeding through environmental management and the use of chemical and biological larvicides; (2) containment of adult mosquitoes through insecticide spraying and fogging; (3) early detection and treatment, (4) personal protection measures, and (5) raising community awareness and engagement in all these measures.

A brief comparison of how these activities are carried out in Tamil Nadu and how they were carried out in a highly-endemic district of West Bengal in 2005 [19] illustrates the benefits of having dedicated public health services with fully functioning planning and implementation systems.

The first contrast is in the technical and administrative support for malaria control staff. In Tamil Nadu, this is provided by professional public health managers, unlike West Bengal and most other states. Technical guidelines for malaria control are routinely circulated to all districts in Tamil Nadu, but had not been received in several districts in West Bengal in 2005. Moreover, districts in Tamil Nadu have an entomologist based in the DDHS' office. By contrast, the medical officer in charge of communicable diseases in the West Bengal district faced an acute lack of entomological information. Most states face an acute shortage of entomologists.[20]

A second contrast is in the management of vector breeding. For example, in the West Bengal district, the irrigation department had left a canal half-constructed for years, and this became a notorious mosquito breeding ground. Lacking entomological and other public health resources, the health authorities' response was primarily to step up efforts to treat the malaria cases. Analogous situations were noted by the district health authorities in several other districts of that state. In Tamil Nadu more proactive measures are taken. For example with the Telugu-Ganga canal,[21] vector density monitoring is regularly undertaken by the nine Zonal Entomological Teams (ZET) whose catchment areas the canal passes through. If the vector density rises above acceptable levels, they intensify their surveillance and source reduction activities (anti-larval measures and adult mosquito control).

A third contrast is in the management of malaria spraying operations. In Tamil Nadu, teams of mosquito laborers are assembled and given a schedule of areas to cover each day such that the spraying is completed within a month. This is done twice a year. Their work is supervised by Health Inspectors and Medical Officers from the Primary Health Centers. Communities are informed by health staff 15-20 days in advance of when spraying will be done in their area, and reminded of the need to allow the spray to remain in place for maximum effect. Zonal Entomological teams check for insecticide-resistance amongst the mosquitoes. In the West Bengal district, spraying is carried out because the central government supplies the insecticides and requires that spraying is done, but it is done with little supervision because health staff are not available for this. Moreover, villagers reported that they had not been told when to expect the spraying, and consequently many re-plastered their homes shortly after the spraying which sharply reduces its effectiveness.

A fourth contrast is in the way that larvivorous fish are deployed. In Tamil Nadu, fish hatcheries have been constructed at district and Primary Health Centre levels, where fish are bred and supplied to Health Inspectors and laborers for placing in wells and other potential mosquito breeding sites. In West Bengal, the Health Department asked the Fisheries Department to supply the fish to an NGO, for release into local water bodies. However, the health authorities in the highly-endemic district reported

that they were not informed where the NGOs had placed the fish, and what guidelines were followed in their placement. Many of the fish died out in the dry season, so the whole process would not to be repeated. It would clearly be much more cost-effective to breed the fish locally and distribute them as needed, especially since they breed easily.

d. *Intersectoral coordination and support to local bodies in their environmental sanitation work*

With its professional public health management, Tamil Nadu is well-placed for intersectoral coordination and support to local bodies. Through their work, the citizenry, local bodies, and other parts of the state administration also become more sensitized to public health issues, and to the need for proactive efforts to address them. To begin with, the Health Department is active in putting forward its plans and requests. At the District level, the District Collectors become sensitized to the need for anticipatory public health planning, which is crucial since they are in charge of the entire district administration, including all line agencies.

In case of a suspected outbreak, the District Collector calls a meeting with representatives from the health department and other departments as needed, such as the departments of Panchayat Development, Social Welfare, Education, Municipal Administration, Public Works, Water Supply and Drainage Board, Highways, Agriculture, and Animal Husbandry. They develop a coordinated response plan and assign responsibilities to each department — for which they will be held accountable.

The District Collector is also mandated to hold meetings once in three months of the public health intersectoral coordination committee (Epidemic Coordination Committee), to review the measures taken to anticipate disease threats and respond to them.[22] Other departments are called to these meetings as needed. The DDHS must inform the Collector about issues such as mosquito nuisance, contamination of water sources, breakages of pipelines etc, which are recorded in the minutes for follow-up action and the departments held accountable for these actions. At the Block level, the Block Development Officer and the Block Medical Officer handle inter-departmental coordination for health issues on a day-to day basis.

However, the District Collectors do not hold these intersectoral coordination meetings regularly, if they are only for making anticipatory plans. This situation needs to be redressed, but it is still better than in other states, where it is the norm to hold a meeting only *after* an outbreak has occurred.

With its public health team reaching to the grassroots, the Tamil Nadu Directorate of Public Health is well-placed also to support local bodies in carrying out their constitutional mandate to maintain environmental sanitation and public health. Support to urban health bodies is discussed below. In the rural areas, the Block Health Supervisors and Health Inspectors, along with the rest of the district public health team, are able to provide technical and other support to the rural local bodies (panchayats) in their work.

This is in sharp contrast to other states, where the health staff are focused on providing clinical services and implementing specific programs, and local bodies are left with little support. The results are haphazard. For example, since local health staff in West Bengal (as in most states) are expected to implement the specific programs rather than broader public health services, the Department of Rural Development and Panchayati Raj in West Bengal trains panchayat members directly for their duties relating to environmental sanitation and health, along with training for their other duties as elected local government officials. This requires a massive training exercise after each panchayat elections, and it is inherently difficult to adequately train people for whom public health is an unfamiliar issue distant from their primary political concerns. It would be much more cost-effective if local health staff were able to provide panchayats with technical and other support, and also monitored the quality of their work — representing professionalism and continuity through electoral cycles.

3. *How does Tamil Nadu's approach help protect urban health?*

Urban areas have an especial need for well-managed public health services, given their crowding and high level of economic and social activities that can cause health threats.[23] Local governments have many political and other pressures on them which are not always compatible with good public health outcomes (see below). The situation can be different in large Corporations such as Chennai, which have the financial resources to support a full-fledged public health department, and are under pressure to protect public health given the attention any major mishaps receive from politicians and the media. Other municipalities, with fewer resources and scrutiny, benefit from Health Department oversight since that is an independent authority focused only on protecting public health.

a. *Directorate of Public Health seconds Health Officers to larger municipalities*

In the 37 largest municipalities, public health services are managed by Municipal Health Officers (MHOs) seconded from the Directorate of Public Health. The MHOs are supported by a staff of Sanitary Inspectors. In smaller municipalities, public health services are managed by a Sanitary Officer (a promotee from the cadre of Sanitary Inspector), while the smallest towns are served only by a Sanitary Inspector.

The job descriptions of all these staff are oriented towards protecting environmental health, and other population-wide health services such as implementing the national disease control programs. Their main tasks include (a) disease prevention, control and management, (b) detection and abatement of nuisances, (c) food safety assurance, (d) monitoring environmental hazards and civic hygiene, e.g. management of solid and liquid wastes, and (e) collection of vital registration data.

The MHO and DDHS are also responsible for providing technical support and oversight of the urban maternal and child health services, which are provided by municipal hospitals and dispensaries. Government hospitals, which offer a wide range of clinical services, are under the Directorate of Medical Services.

By seconding MHOs to urban areas, the Directorate of Public Health provides municipalities with professional public health management. A key point is that they are accountable not to the municipality, but to the Directorate of Public Health which employs them and where the rest of their career lies. This means that they are focused primarily on protecting public health, not on the other agendas of municipal governments.

Sanitary Officers (SO) and Sanitary Inspectors (SI) belong to the Tamil Nadu Municipal Services. They are under the administrative control of the municipalities, whose first priority is not public health unless there is an outbreak which may be reported in the media. Municipalities gain revenues from issuing licenses, so it is not always in their interest to have sanitary staff conduct careful health inspections before recommending issuing of licenses. Municipalities also need help with miscellaneous tasks such as census-taking, and use these staff for various purposes unrelated to health.

Before 1989, the SOs and SIs were deputed by the municipal administration to work under the administrative control of the MHO and the Directorate of Public Health. This meant that the public health authorities had a say in their transfers, promotions, and capacity-building, and could initiate disciplinary action against them. When the administrative control of these staff was transferred to the municipalities in 1989,[24] there was a severe erosion of the MHO and the Directorate of Public Health's power to get the municipal staff to focus on their public health duties.

b. *DDHS takes residual responsibility for municipal public health*

The DDHS holds regular meetings with the person in charge of public health in all the municipalities in the district, i.e. the MHOs, SOs, and SIs as the case may be. They must report to the DDHS on all public health matters. S/he monitors their work and gives them technical support and additional human

resources as needed to carry out their work. For example, in the summer the Directorate of Public Health sanctions the hiring of additional laborers for anti-chikungunya work (such as drain-cleaning and other source reduction activities) in both rural areas and municipalities. In larger municipalities, the MHO will report to the DDHS on the control measures taken, and the DDHS will provide more support as needed. In smaller municipalities without a MHO, the DDHS will monitor the work and if there is any problem will intervene to offer more manpower and ask the Municipal Commissioner to see to it that the control measures are carried out.

The DDHS has no administrative control over these staff,[25] and cannot ensure that all routine preventive public health work is done. For example, s/he may not report to the Municipal Commissioner that the SOs and SIs are neglecting their task of overseeing laborers for street cleaning. However, the DDHS takes more direct responsibility for municipal health in several ways, using his/her own staff as needed. If there is a fair or festival, s/he is responsible for the public health arrangements, including arranging for public toilets. If goats are sacrificed, the health authorities have the place cleaned and sprayed with insecticide to control the flies, to prevent the outbreak of diarrheal diseases. The DDHS is also responsible for implementing all national programs in the urban areas.[26]

Most importantly, the DDHS has the mandate and responsibility to step in if there is an outbreak. S/he is formally responsible for any disease outbreak in the district, or certain other notable health events such as an infant death, maternal death, or a case of polio. In an outbreak, the DDHS can send his/her own team to investigate and undertake control measures, and/or give instructions to the Municipal Commissioner and check that the needed work is carried out.

The fact that the DDHS served earlier for several years as a MHO means that they understand well the modalities and exigencies of municipal public health work. This experience is invaluable for their monitoring of and intervention in protecting urban public health.

The multiplicity of ways in which the Tamil Nadu Directorate of Public Health uses its staff and resources to protect urban public health contrasts sharply with the situation in many other states. In some states such as Karnataka, the health department no longer seconds Health Officers to municipalities, as mentioned above (Krishnan 2005:46). In other states, the health department has little involvement in protecting environmental health in municipalities. For example, in West Bengal the district health authorities' role in municipalities is primarily to offer some support and oversight of the national (and state) single-issue programs, such as that for immunization.[27]

4. *Areas that need strengthening in Tamil Nadu's system*

Public health systems anywhere need periodic re-assessment and upgrading. [28] Tamil Nadu is no exception, and has several areas that need strengthening. For example, the Public Health Act needs updating. Health Impact Assessments need to be instituted, such that new projects cannot be undertaken without the health department's checking its health implications. The potential for protecting urban public health will be much enhanced by restoring the health authorities' administrative control over municipal public health staff.

A key area that needs to be addressed is the management of the Health Inspectors, who are the grassroots environmental health workers. They are currently demoralized and poorly-utilized.

a. *Erosion of the Health Inspectors' training and engagement in Environmental Health duties*

The position of Health Inspectors was severely eroded by the central government's decision in the 1970s to use Male Health Workers (MHW) for implementing specific national programs under the Multi-Purpose Health Workers Scheme, which led to de-emphasizing their environmental health services. [29] Tamil Nadu implemented this change in 1982. The Health Inspectors' training was kept up till 1992, but since then they receive only a condensed 6-month training course, or no training at all for

lateral entrants. Now most of their time is taken up in household visits to monitor diseases and the implementation of the various national programs.

The central government also encouraged the use of this post for accommodating staff originally hired for other programs, such as smallpox and leprosy. They have lower initial qualifications than the Health Inspectors, and received no further training to equip them for essential tasks such as implementing public health regulations. Now the trained and untrained staff must co-exist in the same cadre, which generates resentment on both sides.

In urban areas as well, the training of the Sanitary Inspectors was reduced in 1992 from 12 months to 6 months. To fill attrition vacancies, the state now resorts to promoting lower grade workers[30] to the position of Sanitary Inspector, and thereafter to Sanitary Officer. This seriously degrades the capacity of these key urban public health workers. Much can also be done to improve the supervision and on-the-job training of both the rural Health Inspectors and the urban Sanitary Inspectors.

b. *Erosion of the Health Inspectors' status relative to the Maternal and Child Health workers*

The central government placed much greater emphasis on the Female Health Workers (FHW), who implement the high priority national program of family planning and maternal and child health. This program is key to the national goal of controlling population growth ─ and also for the maternal and child health indicators that donors monitor closely. The central government therefore decided to pay the salaries of all Female Health Workers in the states, give them 18 months' training with a standardized curriculum, and offer them additional grassroots help from ICDS workers and ASHAs.[31] The central government uses them as their main grassroots staff for implementing priority programs.

None of this applies to the male cadre, and they have steadily lost ground in terms of status and authority to the female cadre. The female cadre is accorded higher status in many ways, such as being designated the person to co-manage (along with the village Chairperson) the funds of the Village Health, Water and Sanitation Committee recently set up under the National Rural Health Mission. The female cadre enjoys many perks that the male cadre does not. In Tamil Nadu, these perks include a uniform allowance, a cellphone, and an office in the village sub-center.

c. *Work programming and supervision*

The Health Inspectors' work schedule needs to be re-considered, to leave them more time for their environmental health work. It is a testament to people's need for job satisfaction that the Health Inspectors and Block Health Supervisors continue to attempt to make time for some environmental health work, and take initiative to channel technical support from the Directorate to the panchayats. However, the erosion of their standing and morale can only hamper them in their performance of environmental health work.

Environmental health work also requires a good measure of autonomy and joint decision-making at the local level. By nature, environmental health problems are highly localized ─ needing to answer questions such as "Where do the cases of illness cluster, and what are the drainage and other conditions nearby that could be causing this?" (Das Gupta et al 2006). In Sri Lanka, the Public Health Inspectors have a certain degree of autonomy in identifying and resolving problems in their daily work. In their monthly supervisory meeting they discuss problems with others in their team and their supervisors, and think through them jointly. This also helps incentivize workers (Dalpatadu et al 2008).

The supervisory structures for the environmental health workers may also need to be strengthened. The Medical Officers who are charged with supervising the local public health staff are clinical doctors with brief training in public health issues, most of whom opt subsequently for a career path in the medical services. They can be effective in supervising the maternal and child health workers, since the services they provide dovetail closely with their own. When it comes to supervising environmental

health work, however, there is really no one below the DDHS. The DDHS's office needs a person dedicated to supervising broader public health services including environmental health. And the Block Health Supervisors could be given more responsibility for supervising the Health Inspectors at local level.

5. Has the Tamil Nadu system led to better public health and is it replicable?

The questions of greatest interest to researchers and policy-makers are of course (a) whether, and if so to what extent, public health outcomes in Tamil Nadu are better *because* of its superior public health system, and (b) is the system replicable in other states.

a. *Does it lead to better health outcomes?*

It is very difficult to formally evaluate the impact of having a better public health system, since health outcomes are also shaped by a multiplicity of other factors. These range from the population's education and income levels, to how conducive the environmental conditions are to specific diseases. Regions differ, for example, in their conduciveness to breeding certain vectors, and in their pre-existing disease foci. Some regions may be watered by fresh streams, while others may be watered by rivers that have meandered for thousands of miles, collecting pollutants of every kind along the way and poisoning the subsoil water as well.[32]

There is no simple relationship between public health inputs and outcomes, making it difficult to identify good measures of the quality of the public health system. For example, disease incidence is difficult to measure reliably and, as discussed above, affected by many factors other than health system quality. Child mortality outcomes are good in Tamil Nadu (Table 3), but child mortality too is affected by many factors besides the quality of public health services. Reliable indicators are available for maternal and child health service delivery, and they show that Tamil Nadu's Directorate of Public Health manages these services effectively. The state performs better than all other states in full child immunization coverage, as well as in the percentage of women receiving antenatal care, being informed of specific pregnancy complications, and receiving postnatal checkups (IIPS 2007: Tables 9.5, 8.10, and 8.22, see Figure 1). This is an exploratory analysis, and further analysis is needed.

What is clear is that Tamil Nadu is better organized than most Indian states to manage public health threats. This is illustrated, for example, by the state's ability to respond swiftly to a major disaster like the tsunami, organize care for the survivors, and prevent epidemics breaking out as they often do when other states encounter a disaster. It is also illustrated by the fact that the state had the technical expertise to help control the 1994 plague outbreak in Gujarat, while other public health agencies were caught off balance. The comparisons with other states also illustrate Tamil Nadu's better organization for managing endemic diseases and anticipating and averting health threats. Also, Tamil Nadu's Health Department seeks actively to protect public health in urban areas, unlike most states.

It is also striking that Tamil Nadu has not figured as the main locus of any of India's epidemics in recent decades, ranging from plague to SARS, from chikungunya to swine flu, supporting the premise that a better administrative approach has led to better public health. This is:
- despite being India's third most urbanized state in 2001 (next only to Goa and Mizoram), with 44 percent of its population urban, compared with 28 percent for India as a whole
- despite being one of those least endowed with reliable sources of fresh water
- in the case of bird flu, despite being one of the country's main poultry producers with a major concentration of commercial poultry farms in Namakkal
- in the case of swine flu, despite being a state with 3 international airports and one of India's largest numbers of travelers to and from North America

Although it is difficult to formally prove that strong population-wide health services such as those of Tamil Nadu improve health outcomes, the connection is strongly indicated by the fact that developed countries have continued to invest public funds in these services for over 125 years, and have successfully reduced exposure to communicable diseases.[33]

b.   *Is Tamil Nadu's system replicable in other states?*

Tamil Nadu's system is replicable in other states because its administrative foundations (and ingredients) are similar to those of most other states. As in other states, Tamil Nadu's health department is headed by an IAS officer and staffed at state and district levels by medical officers. The state and district staff work in a largely administrative and managerial capacity, in charge of medical services at the primary, secondary and tertiary levels; as well as public health services and implementing the single-issue programs. There is a network of hospitals, staffed by government doctors, nurses, and other workers. At the lowest level is a network of Primary Health Centers and subcenters, staffed by doctors, nurses, technicians, and male and female outreach workers. These features are common across Indian states.

The difference is that Tamil Nadu organizes these ingredients differently from most states. The state (a) separates the medical officers into the public health and medical tracks, (b) requires those in the public health track to obtain a public health qualification in addition to their medical degree, and (c) orients their work towards managing population-wide health services and primary health care ─ while those in the medical track obtain additional clinical qualifications and are oriented towards providing hospital care. This improves the efficiency of both the public health and the medical services. Coordination between these services is facilitated by the fact that all three Directorates (of Public Health, Medical Services, and Medical Education) report to the Health Secretary.

The additional investment required to train a cadre of public health managers is not onerous, because the numbers involved are very small. This cadre constitutes less than 1 percent of Tamil Nadu's total government doctors. Of the 10,882 government doctors in Tamil Nadu in 2006-07, around 28 percent served under the Directorate of Public Health ─ of which around 100 belonged to the cadre of public health managers, while the remainder serve as medical doctors in the Primary Health Centres.

This means that other states seeking to establish a public health managerial cadre would need to train only a tiny fraction of their medical officers for this purpose. It takes two years of postgraduate training after the basic medical degree to obtain a Diploma in Public Health in Tamil Nadu, which is no longer than the basic postgraduate medical specialization courses that many government doctors obtain. Gujarat state has already begun training some of its doctors in public health management.

Moreover, Tamil Nadu's approach is affordable: the state spends less than the national average on health. The state-wise data on per capita expenditure on health for 2001-02 indicate that Tamil Nadu is just below the all-India average for public expenditure, and well below the average for private expenditure as well as for total health expenditure per capita (Table 3). This suggests that the public expenditures are efficiently used, reducing the need for citizens to spend on private health care. By contrast, Kerala is well above the average for public expenditure and its private expenditure is over twice the national average. Yet the child (under-5) mortality rate for Tamil Nadu for 2005-6 is less than half the national average (Table 3), lower than all the other states except Kerala and Goa.

Tamil Nadu's success seems to lie in the major *efficiency gains which result from separate and well organized approaches to public health and medical care.* Effective delivery of preventive public health measures and primary health care reduces the need for (expensive) curative services, resulting overall in better value for public expenditure on health. Thus Tamil Nadu's model is affordable within the health budgets currently prevailing in India, and also easy to replicate given that it hinges on better administration and management of resources that are within the reach of most states.

6. Conclusions

By separating medical and public health services, Tamil Nadu permits both services to gain from their respective economies of scope. In the case of public health, there are enormous synergies to be derived from an integrated approach to addressing public health threats, not distracted either by the requirements of managing hospitals or by the fragmentation of public health services into the silos of single-issue programs. Under the National Rural Health Mission, the Health Ministry has informally asked other states to learn from Tamil Nadu's approach, and this paper is intended to facilitate this by summarizing its key features.

There is much that other states can learn from Tamil Nadu's public health system. Its key ingredients are a separate Directorate of Public Health ─ staffed by a cadre of professional public health managers with deep firsthand experience of working in both rural and urban areas ─ with its own budget, and with legislative underpinning. This robust system can ensure a full complement of workforce, including the non-medical specialists and laborers who are critical members of a public health team. It can resist pressures to cut funding for services to protect against diseases that have not manifested themselves for decades but retain their potential to re-emerge. It can plan, implement, and support services to reduce the population's exposure to disease, in both rural and urban areas. Whether faced with routine public health administration or a massive freak disaster like the tsunami, the staff's training and organization equips them with the basic tools to respond effectively.

While the general problems affecting a state bureaucracy do affect Tamil Nadu's health department, the very existence of a specialized cadre with a clear, focused mandate, means that it is much better-placed to protect public health than a more generalized cadre which is distracted by other (clinical) activities. As in any public health system, there is room for re-assessment and improvement, and we have indicated some areas that need strengthening. And the perennial problem of inadequate sanitary infrastructure, including for waste management, needs to be better addressed by the local bodies responsible for their development and maintenance.

Tamil Nadu's model is replicable in other states, since it hinges on an administrative approach that can be used anywhere regardless of prevailing socio-economic and environmental conditions. The success of the model depends on better administration and accountability of health service delivery. By contrast, Kerala's success in achieving good health indicators is based on over a century of leadership committed to equity and social development, high literacy, and mass social and political movements, as well as a settlement pattern that leaves few areas isolated from access to good services ─ and high health expenditures.[34] The state is also blessed with rivers that flow quickly down the short distance from the hills to the sea. These conditions are difficult to replicate quickly elsewhere.

Tamil Nadu has an administrative approach that can be replicated by other Indian states, as well as by other developing countries. Even the parts of Tamil Nadu's public health system which have frayed the most, such as its ability to protect urban health, offer insights into how to organize these services much better elsewhere. Moreover, Tamil Nadu spends less per capita on health than the national average, and the composition of its health expenditures suggest that the public funds are used efficiently to improve health outcomes and reduce the need for private outlays on medical care. If other states (and countries) use these insights to re-shuffle the way in which they use their health sector resources, they will be able to protect their people's health more cost-effectively while also helping build their development infrastructure. In doing this, they would follow what the developed world has been doing for over 125 years, to protect its people from exposure to disease and facilitate economic growth.

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Table 1 Health Spending (by Directorate), Tamil Nadu Health Department

	FY 2000-01		FY 2008-09		Compound Annual Growth Rate (nominal)
	(Rs. Million)	% share	(Rs. Million)	% share	(%)
Directorate of Public Health	4571	43.4	8939	38.8	8.7
Directorate of Medical Services	2361	22.4	5303	23.1	10.6
Directorate of Medical Education	3595	34.2	8775	38.1	11.8
Total	10527	100.0	23,017	100.0	10.3

Source: Budget Documents
Notes:
1. The budget of the Directorate of Public Health includes the public health workforce from management level downwards, the rural Primary Health Centres and subcenters, and all the single-issue programs except TB and leprosy.
2. The budget of the Directorate of Medical Education includes teaching hospitals and attached institutions.
3. All rupee figures are in current (nominal) prices.
4. Excludes cash subsidies to pregnant / lactating mothers

Table 2 Staff costs (by Directorate), Tamil Nadu Health Department

|	FY2000-01		FY2008-09		Compound Annual Growth Rate (nominal)
	(Rs. million)	% share	(Rs. million)	% share	(%)
Directorate of Public Health	3,643	46.9	6,497	44.2	7.8
Directorate of Medical Services	1,718	22.1	2,961	20.2	7.0
Directorate of Medical Education	2,412	31.0	5,232	35.6	10.2
Total	7,773	100.0	14,690	100.0	8.2

Source: Budget Documents
Note : All rupee figures are in current (nominal) prices

Table 3: Health Expenditure and Outcome measures in Tamil Nadu and all-India

	Per capita expenditure on health (Rs)			Child (under-5) mortality rate
	Public	Private	Total	
Tamil Nadu	202	644	846	35.5
India	207	790	997	74.3

Sources: For health expenditures, Government of India (2005: Table 1.3), and for child mortality rate IIPS (2007: Table 7.4)

Figure 1 Maternal and Child Health Care Indicators, Tamil Nadu and India
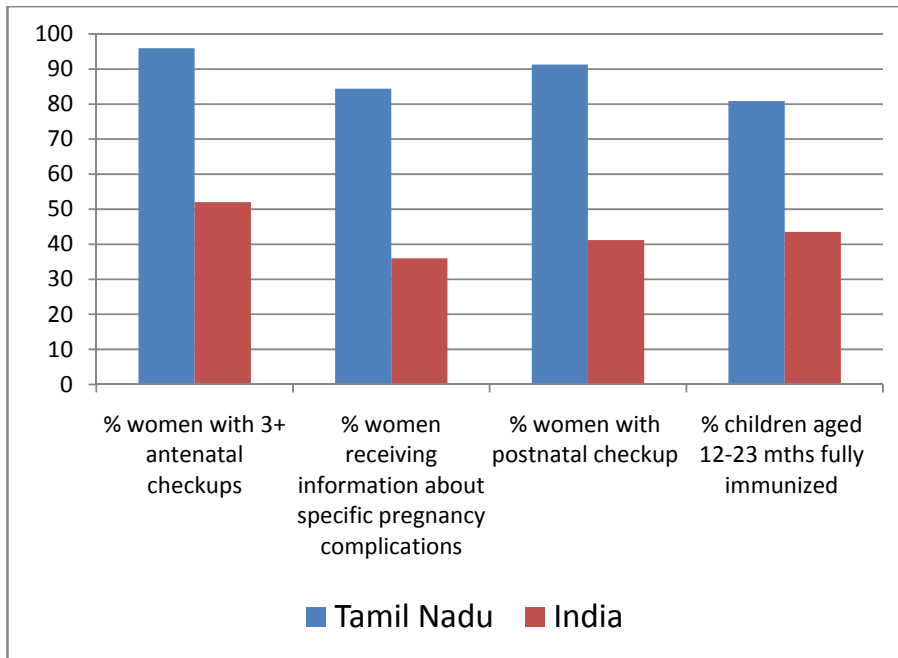
Source: NFHS survey 2005-06 (IIPS 2007: Tables 9.5, 8.10, and 8.22)

Note: The maternal care indicators refer to livebirths in the 5 years preceding the survey

Appendix 1 : Organogram of the Directorate of Public Health, Tamil Nadu

Legend for the organogram:

ADDL.DPH : Additional Director of Public Health and Preventive Medicine
M&F: Malaria & Filaria
ADDL. DM&RHS: Additional Director of Medical and Rural Health Services
JD: Joint Director of Public Health and Preventive Medicine
VBDC: Vector Borne Disease Control
IVCZ: Institute of Vector Control and Zoonoses
SBHI: State Bureau of Health Intelligence
IMM: Immunisation
EPI: Expanded Programme of Immunisation
PFA: Prevention of Food Control Act
HEB: Health Education Bureau
ADMIN: Administration
PHC: Primary Health Centre
INS: Inspection
TRG: Training
LEP: Leprosy
ZET: Zonal Entomological Team
DDHS : Deputy Director of Health Services
DE : District Entomologist
DMCHO: District Maternal and Child Health Officer
AD(SBHI): Assistant Director (State Bureau of Health Intelligence)
TGPA: Technical Gazetted Personal Assistant
MO: Medical Officer
CHN: Community Health Nurse
SHN: Sector Health Nurse
VHN: Village Health Nurse
ANM: Auxiliary Nurse Midwife
HW: Hospital Worker
SW: Sanitary Worker
BHS: Block Health Supervisor
HI GI : Health Inspector Grade I
HI GII : Health Inspector Grade I
HFWTC: Health and Family Welfare Training Centre
IPH: Institute of Public Health
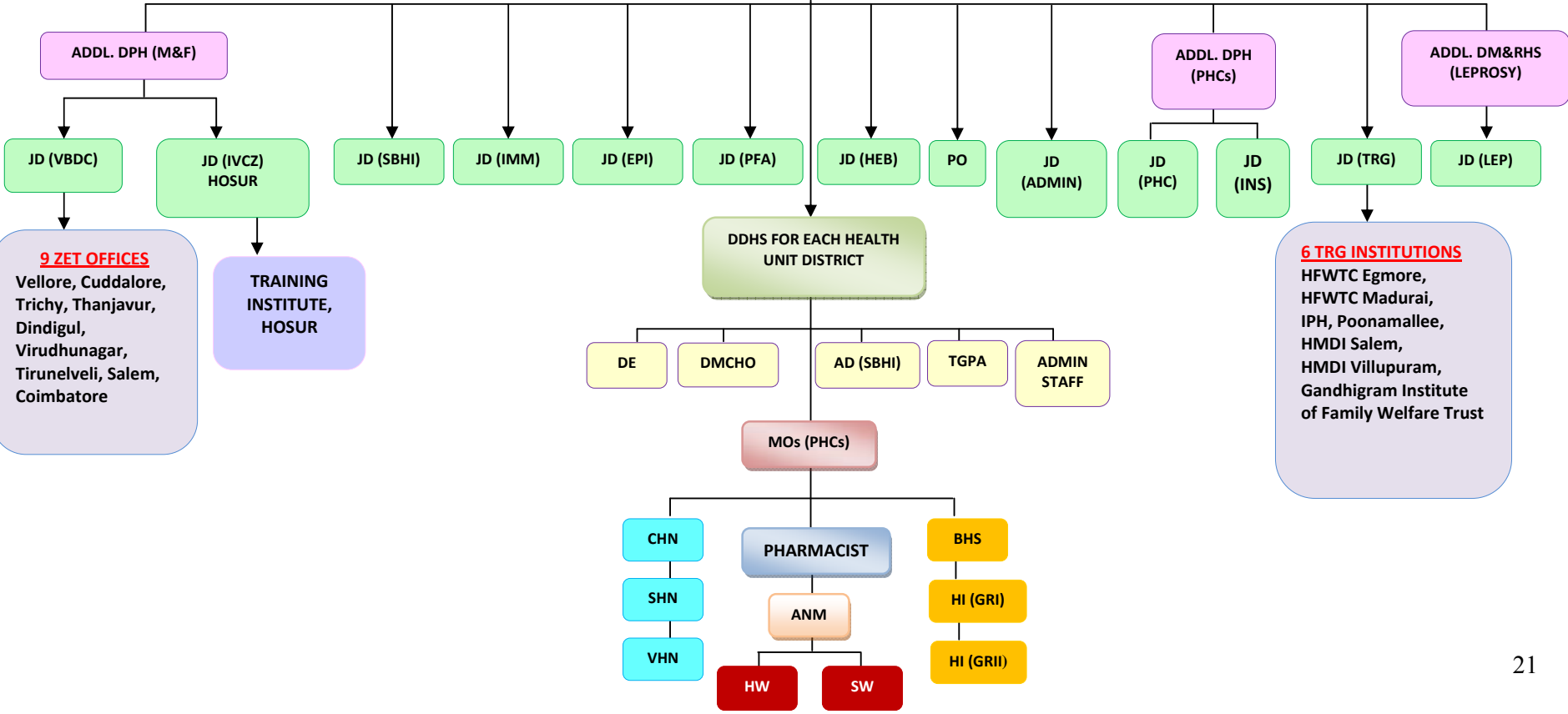HMDI: Health Manpower Development Institute

Endnotes

[1] Cited in Jannetta (2001).

[2] The Health Ministry's National Institute of Health and Family Welfare lists the National Health Programs (http://www.nihfw.org/NDC/DocumentationServices/NationalHealthProgramme.html). They are the programs for (1) controlling TB, AIDS, Vector Borne Diseases, Iodine Deficiency, Cancer, Diabetes, and Blindness; (2) eradicating Yaws, Leprosy, and Guinea Worm; and (3) programs for Reproductive and Child Health; Mental Health; Surveillance for Communicable Diseases; Nutrition; and Control and Treatment of Occupational Diseases.

[3] http://tamilnadu.dotindia.com/corporateinfo/magazine/telenewsjuly2k/P3.html "Hosur, hitherto considered to be a dreaded place with endemic plague and cholera outbreaks, has not only achieved total eradication of the above scourges but also prospects to become a giant industrial complex."

[4] Govt of Karnataka, Directorate of Health and Family Welfare (http://stg2.kar.nic.in/healthnew/IDSP/PLAGUE.aspx)

[5] Dr M.V.Murugendrappa (Director of Health Services, Government of Karnatka, retired), personal communication.

[6] The Public Health Act is still officially dated 1939, following Indian administrative convention. This is because although it has been periodically updated, it has not been superseded by another Act.

[7] This is a Public health diploma (DPH) or MD in Public health.

[8] Health Districts correspond to the administrative districts, except for larger administrative districts which are broken into two Health Districts. The Health Blocks correspond to the administrative Blocks.

[9] The District Malaria Officers have an MSc with a certificate course in Medical Entomology, the Assistant Directors (SBHI) have an MSc in Statistics, and the District MCH officers have a BSc in public health nursing. Recently, a district-level epidemiologist has been added, for the Integrated Disease Surveillance Program (Dr Padmanaban, personal communication).

[10] Communities are also informed of suspected cases of diseases such as measles and chickenpox, so that they can check their spread.

[11] Interviews with Dr Sridhar and Dr Selvaraj Chief Entomologists, Tamil Nadu, in June 2009.

[12] Field interviews in a coastal district, June 2009.

[13] For Delhi, see http://www.hindu.com/2006/10/01/stories/2006100102111200.htm, and http://www.financialexpress.com/old/latest_full_story.php?content_id=142241.

For Kerala, see http://www.hindu.com/2009/04/20/stories/2009042055610400.htm, http://www.thehindu.com/2009/04/28/stories/2009042858270300.htm, and http://keralaonline.com/news/dengue-outbreak-med-college-campus_49933.html

[14] http://www.nicd.org/1997AnnRep04j.asp

[15] Dr KK Datta, who was at the time a senior officer at the National Institute of Communicable Diseases (NICD), says that the NICD had very limited capacity to respond to the 1994 plague outbreak, and the Indian Council of Medical Research (ICMR) stated that they had no capacity for handling plague. In recent years, the capacity to anticipate and respond to plague has been upgraded in India (WHO 2002).

[16] Government of Maharashtra, Directorate of Health Services (http://maha-arogya.gov.in/diseasesinfo/..%5Cdiseasesinfo%5CPlague%5Cdefault.htm)

[17] Government of Maharashtra, Directorate of Health Services. (http://maha-arogya.gov.in/diseasesinfo/..%5Cdiseasesinfo%5CPlague%5Cdefault.htm). For Himachal Pradesh, see Gupta and Sharma (2007).

[18] http://hosur.hosuronline.com/government/vector/default.htm

[19] Source: Das Gupta, Ghosh, Datta, and Chakrabarti (2006), based on field interviews in 4 districts of West Bengal.

[20] For example, in Bihar there is still a post of District Malaria Officer, but it may be filled as a promotion post by people with no entomological background. So in one district the post is held by an ENT surgeon. (Source: Dr Padmanaban, personal communication).

[21] This is to bring drinking water hundreds of kilometers to Chennai.

[22] The terms of reference of this Committee are:

- Whether the statutory functions under section 64 of the Tamil Nadu Public Health Act, 1939 are fulfilled
- Whether Government Medical Institutions, Private Medical Practitioners and Private Hospitals intimate the occurrence of notified diseases
- Whether the reference to the information obtained, a complete analysis of the incidence of notified diseases being made.
- Review of the incidence of diseases whether the appropriate authorities have been contacted to find out if there have been administrative or remedial actions wherever necessary and
- Whether Government Hospitals and Private Hospitals are cautioned in advance, about the possibility of epidemic outbreak in any area, and whether all available resources in terms of man power and materials have been mobilized to meet such emergency situation.

[23] Das Gupta, Shukla, Somanathan, and Datta (2009)

[24] This was done by the state government in response to requests from the Commissionerate of Municipal Administration.

[25] The MHOs continue to have authority over the Sanitary Inspectors' work under three sets of legislation, pertaining to food inspection, issuance of school Sanitary Certificates, and the registration of births and deaths. The DDHS has technical control over the MHOs but no direct administrative control, though some administrative control will be exercised in the event of non-compliance with DDHS's efforts in public health work in municipalities.

[26] If there is an MHO in place, s/he will support the DDHS in implementation, monitoring, documentation, reporting and feedback on national programs.

[27] Recently, the West Bengal health department has begun to expand its provision of clinical services in urban areas, along with some community outreach for IEC activities and early detection and treatment of disease.

[28] See for example the United States' radical analysis of its public health shortfalls (IOM 1988), and the formation of the European Union's Centres for Disease Prevention and Control to provide some federal order to a multiplicity of diverse national public health systems.

[29] Das Gupta, Shukla, Somanathan, and Datta (2009)

[30] These are the Laboratory Assistants and Basic Health Workers of Primary Health Centers and Sanitary Supervisors of Municipalities. These categories of staff possess the minimum general educational qualifications as that of the Sanitary Inspectors but with different work backgrounds.

[31] The ICDS workers are the anganwadi workers under the Integrated Child Development Scheme, and the ASHAs are the Accredited Social Health Activists under the National Rural Health Mission.

[32] We are grateful to Dr KK Datta for drawing our attention to public health implications of the river systems.

[33] See for example Donaldson (2001), and Duffy (1990).

[34] Panikar and Soman (1984). Kerala has made very good use of its strengths, but the lack of a Public Health Directorate suggests that Kerala might find it difficult to respond to an unexpected public health challenge that cannot be easily addressed through social mobilization.