



BRIGHAM AND  
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## CASES IN GLOBAL HEALTH DELIVERY

GHD-042  
APRIL 2018

# Positive Outlier: Health Outcomes in Kerala, India over Time

In 2017, Rajeev Sadanandan, Additional Chief Secretary for Health and Family Welfare, Kerala, was visiting the United States when a respected school of public health invited him to give a talk about Kerala's health successes. The state had a reputation for better-than-expected health outcomes, especially maternal and neonatal health, under-five mortality, and life expectancy. Sadanandan, who had previously served in Kerala's health department, had been appointed after the 2016 elections to expand government health facilities to attract people back to the public sector and accelerate progress.

The prevalence of noncommunicable diseases (NCDs) was growing in Kerala, spurred in part by rising household incomes, lifestyle changes, and increasing life expectancy. Reductions in government health spending during the 1980s and 1990s had led to the deterioration of public health care facilities and growing use of the costly private health care sector. The neighboring state of Tamil Nadu was beginning to take Kerala's place in the spotlight thanks to innovation, system building, construction of new primary-care facilities using a volunteer labor force, 24-hour government health facilities, and the success of its autonomous pharmaceutical purchasing and distribution corporation.

"I told the US school of public health that I'd like to talk about the challenges we face today," Sadanandan said, "one of the biggest challenges being that we've become too complacent. But they didn't want to hear that story—they wanted to hear the story of our success."

Sadanandan returned to Kerala to continue pursuing changes. He thought about what had enabled Kerala's health achievements and how to reignite those forces. *Would expanding the capacity of government health facilities and equipping them to address the new disease burden increase utilization and maintain Kerala's status as an exemplar in health?*

## Overview of Kerala, India

Kerala is a coastal state in southern India bordering the Arabian Sea and the states of Karnataka and Tamil Nadu (see **Exhibit 1** for map). It was "exposed to the outside world" primarily through trade and missionary activity, as opposed to other parts of India, which had been exposed through foreign invasion

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*Amy Madore, Julie Rosenberg, Tristan Dreisbach, and Rebecca Weintraub prepared this case for the purposes of classroom discussion rather than to illustrate either effective or ineffective health care delivery practice.*

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and occupation (see **Exhibit 2** for a timeline of key events in Kerala's history).<sup>1</sup> When the British colonized India in 1790, they took control of Kerala's two northern territories and allowed the other two to remain autonomous.

In 2017, Kerala accounted for 1.18% (38,863 km<sup>2</sup>) of India's land and comprised 14 districts. Administration relied on local self-governments (LSGs): Municipalities and corporations managed towns and cities, respectively, and *panchayats*, elected every five years, governed rural districts, blocks, and villages.<sup>2</sup>

## **Demography**

In 2011, Kerala was the 13th most populous of India's 36 states and union territories (33.4 million people).<sup>3</sup> It had been one of the most densely populated states since the 1950s, when its population growth rate was 23%. Fertility rates fell in the late 20th century (see **Exhibit 3**), owing in part to widespread education and women's empowerment.<sup>4</sup> By 2017, Kerala had one of the lowest population growth rates in India (4.9%).<sup>3</sup>

In 2011, Kerala was one of two states in India where females outnumbered males (1,084 females per 1,000 males), a reflection of better conditions for girls and women.<sup>5</sup> For the period 2010–2014, life expectancy averaged 74.9 years (77.8 for females, 72.0 for males), compared with the national average of 67.9.<sup>6</sup> The proportion of adults age 60 or older was 12.6% in 2011—compared with 8% in India—and expected to reach 17% in 2021.<sup>3</sup>

Around half (52.3%) of Kerala's population was rural, down from 74.04% in 2001.<sup>3</sup> Access to safe drinking water in rural and urban areas was considerably lower than in other states. Household wells were common in Kerala and, unlike protected village wells, were not considered an improved drinking water source by the national government. Rural households typically boiled water before drinking it.<sup>7</sup>

In 2011, the most common religions were Hinduism (54.73%), Islam (26.56%), and Christianity (18.38%).<sup>3</sup> Members of disadvantaged social classes (scheduled castes) and indigenous groups (scheduled tribes) made up 9.1% and 1.45% of the population, respectively, compared with 16.6% and 8.6% in India.

Kerala's literacy rate had been the highest in India since at least the 1950s. At 93.91% in 2011, it also exceeded the middle-income country rate (85.64%) and was close to achieving the upper-middle-income country rate (94.95%).<sup>5</sup> Literacy in rural areas (92.92%) was only slightly lower than literacy in urban areas (94.99%).<sup>3</sup> Women's literacy in Kerala (91.98%) was the highest in India.<sup>5</sup>

Local media used the state's native and official language, Malayalam. In 2005–2006, only 9.5% of women and 1.7% of men aged 15–49 were not regularly exposed to any form of media,<sup>8</sup> compared with 35% of women and 18% of men in all of India.<sup>9</sup> Many Keralites consumed information on health issues and conditions, as well as health policy, quality, and equity, to make informed choices. Kerala ranked eighth in India for voter turnout in 2014, and had record-high participation in 2016 (77.35%).<sup>10,11</sup>

## **Economy**

In 2016, Kerala had the eighth-largest economy and the seventh-highest per capita net state domestic product in India.<sup>12,13</sup> Growth in real estate, tourism, construction, and remittances from Keralites working abroad—approximately 2.25 million people in 2016—had contributed to economic rebound in the 2000s after several decades of low growth.<sup>14,15</sup> Per capita income increased from 16% lower to 34% higher than the Indian average from the early 1980s to 2010.<sup>14</sup> However, Kerala's 10.6% unemployment rate was also the highest in India,<sup>15</sup> and income inequality was growing more sharply than in India as a whole. From 2004 to

2010, Kerala's rural and urban Gini coefficients rose from 0.29 and 0.35 to 0.35 and 0.40, respectively.<sup>16</sup> Health and education gains remained more equitably distributed in Kerala than in other states, however.<sup>17</sup>

Remittances accounted for about 33.6% of state domestic product in 2014<sup>14</sup> and helped keep the state's poverty rate (7.05% in 2012) low relative to the national rate (21.92%).<sup>18</sup> Poverty was highest in tribal, coastal fishing, and agrarian communities in the northern region of the state.

### Basic Socioeconomic and Demographic Indicators<sup>i</sup>

| INDICATOR  | KERALA                  | YEAR | INDIA          | YEAR |
|--|-------------------------|------|----------------|------|
| UN Human Development Index ranking                                 | 99 of 188 <sup>ii</sup> | 2011 | 131 of 188     | 2016 |
| Population (thousands)   | 33,387                  | 2011 | 1.247 million  | 2011 |
| Urban population (%)   | 47.7                    | 2016 | 33             | 2016 |
| Population using improved drinking water source (% urban, % rural) | 29.5, 56.8              | 2016 | 88.5, 95.3     | 2014 |
| Poverty (% under national poverty line)                            | 7.05                    | 2012 | 21.92          | 2012 |
| Gini index   | 47.3                    | 2010 | 35.2           | 2011 |
| GDP per capita in PPP (current international dollars)              | 8,172.87                | 2014 | 6,570.6        | 2016 |
| GDP per capita (current USD)                                       | 2,323.4                 | 2016 | 1,709.6        | 2016 |
| Literacy (total/female/male)                                       | 93.9/92.1/96.1          | 2011 | 74.0/65.5/82.1 | 2011 |

## History of Health in Kerala

### *Pre-Statehood*

Colonial leaders brought Western medicine to Kerala in 1790 where indigenous health care practices such as Ayurveda and Siddha were common.

In 1879, Kerala's autonomous southern territories became the first in India to make vaccination compulsory for public servants, prisoners, and students.<sup>19</sup> Missionaries set up hospitals and schools in underserved areas, with a focus on scheduled castes and scheduled tribes, contributing to a growing expectation of service provision for all.<sup>19</sup>

Class divisions were strong in Kerala, among "the most rigid and repressive caste hierarchies" in the country.<sup>20</sup> However, in the 1890s, a sense of subnationalism began to emerge among elite Keralites. They promoted a shared identity across classes and ethnic groups to strengthen their sociopolitical power. Their

<sup>i</sup> Compiled by case writers using data from the World Bank, UNAIDS, World Health Organization (WHO), UNESCO, the Government of India, the Government of Kerala, and *The Hindu*.

<sup>ii</sup> If Kerala were a country, this would be its global HDI ranking.

support for public welfare pushed Kerala's leaders to increase spending on health, education, and other services, inciting progressive social policymaking.<sup>20</sup>

Meanwhile, the commercialization of agriculture stimulated trade growth and prompted government investment in transportation infrastructure, which facilitated public services in rural areas.<sup>20</sup>

By the 1950s, Kerala had a discernible lead in life expectancy over neighboring Tamil Nadu and other Indian provinces.<sup>20</sup> In 1951, Kerala had the highest literacy in India (47.18%)—more than 2.5 times the national rate (18.33%).<sup>21</sup> Kerala's autonomous territories had better outcomes, including 50% less infant mortality, than its two northern British-controlled territories.

### **1950s–1970s**

India gained independence in 1947, and Kerala became a state in 1956. One of two liberal political coalitions—one communist and one center-left—governed the state in the decades that followed and consistently prioritized health and education spending. Public scrutiny of schools and health care facilities increased and continued over time. People protested and complained to local officials if a doctor did not come to work or a newborn died in a public hospital. Mass literacy and high social and political consciousness “fuelled the demand for health services and increased citizens’ awareness about the need and right to use medical facilities.”<sup>22</sup> “Seeing health and education as top priorities and rights was unique to Kerala in India,” a local public health researcher explained.

The state instituted high minimum wages, continued expanding roads (72 miles of road for every 100 square miles in the 1950s, compared with India's average of 16), and encouraged strong trade and labor unions. It invested in clean water, sanitation, housing, efficient food assistance for the poor, public health infrastructure, and education. In 1956, 59% of 5- to 16-year-olds attended school, compared with 28% nationally.<sup>23</sup> Land reforms in the 1960s abolished the feudal agrarian system and redistributed land to tenants.

Declining mortality rates during this time period doubled the state's population.<sup>24</sup> Immunization services, infectious disease care, health awareness activities, and antenatal and postnatal services became more widely available. In 1959, the number of hospitals and dispensaries per capita in Kerala was more than double the all-India average.<sup>23</sup> The number of beds in government health facilities grew from 13,000 in 1960–1961 to 20,000 in 1970–1971, to 29,000 in 1980–1981.<sup>25</sup> Combined with increasing literacy, dispersed, accessible health facilities contributed to people seeking “prompt medical care for illnesses” and a “culture of antenatal care,”<sup>26</sup> including proper dietary practices and immunization by young educated mothers. Neighbors and family members encouraged women to deliver in facilities and to breastfeed immediately after giving birth.

During the 1970s, a decade before India initiated its national immunization program with WHO, Kerala launched an immunization program for infants and pregnant women.<sup>27</sup>

Small private medical institutions complemented the government's efforts to provide basic health care and contributed to the culture of health consciousness.<sup>26</sup> Private facilities also offered specialty care not available in public facilities.<sup>25</sup> In 1960, there were four private-sector doctors for every six public-sector doctors (see **Exhibit 4** for number of government and private physicians, 1960–1995).<sup>25</sup> In 1976, the government accounted for 53% of health care facilities and 59% of beds.

In step with global trends, life expectancy continued to increase in Kerala with improved living conditions, communicable disease control, and education (see **Exhibit 5** for global life expectancy, 1960–2015). Still, Kerala's progress outpaced other Indian states and countries with similar economic

circumstances. Differences in living standards between income groups in Kerala narrowed; however, household income remained low. In fact, the prevalence of poverty in Kerala in 1974 (59.74%) exceeded that of India (54.88%) until the 1980s (see **Exhibit 6** for poverty levels in Kerala and India, 1973–2012).<sup>28</sup>

In the 1970s, development researchers in Kerala coined the concept of “the Kerala model” for equitable development.<sup>29</sup> Kerala drew international recognition for its health achievements despite low per capita income and was regarded as an example for other countries.<sup>30</sup>

### ***Late 20th Century***

While scholars credited Kerala’s socially progressive policies with its development success throughout the 20th century, they also linked them to its persistently low economic growth and high unemployment.<sup>1</sup> “As other states invested in revenue-generating enterprises,” a senior health department official said, “Kerala invested in health and education. These are highly human resource–intensive investments, and as manpower costs increased in India, they became costlier to sustain.”

With a fiscal crisis from the mid-1970s to the early 1990s, the state cut back on health and other social service spending (see **Exhibit 7** for per capita gross state domestic product and per capita health expenditure, 1985–2014). Reductions in health spending at the national level—due, in part, to India’s fiscal response to economic liberalization and World Bank policies—also affected Kerala’s health budget. Reluctant to lower salaries or cut positions, the health department lowered costs by reducing spending on drugs and medical supplies and froze infrastructure growth and hiring.<sup>19</sup> The quality and capacity of government primary and secondary health care facilities began to decline as a result.

Keralites protested through the media, to their elected officials, and by organizing street demonstrations in front of public hospitals. They also began to bypass public primary health care facilities and use public and private secondary and tertiary facilities, which did not require referrals, to access specialists, whom they perceived as more competent. High unemployment during this time led to mass migration, primarily of manual laborers, to Gulf countries.<sup>31</sup>

Though Kerala’s public health facilities were considered superior to those in most other states,<sup>32</sup> they were more crowded, had longer wait times and poorer “customer service,” used less sophisticated technology, and experienced more frequent supply and medicine shortages compared with private providers.<sup>33,34</sup> Limited government regulation enabled rapid private-sector expansion.

By the mid-1980s, only 23% of households regularly utilized government health services.<sup>19</sup> As consumers became familiar with advances in health care, demand for more complicated and expensive interventions grew. A health department leader explained, “As incomes started rising again, consumers were able to pay the modest fees charged by small, physician-managed private practices, which had spread throughout the state.”

From 1986–1996, private-sector growth surpassed public-sector growth by a wide margin.<sup>19,25</sup> The private sector accounted for 77% of facilities and 62% of hospital beds. Corporate hospitals began to put smaller, less expensive private providers out of business. Kerala had one health facility (including Ayurveda facilities) per 2.6 km<sup>2</sup>.<sup>25</sup> Higher private-sector fees contributed to rising out-of-pocket costs. In the mid-1990s, Kerala had the highest private and public per capita health spending in India.<sup>32</sup>

In the 1990s, Kerala introduced user fees for households above a certain income level to help recover costs; however, they were poorly implemented and generated insufficient revenues.<sup>35</sup>

In 1993, Kerala adopted the new WHO-UNICEF Baby Friendly Hospital Initiative to increase early breastfeeding by training facility-based providers. The state created a task force to conduct training

programs for hospital administrators, doctors, nurses, and other health personnel. It certified 39 hospitals as “baby friendly” within the first year and 80% of all maternity hospitals—half of which were private—by 2002, when UNICEF and WHO named Kerala the world’s first “baby friendly state.”<sup>36</sup> An estimated 92% of mothers initiated breastfeeding within one day of delivery in Kerala, compared with 37.1% nationally and 78.7% in the neighboring state of Tamil Nadu.

In 1996, the national government issued recommendations to decentralize certain state administrative functions to LSGs to make local services more responsive to community needs. Kerala was the first state to act, making LSGs responsible for managing and maintaining public primary and secondary care facilities. Kerala was the only state to also decentralize fiscal responsibilities, devolving 35% of its budget to LSGs. LSGs supported construction of new sub-center and PHC buildings and purchased new equipment and supplies for facilities. LSGs created hospital management committees, groups of local physicians and government officials that would provide input on health-spending decisions. There were no protocols or systems for collecting local health information, which meant there was limited data to inform planning and budgeting.<sup>27</sup>

One report suggested a correlation between decentralization and improvement of facilities in primary and secondary government health facilities, greater access to safe drinking water and sanitation facilities through construction of household latrines, and increased accountability of the public health care system.<sup>27</sup> The authors cited a sharp decline in the incidence of diarrhea-related diseases from 1996 to 2006 and an increase in the percentage of people depending on the public health sector—from 28% in 1996 to 32% in 2004—as possible evidence of these effects.

## Kerala’s Health System in the Early 2000s

### *Governance and Financing*

The health minister led Kerala’s health department, which managed public-sector health services and oversaw the additional chief secretary of health.

As in other states, a mix of national, state, local, and private sources financed the health system. In 2014, the national government contributed 5.8% of Kerala’s health budget, which covered the administration of national health programs (e.g., tuberculosis control). State funding, 79.7% of the budget, covered recurring health-system expenses, including salaries, wages, health infrastructure maintenance, drugs, and medical supplies. It also covered spending on new health facilities, or capital expenditure. Historically, Kerala allocated most of its health budget (two-thirds in 2017) to human resources. LSGs supplemented state funding with local funding (e.g., tax and non-tax revenues, grants, loans, donations) that provided 14.5% of the budget.<sup>37</sup> LSGs dedicated as much as 68% of health expenditure to safe drinking water in 2007.<sup>27</sup>

Total health expenditure in Kerala for 2014–2015 was USD 125 per capita,<sup>iii</sup> the highest in India. Government health expenditure represented 17.8% of total health expenditure—the sixth-lowest among Indian states—and 5.6% of general government expenditure. The proportion of household spending dedicated to health in Kerala was twice the national average.<sup>34</sup> Out-of-pocket expenditure, including specialty and private care, accounted for 73.9% of total health expenditure, with the largest share going to medicines (see **Exhibit 8** for national health spending data for comparison).<sup>37,38</sup> High costs meant that poor patients had greater difficulty accessing private care and were more likely to use public facilities<sup>39</sup>; however, many still opted for private providers, spending a higher share of their income on health than wealthier

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<sup>iii</sup> Currency conversions are based on the Indian rupee (INR) to US dollar (USD) exchange rate average for the given year using <https://www.rbi.org.in/scripts/ReferenceRateArchive.aspx>.

households.<sup>40</sup> More than 20% of Keralites reported catastrophic health expenditures (greater than 25% of household consumption expenditure) in 2014, the highest in India.<sup>41</sup> In 2014, 60.5% of people did not have any kind of health insurance and 34.6% of people were covered by a government-sponsored health insurance scheme.<sup>42</sup> Around 90% (2.06 million) of eligible households (those below the poverty line, unorganized workers) were enrolled in the national health insurance scheme,<sup>43</sup> which covered a set of secondary-level interventions. In 2010–2011, Kerala began supplementing the national insurance scheme to cover tertiary care procedures—such as cardiac, cancer, and neurosurgical care—at public hospitals.

### ***Infrastructure, Service Delivery, and Utilization***

Kerala's public health system consisted of sub-centers; primary health centers (PHCs); secondary care community health centers (CHCs) and *taluk* (sub-district) hospitals; tertiary care hospitals, including district hospitals, regional, specialty, and teaching hospitals called "medical colleges" (see **Exhibit 9** for staffing by facility).<sup>44</sup> Medical colleges were the most prestigious public health care facilities. In 2009, 73% of CHCs and public hospitals, and 44% of CHC and public hospital beds, were in rural areas.<sup>45</sup>

"Overutilization" of health care was a growing concern in Kerala. For example, the rate of Caesarean sections<sup>iv</sup> increased from 30.1% in 2005–2006 to 35.8% in 2015–2016 (twice the all-India rate of 17.2%), despite the health department's training and awareness programs aimed at reducing it.<sup>46,47</sup> The probability of hospital admission was highest in Kerala (10%), followed by Tamil Nadu (4%). In 2014, outpatient care utilization in Kerala was nearly double that of the next-highest state, Punjab. Differences in utilization between urban and rural areas were small in the two states—the only ones to achieve "horizontal equity in outpatient care utilization."<sup>48</sup> Kerala, in fact, was the only state with higher hospitalization in rural areas than in urban areas (see **Exhibit 10** for a comparison of outpatient care and hospitalization rates by state, 2004).<sup>48</sup> "Everywhere you go, you can find a school and hospital. There is relatively equitable access to services," one academic explained. "Because people are educated, they seek medical attention early," a public-sector oncologist said. "And patients assume a higher level of responsibility for understanding their condition and addressing it. You don't see that in any other state."

Patients often used a mixture of traditional health systems (e.g., Ayurveda, Sidhha, Unani) and western care. It was estimated that at least 13.7% of patients sought indigenous services from private or public providers in 2014. These services were especially popular for specific conditions, such as chronic back pain and asthma. The health department regulated indigenous medicines; as of December 2017, facilities were unregulated.

Some programs unique to Kerala began as local initiatives. For example, Kerala's internationally recognized palliative care program began as a grassroots nongovernmental effort in the northern district of Kozhikode in 1993 (see **Exhibit 11** for more on the program's history and design). With positive results and support from LSGs, the program spread quickly to other communities in the north. Observing its popularity and the growing need for palliative care, the state created a Palliative Care Policy in 2008 and, five years later, required all local governments to implement palliative care, including budgeting, forming home-care teams, training providers, and coordination and monitoring of services.<sup>49</sup> In 2013, the national government used Kerala's policy as the basis for its National Palliative Care Strategy.

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<sup>iv</sup> WHO recommends the percentage of Caesarean sections not exceed 15% of deliveries.

## ***Procurement***

Inspired by Tamil Nadu's model, Kerala shifted to a centralized system for tendering and purchasing drugs in 2008 to increase efficiency and lower costs. Health department officials from Kerala traveled to Tamil Nadu to learn about its system before adapting and implementing it back home. The Kerala Medical Services Corporation improved pharmaceutical quality controls and inventory management of generic drugs and equipment for government hospitals. It also increased affordability of branded and generic drugs through direct sales from the state government's Karunya Community Pharmacy outlets.

## ***Human Resources***

Kerala had an international reputation for producing high-quality physicians and nurses. In 2016, there were 1,557 and 16,043 spots for students in public and private nursing schools, respectively.<sup>50</sup> Approximately 3,000 MBBS (Bachelor of Medicine, Bachelor of Surgery) students graduated annually, most (60%) from private medical schools.<sup>51</sup> Public medical education in Kerala was highly subsidized; it cost students USD 1,930 (USD 386 per year) to attend a five-year government medical college in 2017. Private medical college tuition was USD 38,757 (USD 7,715 annually).

Physicians and specialists generally preferred to work in the public sector, according to a health department official. Reasons included better job security, better work-life balance, greater availability of teaching opportunities, and the perception that medical practices were "more ethical" and less profit-driven. Private-sector positions tended to offer higher salaries.

Many of Kerala's nurses and an estimated 5–20% of doctors in 2017 emigrated to other countries for better working conditions, career prospects, and compensation.<sup>52</sup> Most doctors traveled to the United States, Canada, and the United Kingdom, whereas nurses—many Muslim—typically emigrated to the Gulf region.<sup>51</sup>

There were 18.5 nurses and midwives per 10,000 in Kerala, compared with 3.2 per 10,000 nationally. More than one-third (38.4%) of India's medically qualified nurses were in Kerala in 2016.<sup>53,54</sup>

In 2016, the density of physicians trained in Western medicine was 3.2 per 10,000 population, compared with 3.4 per 10,000 nationally.<sup>53</sup> There were acute shortages of doctors in the public sector, especially in rural secondary and tertiary facilities (see **Exhibit 9** of specialist shortfalls at CHCs).<sup>33,34</sup> In 2015, an estimated 91% of Kerala's CHCs did not have an obstetrician, and none had a general surgeon.<sup>55</sup> Health department officials attributed the problem to the state's "archaic and cumbersome recruitment process," which required equitable representation of Kerala's different communities and castes and, as a result, slowed hiring for vacant positions. Physicians waiting to be placed often practiced as consultants at private hospitals and prepared for the postgraduate medical entrance exam. Some who were appointed to underserved areas were unwilling to go and instead went on leave or asked to be transferred.

In 2012, the state discontinued its one-year compulsory rural service program for medical graduates (introduced in 2006) for two reasons: (1) graduates protested the requirement to serve while permanent, better-paid positions remained open, and (2) while the program allowed graduates to gain practical experience, it did little to improve outcomes. Graduates (MBBS) and postgraduates (MD) were still required to complete six months and two years, respectively, of government service. Other states had similar requirements.

With the exception of faculty at government medical colleges, public-sector providers could practice in the private sector. Many did so to supplement their salaries. Others chose to work in the public sector because there were fewer perverse incentives to provide more or costlier services.



Accredited social health activists (ASHAs) and other frontline health workers provided health education, screening, and service referrals to households, primarily through home visits. States could adapt the ASHA role to address specific health needs; in Kerala, ASHA duties included mental health screening and referrals. A 2010–2014 study of ASHAs in 16 states found that access to ASHA services was highest in Kerala, with 85% of potential beneficiaries receiving services.<sup>56</sup> As in other states, *Anganwadi* (“courtyard shelter”) workers provided supplementary nutrition for children under age six and their mothers at village Anganwadi Centers.

There were no performance incentives for government health care workers, and the state did not require or provide continuing medical education. “Public-sector providers have to spend their own money to keep up with their private-sector counterparts,” an academic noted. “This is one reason why over the last few decades, many of the advances in health care practice have come from the private sector first.”

A few private universities offered courses on hospital administration, which mostly tailored to the private sector. Public-sector administrators were primarily physicians who had advanced to management roles over time after demonstrating leadership. “If hospitals do not do well,” a health department official said, “the pressure on elected representatives will be high, so politicians often try to get competent persons posted to their hospital.” Some universities offered a public health career track modeled after Tamil Nadu’s successful program, but Kerala’s program did not compare favorably, according to a health department official.

### ***Data Collection and Monitoring***

The health department used a combination of national and state data sources and academic studies to monitor epidemiologic trends. A universal electronic medical record system had not been established. State data tended to focus on tracking program and service implementation. The national Sample Registration System and the National Family Health Survey helped estimate mortality and other health indicators. Data on subpopulations below the district level were scarce. Private providers were required to register births and deaths through LSGs, and to report maternal, infant, and infectious disease deaths to district medical officers; however, private-sector regulation, and therefore data accuracy, were poor.

The accuracy and precision of national survey data were also uncertain. For example, the Sample Registration System’s 2015 infant mortality ratio estimate of 12 per 1,000 live births was double the 2015–2016 National Family Health Survey’s estimate of six (see **Exhibit 12** for online newspaper headlines).<sup>47,57</sup> Possible explanations for suspected inaccuracies included outdated sampling methods and insufficient training of data collectors. Health department officials did not suspect intentional underreporting. “Internally, no one bothers to window dress,” a senior health department leader said. “Health officers, health workers, and the media are acutely conscious of the deficiencies in Kerala’s health system. There’s also an awareness that the parameters and comparators we need to apply to our state are different from the rest of India. We’ve assessed that we have large gaps to cover.”

National data collection tools did not incorporate NCD measures until the early 21st century, allowing the rise of diabetes, hypertension, cancer, and other NCDs to go largely undetected.<sup>58,59</sup>

### **New Direction**

In 2011, Kerala’s state elections brought new leadership. The newly appointed health minister selected health economist Rajeev Sadanandan, an accomplished bureaucrat, as additional chief secretary for health and family welfare. Sadanandan had launched Kerala’s HIV/AIDS response in the late 1990s and later

worked for the National AIDS Control Organization. He had more health expertise and experience than previous leaders, many of whom were seen as “politically motivated.”

One of Sadanandan’s priorities was to identify the top causes of maternal and infant mortality so the state could address them. The following year, the Kerala Federation of Obstetrics & Gynecology found that 16%, 12%, and 6% of maternal deaths were caused by postpartum hemorrhage, preeclampsia, and sepsis, respectively—all of which were preventable.<sup>60</sup> The health department asked the UK’s National Institute for Health and Care Excellence (NICE)—through physicians from Kerala working in the UK—for help modernizing and adapting protocols to prevent such deaths. NICE agreed and shared the cost with the health department.

Over the next four months, a team of doctors and nurses in Kerala adapted NICE’s guidelines and piloted the tailored guidelines in six government and two private hospitals. The health department modified and adopted the guidelines as “state quality standards” and worked with the Kerala Federation of Obstetrics & Gynecology to train relevant providers statewide.

At the same time, the health department obtained funding from the UK’s Department for International Development to launch a pilot project modeled after the family physician concept in the UK. The goal was to improve public-sector primary health care to reduce utilization of secondary and tertiary facilities so that primary care physicians were providing 70–80% of health care in Kerala. They began in three PHCs. The health department, with UK support, offered refresher training on 20 common diseases, implemented electronic health record and laboratory management software systems to increase efficiency and reduce patient wait times, and created patient waiting areas.

In 2013, Sadanandan left Kerala to lead the national health insurance program. The universal health coverage pilot unexpectedly discontinued shortly after his departure. Government officials attributed its termination to the lack of a strong advocate and insufficient funding.

## New Initiatives

In 2016, Kerala elected a new chief minister who was passionate about health care. He appointed K.K. Shailaja Teacher health minister, who recruited Sadanandan back to Kerala to manage large-scale projects in the health department. Sadanandan was excited to return to tackle the challenge of reinvigorating Kerala’s public health sector. “The government has been resting on its laurels over the last few decades,” he said. “As a result, we’re not prepared to address the epidemiological shift toward NCDs—what we call a second-generation development issue. Kerala’s reputation for good health is perceived only by people outside the state, especially those who compare it to other Indian states.” While national and international headlines celebrated Kerala’s newly published infant mortality rate of six per 1,000 live births, Keralities continued to protest conditions in government health facilities. A local journalist noted:

We now have this culture of mob attacks on hospitals, and every time a woman dies in childbirth, people conclude that it’s medical negligence and immediately call the media. People are not willing to accept that sometimes things go wrong. The local politicians get involved and are forced to stand with the local people. Our fertility rate has been falling and is now 1.7, so every child is precious.

A state politician agreed, adding, “Kerala is a state with an awful lot of concern for being responsive to the electorate, and there is very much a perception that if you don’t give your voters what they want, you will lose the next election. As a result, things like health care for the poor—who turn out in high numbers at the polls—become extremely important.”

One of the chief minister's top priorities was to improve tertiary care. He approached a nongovernmental agency about leading the effort, but the estimated costs were too high. Sadanandan suggested the health department manage the project and broaden it to include primary and secondary facilities. After one month developing the proposal, in February 2017, the health department launched Mission Aardram, an initiative to strengthen quality and expand capacity in government health facilities to increase utilization and, in doing so, lower out-of-pocket spending by forcing the private sector to lower its prices to remain competitive. *Aardram* meant "tenderness" or "empathy," reflecting the focus on making Kerala's health system more "people friendly." Sadanandan was responsible for managing implementation.

### ***Mission Aardram***

Initial Mission Aardram activities included:

- ◆ Transforming Kerala's 848 PHCs into more efficient Family Health Centers with longer hours
- ◆ Developing individual care plans for patients, prioritizing pregnant women, infants; people aged 30 and older at higher risk for diabetes mellitus, hypertension, and chronic obstructive pulmonary disorder (COPD); and people with depression
- ◆ Hiring 692 new health care professionals to add to each of the 170 Family Health Centers (bringing the total in each facility to three physicians and adding two staff nurses and a lab technician) and to add assistant surgeons to *taluk* and district hospitals
- ◆ Increasing the number of specialists at secondary and tertiary care facilities by creating new positions in *taluk* and district hospitals
- ◆ Introducing subspecialties in district (secondary care) hospitals, including cardiology, neurology, and nephrology
- ◆ Developing palliative care capacity in district hospitals
- ◆ Increasing coverage of cancer care centers in tertiary facilities
- ◆ Improving patients' experience in hospitals, including online booking of appointments and comfortable waiting rooms

Family Health Centers would be responsible for developing the individualized health care plans for every community member. "Rather than waiting for people to come to the facilities," he said, "we have to start going to them and, when you screen them and find they need help, your system has to be equipped to deal with it."

At the same time, Sadanandan was piloting an electronic health record system that would enable patient tracking and follow-up, including regular NCD screening for all adults age 30 or older. He had visited Tamil Nadu to learn more about its electronic health record platform, noting, "They're stronger in systems design than we are." The health department selected NCD target indicators (e.g., optimal blood pressure) to guide diagnosis, prescribe treatment and lifestyle changes, and monitor progress. Sadanandan aimed to scale to all government health facilities by 2022, though the project was behind by one year. "The main problem is that physicians are overworked, so it's hard to ask them to help us clean patient data. Older practitioners aren't comfortable with computing, so it takes them longer." The health department provided additional data entry operators while it sought a more sustainable solution. In 2017, it was building three regional centers to conduct facility-based training in data entry and management and training frontline providers to use tablets to collect household demographic and health data to inform programing.

Sadanandan also hoped to create a general practice postgraduate specialization for MBBS physicians, modeled after a postgraduate course offered by the UK's professional association for general practitioners.<sup>61</sup> "We want to generate capacity and confidence among primary care providers to assess and respond to the

current epidemiological situation,” Sadanandan said. “At the same time, we hope that creating a pathway for primary care providers to specialize will lead patients to trust and value their services more.”

Kerala’s Indian Medical Association branch initially objected to the Family Health Centers, arguing that the expanded facility hours and higher patient volume would increase physicians’ workload. They changed their position, however, when their members—especially younger physicians—voiced support of the changes because of their “potential to transform the public health sector,” Sadanandan said.

The Family Health Center required additional funding from the state budget to fund new hires and upgrade facilities and technology. Revenues from a new national tax on goods and services and capital borrowing from the Kerala Infrastructure Investment Fund Board would finance the improvements. “The state finance minister was supportive of increasing health investment,” Sadanandan said. As of December 2017, the health department had approval to borrow USD 169 million.

In addition, Sadanandan planned to improve facilities’ business processes. As of 2017, there was no plan for specifically addressing management practices or health care quality or for measuring the Mission’s success. Sadanandan aimed to develop process measures (e.g., shorter patient wait times, improved patient experience) and outcome measures. Sadanandan hoped the growing excitement about the Aardram Mission would lead to support for independent evaluation of its results.

### **Other Priorities**

The state began revising NCD care protocols to align with international standards, partnering with the education department and local medical officers on NCD awareness and prevention tools for schools. It also started creating emergency departments and trauma units in public facilities, spurred in part by the high incidence of accidents/injuries (7.5% of all accidents in India in 2014)<sup>62</sup> and related public protests in mid-2017 after a widely publicized death due to insufficient hospital equipment and poor treatment.

In late 2017, the state was close to passing legislation empowering it to regulate all hospitals and laboratories, including private ones. The health department was working on rules and information technology systems to support a new state agency that would inspect facilities and require them to display their services and rates for procedures. The health department pitched stories to media outlets to raise support for the effort. “We are trying to sensitize people to the importance of greater transparency in the private sector, and how it will help them as patients,” Sadanandan said. Private-sector stakeholders opposed the bill, arguing it would increase facilities’ documentation and reporting costs.

## **Health Status in Kerala**

At the turn of the 21st century, Kerala’s mortality and life expectancy figures still outranked those of other states. In 2016, almost all births were attended by health personnel, compared with just 27% percent in the northern state of Uttar Pradesh (204 million population).<sup>63</sup> An estimated 99.3% of deliveries were institutional, and 90.2% of mothers had four or more antenatal checkups during pregnancy, compared with 78.9% and 58.6%, respectively, in India.<sup>46,47</sup> Kerala’s child nutrition indicators exceeded national figures, as well (see **Exhibit 13**).

In a new national index of health development, Kerala’s overall health performance (see **Exhibit 14** for health system and epidemiologic indicators) exceeded other states’ by a decisive margin: Kerala’s score of 76.55 was 11 points higher than the next-closest state (Punjab, 65.21) and more than 40 points higher than the lowest-performing state, Uttar Pradesh (33.69).<sup>64</sup> However, the gap was narrowing (see **Exhibit 15** for a comparison of maternal, neonatal, and under-five mortality figures in Kerala, Tamil Nadu, Uttar Pradesh,

India, and Sri Lanka from 1960–2016). Kerala’s annual incremental progress on the index ranked at the bottom. For example, while all states saw a reduction of 8–70% in their infant mortality ratios from 1997 to 2015, Kerala—which had less room for improvement—remained constant (see **Exhibit 16**). By the end of 2017, most obstetricians were using the NICE maternal mortality prevention guidelines. However, because data entry in government hospitals was still manual, compliance was hard to track. In 2017, around 66–80% of India’s palliative care clinics were in Kerala, and Kerala was a WHO demonstration site for palliative care.<sup>65</sup>

The preference for tertiary and private health services in Kerala continued. A district medical officer who had worked in both urban and rural communities explained:

If people have a headache, they will go to the neurosurgeon because they think primary care doctors don’t know enough. Similarly, people won’t go to their local PHC to deliver; instead, they prefer a gynecologist in a high-tech hospital, and they expect a physician, a gynecologist, a pediatrician, and a well-set-up facility. It’s become part of the psychology and a status symbol here.

A health department staff member elaborated on the association between private care and quality: “What people are talking about is more like *hotel* quality—the ambience, the cleanliness, and the customer service. There is no study comparing clinical quality of public and private facilities, so it’s more about perception and prestige.” One study found that among the two-thirds of people who opted for private health care, the most popular reasons were greater access to specialty services and less crowded facilities; only 2% cited better quality.<sup>48</sup> “People in Kerala trust the government sector more than the private sector,” Sadanandan said, “but are forced to visit the private sector due to inadequate investment in government facilities.” Private hospitals advertised in the media and had strong backing from Kerala’s Indian Medical Association.

In 2013, Kerala became the first state to implement its District Mental Health Program in all districts. Mental health disorders were becoming more prevalent. Kerala had one of the highest suicide rates in the country.<sup>62</sup> Experts attributed the increase in clinical depression to the transition away from multigenerational living, underemployment, high alcohol consumption, and labor migration to the Gulf states, resulting in “Gulf depression” of migrants and the wives they left in Kerala.<sup>66</sup>

Kerala was experiencing the greatest level of epidemiological transition<sup>v</sup> of any Indian state.<sup>67</sup> In 2016–2017, Kerala conducted its largest study of NCD risk factors and prevalence and found that nearly one in three adults had hypertension, one in five had diabetes, and few were controlling their conditions.<sup>68</sup> It also found that knowledge of NCD risks, treatment, and control was low statewide, regardless of education level. Kerala had the highest prevalence of diabetes and hypertension in India (see **Exhibit 17**). Contributing factors included low risk perception; low outcome expectations for behavior change; the replacement of traditional, healthier diets with unhealthier foods; and a decline in work-related and leisure-time physical activity due to increasing urbanization, automation, better economic conditions, and increasing availability of sedentary information technology jobs.<sup>69–71</sup>

Kerala also had one of the highest crime rates in the country and, despite its reputation for promoting gender equity, violence against women was increasing (see **Exhibit 18** for types and rate of crimes against women, 1996–2015). Kerala’s more thorough and transparent reporting likely contributed to its high figures.<sup>72,73</sup>

Kerala faced other health challenges as well: Utilization of maternal health care was lower among tribal women in Kerala, who typically had less education and access to public transportation than other women in the state.<sup>74</sup> Though better off than their counterparts in the rest of India, scheduled caste members had

<sup>v</sup> An advanced level is characterized by a higher burden of NCDs than communicable, maternal, neonatal, and nutritional diseases.

poorer health indicators than those in higher castes.<sup>44</sup> In Kerala's Muslim-majority district, a growing anti-vaccination campaign was contributing to lower immunization rates. Fundamentalist groups used social media and other platforms to cast doubt on vaccine safety and effectiveness. Some claimed that vaccines were a conspiracy to sterilize Muslims, a rumor that had suppressed immunization in Muslim communities in India and other countries (e.g., Nigeria, Pakistan, Afghanistan). This trend was especially troubling given infectious disease outbreaks (e.g., dengue, H1N1) and the reemergence of previously eradicated diseases.

## Looking Ahead

A journalist described the impact of Sadanandan's return to the health department: "Since he came back, a lot of things have been happening. Every other day there's a new project getting launched."

Sadanandan reflected on the story of Kerala's success:

When people from other states ask me how they should restructure their health system, I say don't come to Kerala, go to Tamil Nadu. Kerala has survived because of demand-side success: the community was educated and could demand services, so there was a synergy between what the community wanted and what the government or market supplied. Tamil Nadu, on the other hand, adopted a supply-side strategy. The government designed the system, ensured the inputs were there, and pushed to get people there. The supply created demand—unlike in Kerala, where demand created the supply. Copying Kerala is a circuitous road because recreating our social and education systems would take a lot of time.

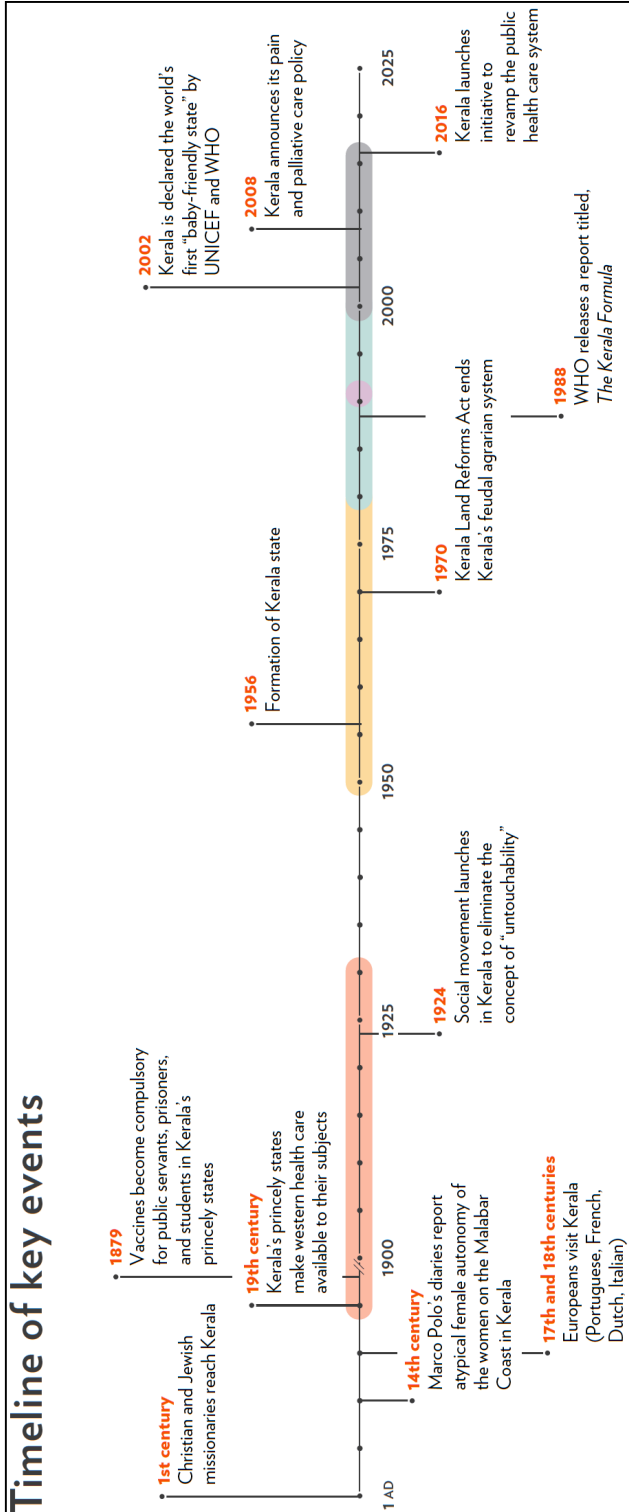
Sadanandan hoped that Mission Aardram was one of many first steps toward improving the health of Keralites. He wondered, *Would revamping primary care facilities draw Keralites back to the public sector and keep Kerala on the list of top performers in health in the world? What would he say next time he was asked to speak to a group of aspiring public health leaders about Kerala's success?*

**Exhibit 1** *Maps of India and Kerala, 2017*



Source: Google Maps. ©2017 Google.

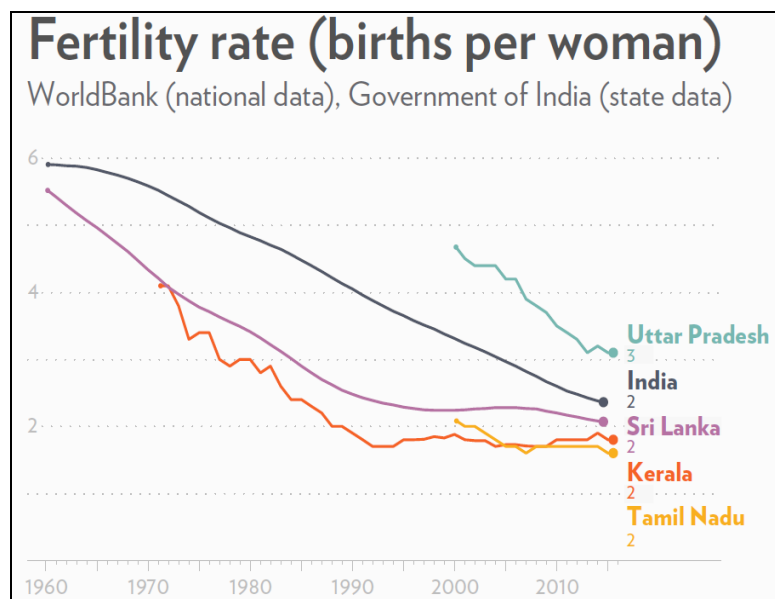
**Exhibit 2** *Timeline of Key Events in Kerala's History*



Note: *Princely states* are the two territories that maintained local rule during British occupation.  
 Source: Exemplars in Global Health team, bgC3 (2018).



**Exhibit 3** *Fertility in Three Indian States, India Overall, and Sri Lanka, 1960–2016*

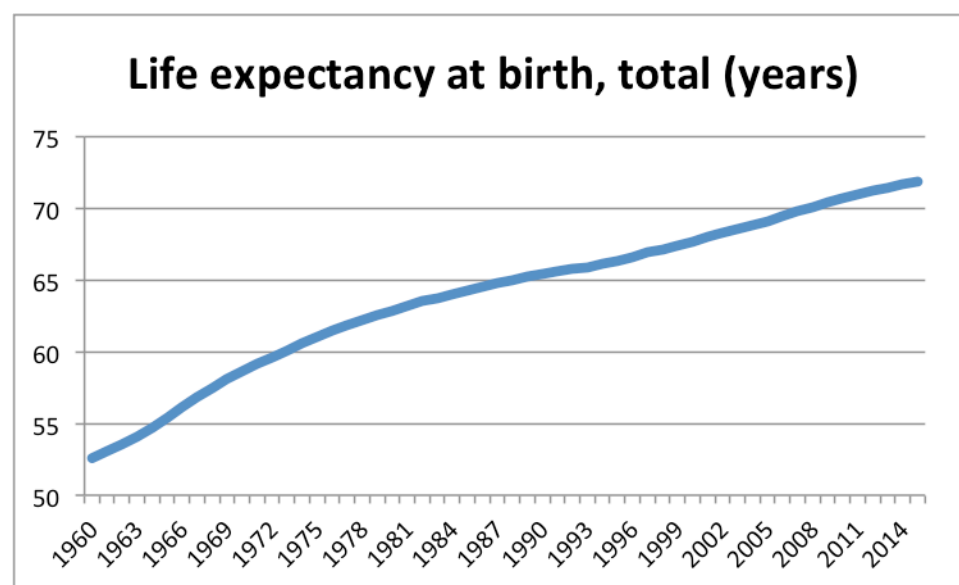


Source: Exemplars in Global Health team at bgC3 (2018) using World Bank and national and state data sources.

**Exhibit 4** *Estimated Number of Private and Government Physicians in Kerala, 1960–1995*

| Year | Number of Medical Practitioners | Doctors in Government Service | Doctors in Private Sector |
|------|---------------------------------|-------------------------------|---------------------------|
| 1960 | 1,842                           | 860                           | 550                       |
| 1965 | 2,807                           | 1,500                         | 720                       |
| 1971 | 5,516                           | 2,000                         | 1,934                     |
| 1986 | 15,470                          | 4,500                         | 6,345                     |
| 1995 | 23,813                          | 5,000                         | 10,388                    |

Source: Kerala Development Report, p. 309.<sup>25</sup>

**Exhibit 5** *Global Life Expectancy, 1960–2015*

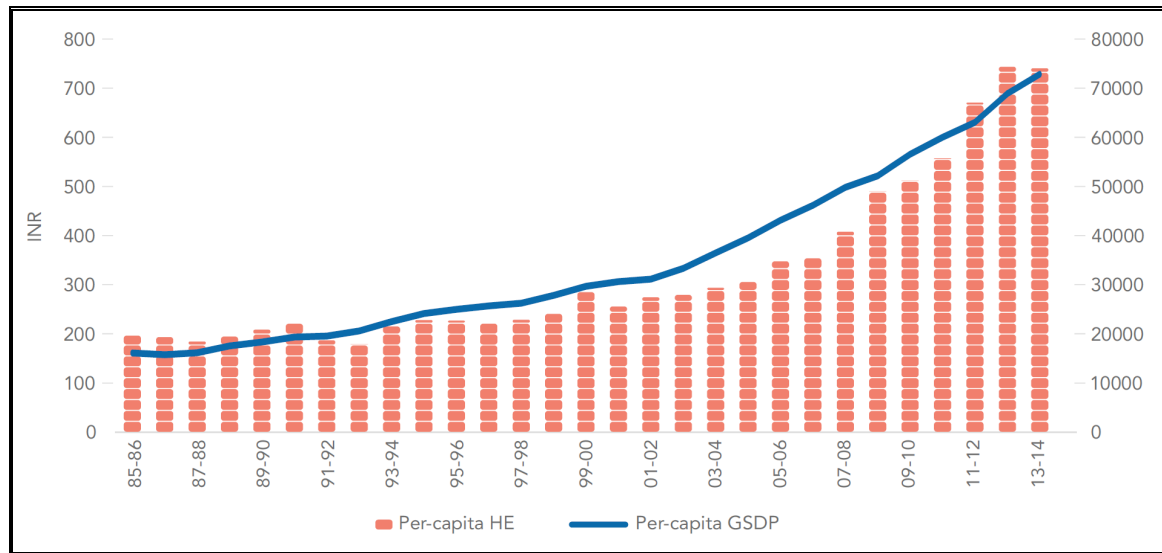
Source: World Bank.

**Exhibit 6** *Proportion of Poor in India and in Kerala, 1973–1974 to 2011–2012*

| Year      | Kerala |       |       | India |       |       |
|-----------|--------|-------|-------|-------|-------|-------|
|           | Rural  | Urban | Total | Rural | Urban | Total |
| 1973–1974 | 59.19  | 62.74 | 59.74 | 56.44 | 49.01 | 54.88 |
| 1977–1978 | 51.48  | 55.62 | 52.22 | 53.07 | 45.24 | 51.32 |
| 1983      | 39.03  | 45.68 | 40.42 | 45.65 | 40.79 | 44.48 |
| 1987–1988 | 29.10  | 40.33 | 31.79 | 39.09 | 38.29 | 38.86 |
| 1993–1994 | 25.76  | 24.55 | 25.43 | 37.27 | 32.36 | 35.97 |
| 1999–2000 | 9.38   | 20.27 | 12.72 | 27.09 | 23.62 | 26.10 |
| 2004–2005 | 13.2   | 20.20 | 15.00 | 28.30 | 25.70 | 27.50 |
| 2009–2010 | 9.7    | 23.70 | 16.00 | 39.60 | 35.10 | 38.20 |

Source: Economic Review 2016, State Planning Board, March 2017. Available at:  
<https://kerala.gov.in/documents/10180/ad430667-ade5-4c62-8cb8-a89d27d396f1>.

**Exhibit 7** *Per Capita Gross State Domestic Product and Per Capita Health Expenditure, Kerala, 1985–2014 (2004–2005 prices)*



Source: Public Health Foundation of India, USAID. *Kerala Health Accounts 2013–14*, p. 40.

**Exhibit 8** *Key Health Financing Indicators for India, Select Years from 2004–2015*

In 2014–2015, total health expenditure (current and capital expenditures incurred by government and private sources, including donor and other external funds) in India represented 3.89% of national GDP. Government health expenditure accounted for 29% of total health expenditure, or 1.13% of GDP and 3.94% of general government expenditure. Households contributed a majority (71%) of current health expenditure (93.4% of total health expenditure), mostly through user fees. The central government contributed 8.2%, states 13.3%, local governments 0.7%, enterprises (including insurance contributions) 4.4%, NGOs 1.6%, and donors and other external sources 0.7%. Household out-of-pocket expenditure on health accounted for 62.6% of total health expenditure in India.<sup>38</sup>

| Indicator  | NHA<br>2014–15 | NHA<br>2013–14 | NHA<br>2004–05 |
|--|----------------|----------------|----------------|
| Total health expenditure (THE) as percentage of GDP        | 3.9            | 4              | 4.2            |
| Total health expenditure (THE) per capita (INR)            | 3,826          | 3,638          | 1,201          |
| Current health expenditure (CHE) as percentage of THE      | 93.4           | 93             | 98.9           |
| Government health expenditure (GHE) as percentage of THE   | 29             | 28.6           | 22.5           |
| Out-of-pocket expenditures (OOPE) as percentage of THE     | 62.6           | 64.2           | 69.4           |
| Social Security expenditure on health as percentage of THE | 5.7            | 6              | 4.2            |
| Private health insurance expenditures as percentage of THE | 3.7            | 3.4            | 1.6            |
| External/donor funding for health as percentage of THE     | 0.7            | 0.3            | 2.3            |

Source: National Health Accounts Estimates in India, October 2017.

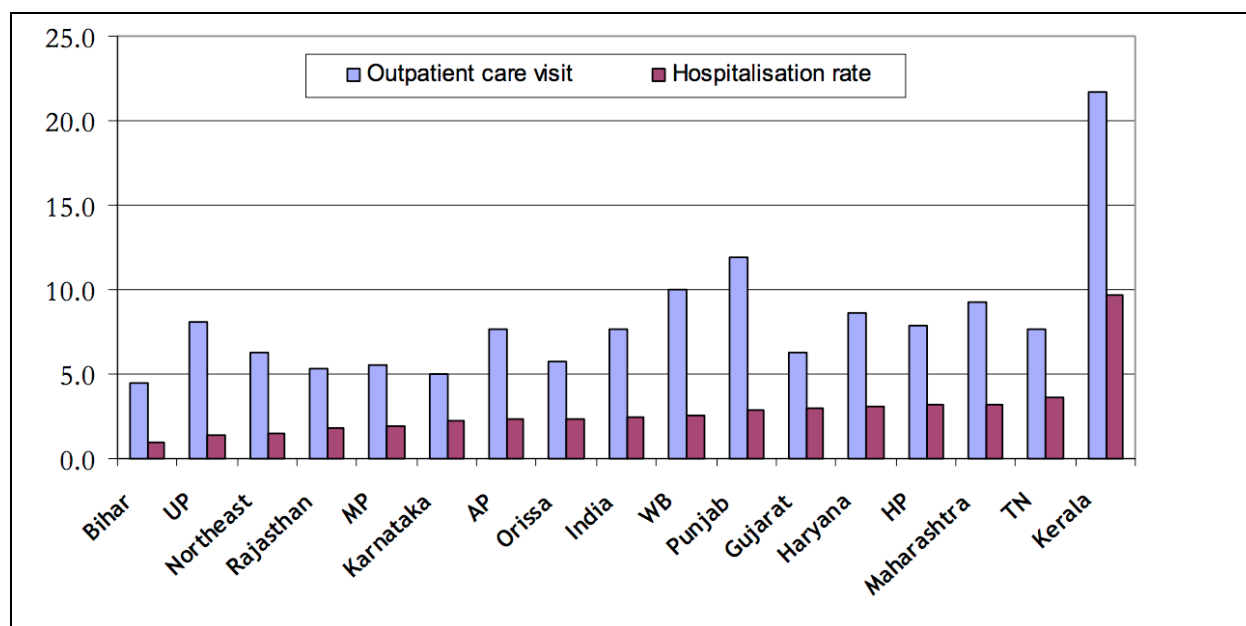
**Exhibit 9** *Staffing Levels by Facility Type in Kerala, 2005 and 2015*

|   | 2005     |            |         |        |           | 2015     |            |         |        |           |
|---|----------|------------|---------|--------|-----------|----------|------------|---------|--------|-----------|
|   | Required | Sanctioned | Placed  | Vacant | Shortfall | Required | Sanctioned | Placed  | Vacant | Shortfall |
| <b>Female Health Worker (ANM)</b>   |          |            |         |        |           |          |            |         |        |           |
| <b>Kerala</b>   | 6,005    | 5,675      | 5,565   | 110    | 440       | 5,402    | 7,929      | 7,950   | *      | *         |
| <b>All India</b>  | 169,262  | 139,798    | 133,194 | 6,640  | 19,311    | 178,963  | 195,672    | 212,185 | 20,492 | 9,326     |
| <b>Doctors at PHCs</b>  |          |            |         |        |           |          |            |         |        |           |
| <b>Kerala</b>   | 911      | 1,345      | 949     | 396    | *         | 827      | 1,120      | 1,169   | *      | *         |
| <b>All India</b>  | 23,236   | 24,476     | 20,308  | 4,282  | 1,004     | 25,408   | 3,475      | 27,421  | 9,389  | 3,002     |
| <b>Total Specialists at CHCs (Surgeons, OB&amp;GY, Physicians, and Pediatricians)</b> |          |            |         |        |           |          |            |         |        |           |
| <b>Kerala</b>   | 424      | 424        | 82      | 342    | 342       | 888      | 30         | 39      | *      | 849       |
| <b>All India</b>  | 13,384   | 7,582      | 3,350   | 3,538  | 6,110     | 21,584   | 11,661     | 4,078   | 7,881  | 17,525    |
| <b>Radiographers</b>  |          |            |         |        |           |          |            |         |        |           |
| <b>Kerala</b>   | 106      | 17         | 16      | 1      | 90        | 222      | 16         | 18      | *      | 204       |
| <b>All India</b>  | 3,346    | 16,699     | 1,337   | 332    | 1,176     | 5,369    | 4,167      | 2,150   | 2,032  | 3,406     |
| <b>Pharmacists at PHCs &amp; CHCs</b>   |          |            |         |        |           |          |            |         |        |           |
| <b>Kerala</b>   | 1,017    | 1,038      | 858     | 180    | 159       | 1,049    | 1,036      | 1,102   | *      | *         |
| <b>All India</b>  | 26,582   | 21,072     | 17,708  | 3,380  | 2,858     | 30,704   | 28,268     | 23,131  | 5,456  | 8,321     |
| <b>Laboratory Technicians at PHCs &amp; CHCs</b>                                      |          |            |         |        |           |          |            |         |        |           |
| <b>Kerala</b>   | 1,017    | 368        | 358     | 10     | 659       | 1,049    | 324        | 365     | *      | 684       |
| <b>All India</b>  | 26,582   | 14,571     | 12,284  | 2,287  | 7,226     | 30,704   | 22,626     | 17,154  | 6,139  | 13,691    |
| <b>Nursing Staff at PHCs &amp; CHCs</b>   |          |            |         |        |           |          |            |         |        |           |
| <b>Kerala</b>   | 1,653    | 2,811      | 2,578   | 233    | *         | 2,381    | 3,610      | 3,969   | *      | *         |
| <b>All India</b>  | 46,658   | 34,061     | 28,930  | 5,280  | 13,352    | 63,080   | 74,098     | 65,039  | 11,757 | 12,953    |

Note: *Placed* means filled position; \* indicates a surplus.

Source: Government of India. Rural Health Statistics 2014–2015. Available at:  
[http://wcd.nic.in/sites/default/files/RHS\\_1.pdf](http://wcd.nic.in/sites/default/files/RHS_1.pdf).

### Exhibit 10 Outpatient Care and Hospitalization Rates in 16 Major States and India Overall, 2004



Note: Outpatient care is based on the past 15 days, and inpatient care, the past year.

Source: Ghosh, S. Equity in the utilization of health care services in India: implications for paths to UHC. Center for Health Policy, Planning and Management, Tata Institute of Social Sciences, Mumbai, India. Available at: <https://pdfs.semanticscholar.org/2a2c/2bd8f8578ac0291a38dc597d8be9f77doad3.pdf>.

### Exhibit 11 Palliative Care in Kerala, India

Kerala's internationally recognized palliative care program began as a grassroots initiative in 1993. Launched by two physicians and an activist in northern Kerala with private funding, the Pain and Palliative Care Society worked with local primary care providers and community volunteers to provide outpatient palliative care to patients with terminal illness or disabilities. Local organizations, governments, and health facilities in other communities quickly replicated the approach, and services expanded to include home-based care. In 1998, Kerala's government became one of the first states in India to relax narcotics regulations to permit the use of morphine by palliative care providers. Ten years later, it launched the first state Palliative Care Policy, which inspired the creation of a National Palliative Care Strategy in 2012.<sup>65</sup> In 2013, Kerala required all local governments to implement palliative care, including budgeting, forming home-care teams, training providers, and coordination and monitoring of services.<sup>49</sup> As of 2017, there are an estimated 300 volunteer groups statewide collaborating with PHCs and nongovernmental clinics to deliver palliative care in Kerala, where an estimated 66–80% of India's palliative care clinics are located.<sup>65</sup> Most of their funding comes from local donations and local governments. It has been suggested that Kerala's "strong ethos of community involvement" and the "organic," locally driven development of palliative care groups have been essential to replication and sustainability.<sup>65</sup> Kerala is a WHO demonstration site for palliative care, and visitors from other states and countries interested in learning from its model. The health department is in the process of expanding palliative care services to CHCs.

**Exhibit 12** *Sample of Google Results for Search Terms, “Infant Mortality Kerala,” from National and International Sources, November 2017*

- ◆ In Kerala, infant mortality rate is now as good as that in the United States
- ◆ Kerala is as good as the US, OECD in saving newborn children
- ◆ New survey says Kerala now has an infant mortality rate of six per 1,000
- ◆ Kerala scores best state for newborns
- ◆ Kerala achieves single-digit IMR
- ◆ Kerala single-handedly brings down India’s infant mortality rate

Source: Google, November 17, 2017.

**Exhibit 13** *Child Nutrition in Kerala and India, 1998–1999 and 2005–2006*

|               | Percentage of Children |        |         |        |             |        |                                     |        |
|---------------|------------------------|--------|---------|--------|-------------|--------|-------------------------------------|--------|
|               | Stunting               |        | Wasting |        | Underweight |        | Children 6–35 months who are anemic |        |
|               | NFHS-2                 | NFHS-3 | NFHS-2  | NFHS-3 | NFHS-2      | NFHS-3 | NFHS-2                              | NFHS-3 |
| <b>Kerala</b> | 22                     | 21     | 11      | 16     | 27          | 29     | 43.9                                | 55.7   |
| <b>India</b>  | 46                     | 38     | 16      | 19     | 47          | 46     | 74.2                                | 79.2   |

Note: NFHS-2 was conducted in 1998–1999; NFHS-3 was conducted in 2005–2006.

Source: National Family Health Survey-2 and National Family Health Survey-3, India.

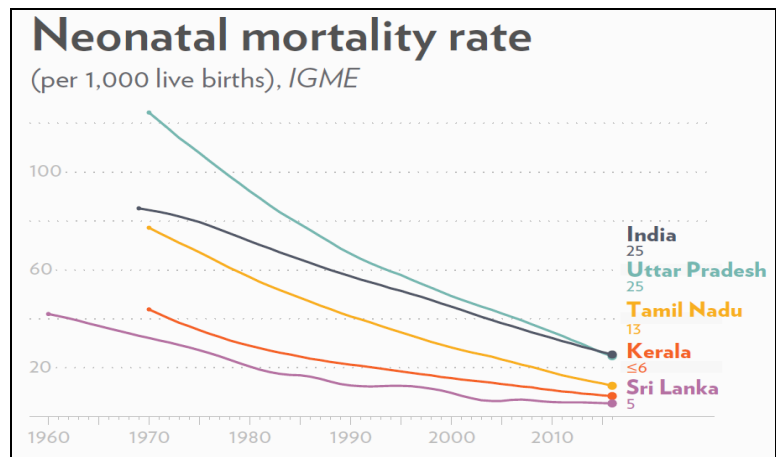
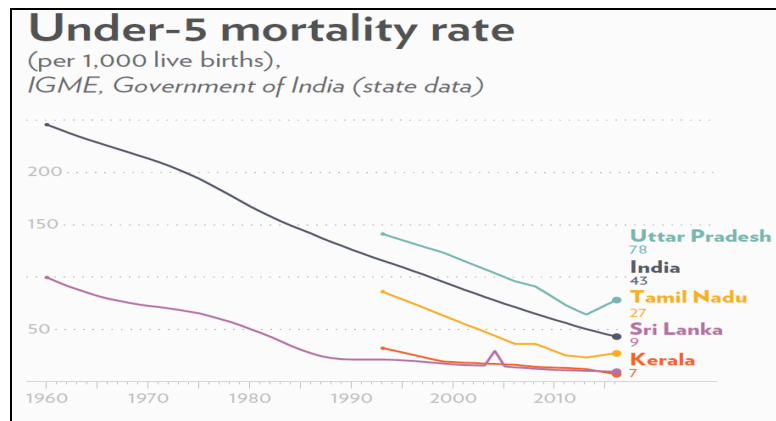
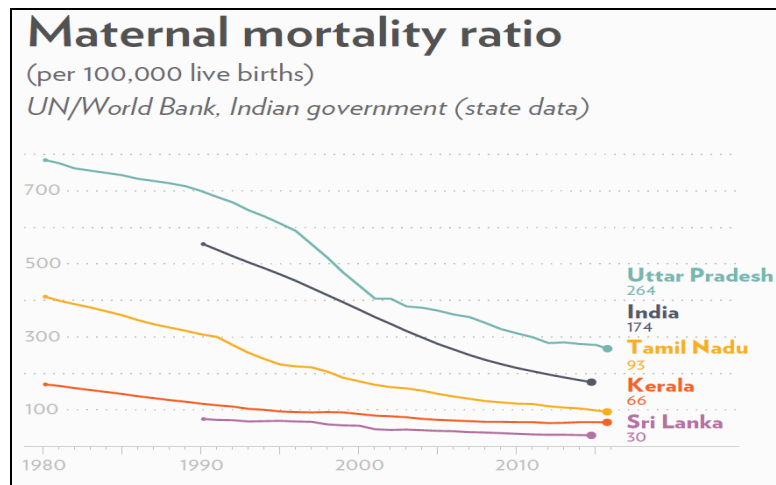
**Exhibit 14** *Health System and Epidemiologic Indicators*

| INDICATOR   | KERALA              | YEAR | INDIA              | YEAR |
|---|---------------------|------|--------------------|------|
| Average life expectancy at birth<br>(total/female/male)                           | 74.9/ 77.8/<br>72.0 | 2014 | 68.1/<br>69.4/70.0 | 2015 |
| Maternal mortality ratio (per 100,000 live births)                                | 66                  | 2014 | 174                | 2015 |
| Under-five mortality rate (per 1,000 live births)                                 | 13                  | 2014 | 48                 | 2015 |
| Infant mortality rate (per 1,000 live births)                                     | 12                  | 2014 | 38                 | 2015 |
| Vaccination rates (% of DTP3 coverage)  | 92.7                | 2013 | 87                 | 2015 |
| Stunting (%)  | 19.7                | 2016 | 38.4               | 2016 |
| Adult (15–49 years) HIV prevalence (per 100,000)                                  | 0.26                | 2013 | 32.97              | 2011 |
| HIV antiretroviral therapy coverage (%)   | 56.2                | 2011 | 36                 | 2013 |
| Tuberculosis prevalence (per 100,000)   | 2.02                | 2013 | 195                | 2014 |
| DOTS coverage (%)   | 100                 | 2009 | 100                | 2010 |
| Malaria cases (per 1,000)   | < 2                 | 2012 | .013               | 2013 |
| Government expenditure on health as % of total<br>government expenditure          | 6.5                 | 2016 | 5.0                | 2014 |
| Government expenditure on health per capita,<br>(PPP international dollars, USD)  | 116.8               | 2016 | 80.32              | 2014 |
| Total health expenditure per capita, PPP<br>(constant 2011 international dollars) | 505                 | 2016 | 267                | 2014 |
| Total health expenditure per capita (current USD)                                 | n/a                 | n/a  | 74.00              | 2014 |
| Physician density (per 10,000)  | 3.6                 | 2016 | 7.02               | 2012 |
| Nursing and midwifery density (per 10,000)  | 18.5                | 2012 | 17                 | 2011 |
| Number of hospital beds (per 10,000)  | 9.37                | 2009 | 7                  | 2011 |

Source: Compiled by case writers using data from World Bank, UNAIDS, WHO, UNESCO, the Government of India, the Government of Kerala, and *The Hindu*.



**Exhibit 15** *Maternal, Infant, and Under-Five Mortality in Kerala, Tamil Nadu, Uttar Pradesh, India, and Sri Lanka, 1960–2016*



Source: Exemplars in Global Health team at bgC3 using data from the United Nations Inter-agency Group for Child Mortality Estimation (2018).

**Exhibit 16** *Infant Mortality in Indian States (per 1,000 live births), 1997–2015*

| States/Union Territories  | Year |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|---------------------------|------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|                           | 97   | 98 | 99 | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 |
| Andaman & Nicobar Islands | 33   | 30 | 25 | 23 | 18 | 15 | 18 | 19 | 27 | 31 | 34 | 31 | 27 | 25 | 23 | 24 | 24 | 22 | 20 |
| Andhra Pradesh            | 63   | 66 | 66 | 65 | 66 | 62 | 59 | 59 | 57 | 56 | 54 | 52 | 49 | 46 | 43 | 41 | 39 | 39 | 37 |
| Arunachal Pradesh         | 47   | 44 | 43 | 44 | 39 | 37 | 34 | 38 | 37 | 40 | 37 | 32 | 32 | 31 | 32 | 33 | 32 | 30 | 30 |
| Assam                     | 76   | 76 | 76 | 75 | 73 | 70 | 67 | 66 | 68 | 67 | 66 | 64 | 61 | 58 | 55 | 55 | 54 | 49 | 47 |
| Bihar                     | 71   | 67 | 63 | 62 | 62 | 61 | 60 | 61 | 61 | 60 | 58 | 56 | 52 | 48 | 44 | 43 | 42 | 42 | 42 |
| Chandigarh                | 40   | 32 | 28 | 28 | 24 | 21 | 19 | 21 | 19 | 23 | 27 | 28 | 25 | 22 | 20 | 20 | 21 | 23 | 21 |
| Chhattisgarh              | .    | 94 | 78 | 79 | 76 | 73 | 70 | 60 | 63 | 61 | 59 | 57 | 54 | 51 | 48 | 47 | 46 | 43 | 41 |
| Dadra & Nagar Haveli      | 63   | 61 | 56 | 58 | 58 | 56 | 54 | 48 | 42 | 35 | 34 | 34 | 37 | 38 | 35 | 33 | 31 | 26 | 21 |
| Daman & Diu               | 38   | 51 | 35 | 48 | 40 | 42 | 39 | 37 | 28 | 28 | 27 | 31 | 24 | 23 | 22 | 22 | 20 | 18 | 18 |
| Delhi                     | 35   | 36 | 31 | 32 | 29 | 30 | 28 | 32 | 35 | 37 | 36 | 35 | 33 | 30 | 28 | 25 | 24 | 20 | 18 |
| Goa                       | 19   | 23 | 21 | 23 | 19 | 17 | 16 | 17 | 16 | 15 | 13 | 10 | 11 | 10 | 11 | 10 | 9  | 10 | 9  |
| Gujarat                   | 62   | 64 | 63 | 62 | 60 | 60 | 57 | 53 | 54 | 53 | 52 | 50 | 48 | 44 | 41 | 38 | 36 | 35 | 33 |
| Haryana                   | 68   | 70 | 68 | 67 | 65 | 62 | 59 | 61 | 60 | 57 | 55 | 54 | 51 | 48 | 44 | 42 | 41 | 36 | 36 |
| Himachal Pradesh          | 63   | 64 | 62 | 60 | 54 | 52 | 49 | 51 | 49 | 50 | 47 | 44 | 45 | 40 | 38 | 36 | 35 | 32 | 28 |
| Jammu and Kashmir         | -    | 45 | 52 | 50 | 48 | 45 | 44 | 49 | 50 | 52 | 51 | 49 | 45 | 43 | 41 | 39 | 37 | 34 | 26 |
| Jharkhand                 | .    | .  | 71 | 70 | 62 | 51 | 51 | 49 | 50 | 49 | 48 | 46 | 44 | 42 | 39 | 38 | 37 | 34 | 32 |
| Karnataka                 | 53   | 58 | 58 | 57 | 58 | 55 | 52 | 49 | 50 | 48 | 47 | 45 | 41 | 38 | 35 | 32 | 31 | 29 | 28 |
| Kerala                    | 12   | 16 | 14 | 14 | 11 | 10 | 11 | 12 | 14 | 15 | 13 | 12 | 12 | 13 | 12 | 12 | 12 | 12 | 12 |
| Lakshadweep               | 36   | 26 | 32 | 27 | 33 | 25 | 26 | 30 | 22 | 25 | 24 | 31 | 25 | 25 | 24 | 24 | 24 | 20 | 20 |
| Madhya Pradesh            | 94   | 98 | 90 | 87 | 86 | 85 | 82 | 79 | 76 | 74 | 72 | 70 | 67 | 62 | 59 | 56 | 54 | 52 | 50 |
| Maharashtra               | 47   | 49 | 48 | 48 | 45 | 45 | 42 | 36 | 36 | 35 | 34 | 33 | 31 | 28 | 25 | 25 | 24 | 22 | 21 |
| Manipur                   | 30   | 25 | 25 | 23 | 20 | 14 | 16 | 14 | 13 | 11 | 12 | 14 | 16 | 14 | 11 | 10 | 10 | 11 | 9  |
| Meghalaya                 | 54   | 52 | 56 | 58 | 56 | 61 | 57 | 54 | 49 | 53 | 56 | 58 | 59 | 55 | 52 | 49 | 47 | 46 | 42 |
| Mizoram                   | 19   | 23 | 19 | 21 | 19 | 14 | 16 | 19 | 20 | 25 | 23 | 37 | 36 | 37 | 34 | 35 | 35 | 32 | 32 |
| Nagaland                  | -    | -  | -  | -  | 13 | -  | -  | 17 | 18 | 20 | 21 | 26 | 26 | 23 | 21 | 18 | 18 | 14 | 12 |
| Odisha                    | 96   | 98 | 97 | 95 | 90 | 87 | 83 | 77 | 75 | 73 | 71 | 69 | 65 | 61 | 57 | 53 | 51 | 49 | 46 |
| Puducherry                | 22   | 21 | 22 | 23 | 22 | 22 | 24 | 24 | 28 | 28 | 25 | 25 | 22 | 22 | 19 | 17 | 17 | 14 | 11 |
| Punjab                    | 51   | 54 | 53 | 52 | 51 | 51 | 49 | 45 | 44 | 44 | 43 | 41 | 38 | 34 | 30 | 28 | 26 | 24 | 23 |
| Rajasthan                 | 85   | 83 | 81 | 79 | 79 | 78 | 75 | 67 | 68 | 67 | 65 | 63 | 59 | 55 | 52 | 49 | 47 | 46 | 43 |
| Sikkim                    | 51   | 52 | 49 | 49 | 42 | 34 | 33 | 32 | 30 | 33 | 34 | 33 | 34 | 30 | 26 | 24 | 22 | 19 | 18 |
| Tamil Nadu                | 53   | 53 | 52 | 51 | 49 | 44 | 43 | 41 | 37 | 37 | 35 | 31 | 28 | 24 | 22 | 21 | 21 | 20 | 19 |
| Tripura                   | 51   | 49 | 42 | 41 | 39 | 34 | 32 | 32 | 31 | 36 | 39 | 34 | 31 | 27 | 29 | 28 | 26 | 21 | 20 |
| Uttar Pradesh             | 85   | 85 | 84 | 83 | 82 | 80 | 76 | 72 | 73 | 71 | 69 | 67 | 63 | 61 | 57 | 53 | 50 | 48 | 46 |
| Uttarakhand               | .    | .  | 52 | 50 | 48 | 41 | 41 | 42 | 42 | 43 | 48 | 44 | 41 | 38 | 36 | 34 | 32 | 33 | 34 |
| West Bengal               | 55   | 53 | 52 | 51 | 51 | 49 | 46 | 40 | 38 | 38 | 37 | 35 | 33 | 33 | 32 | 32 | 31 | 28 | 26 |
| ALL INDIA                 | 71   | 72 | 70 | 68 | 66 | 63 | 60 | 58 | 58 | 57 | 55 | 53 | 50 | 47 | 44 | 42 | 40 | 39 | 37 |

." " = Not applicable; "- " = Not available.

Source: Reserve Bank of India. Available at:

<https://www.rbi.org.in/scripts/PublicationsView.aspx?id=17633>

**Exhibit 17** *Prevalence of Select NCDs and NCD Risk Factors in Kerala, 2016–2017*

| Condition                 | Prevalence (%) |
|---------------------------|----------------|
| Pre-diabetes              | 33.7           |
| Diabetes                  | 19.2           |
| Hypertension              | 30.6           |
| Abdominal obesity         | 56.3           |
| Overweight                | 31.3           |
| Physical inactivity       | 22.1           |
| >5mg/day of salt          | 69.0           |
| <2 Servings of fruit      | 86.0           |
| <3 Servings of vegetables | 77.8           |
| Alcohol use, men          | 31.1           |
| Alcohol use, women        | 0.5            |
| Smokeless tobacco use     | 2.3            |
| Tobacco smoking           | 21.3           |

Source: Prevention and Control of NCDs in Kerala, 2016-2017.

**Exhibit 18** *Crimes Against Women in Kerala by Type (per 100,000), 1996–2015*

| Year | Rape   |       | Dowry Death |       | Cruelty at Home |       | Molestation |       | Sexual Harassment |       |
|------|--------|-------|-------------|-------|-----------------|-------|-------------|-------|-------------------|-------|
|      | Kerala | India | Kerala      | India | Kerala          | India | Kerala      | India | Kerala            | India |
| 1996 | 1.33   | 1.57  | 0.10        | 0.60  | 3.73            | 3.67  | 3.77        | 3.13  | 0.10              | 0.57  |
| 1997 | 1.67   | 1.57  | 0.10        | 0.63  | 5.13            | 3.97  | 4.77        | 3.17  | 0.20              | 0.67  |
| 1998 | 1.70   | 1.57  | 0.10        | 0.67  | 6.60            | 4.17  | 5.23        | 3.23  | 0.23              | 0.77  |
| 1999 | 1.63   | 1.57  | 0.10        | 0.70  | 7.33            | 4.43  | 5.30        | 3.27  | 0.23              | 0.93  |
| 2000 | 1.70   | 1.60  | 0.10        | 0.79  | 7.50            | 4.60  | 5.20        | 2.10  | 0.20              | 1.20  |
| 2005 | 1.40   | 1.60  | 0.10        | 0.60  | 9.80            | 5.20  | 7.00        | 3.10  | 0.50              | 0.90  |
| 2010 | 1.80   | 1.90  | 0.10        | 0.70  | 13.7            | 8.00  | 8.40        | 3.40  | 1.50              | 0.80  |
| 2015 | 6.90   | 4.40  | 0.00        | 1.30  | 20.2            | 18.40 | n/a         | n/a   | 6.30              | 3.80  |

Source: National Crime Records Bureau. Crime in India 1996–2015. Available at: <http://ncrb.gov.in/>.

**Appendix** *Common Acronyms and Other Abbreviations*

|        |   |
|--------|---|
| AIDS   | Acquired immune deficiency syndrome               |
| ASHA   | Accredited social health activist                 |
| CHC    | Community health center                           |
| HIV    | Human immunodeficiency virus                      |
| INR    | Indian rupee                                      |
| LMIC   | Low- and middle-income country                    |
| LSG    | Local self-government                             |
| MBBS   | Bachelor of Medicine, Bachelor of Surgery         |
| NCD    | Noncommunicable disease                           |
| NICE   | National Institute for Health and Care Excellence |
| PHC    | Primary health center                             |
| UK     | United Kingdom                                    |
| UNICEF | United Nations Children's Fund                    |
| USD    | United States Dollar                              |
| WHO    | World Health Organization                         |

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