06 Addendum

Market views: Varied approaches and outcomes

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Market views

Adult immunization recommendations, funding, and coverage seem to differ significantly by nation, necessitating tailored approaches to policy shaping that take into consideration a variety of factors, including those shown in Figure 2, page 10 in the main report, as well as disease incidence and prevalence, FSV, and other salient evidence. These data are currently not available in many nations.

Determinants of adult immunization coverage are challenging to decipher with anything approaching certainty. Adult immunization recommendations and coverage rates are not readily and consistently correlated with health system archetype, insurance, country GDP, health expenditures, or OOP spending. While funded vaccines have greater coverage rates, government funding alone doesn't guarantee uptake.

Table 1 (right) presents information on 14 key markets, including overall health expenditure as a percentage of GDP in 2018, per capita health expenditure, OOP as a percentage of overall health expenditure and the number of currently recommended adult vaccines, including COVID-19 and the most recently available reports of influenza vaccination coverage for adults 65 and older (from 2019, unless otherwise noted).

Average expenditure on health as a percentage of GDP was 9.2%, with the US being a significant outlier, as it is on per capita spending – but the US has only one more recommended adult vaccine than France, which spends 66% less per capita. OOP expenditure doesn't correlate with the number of recommended vaccines in any meaningful way – in Spain, OOP expenditure is 22% of spending, but the country includes 13 vaccines in its adult recommendations, and its influenza coverage rate is among the highest reported.

In short, adult immunization recommendations, funding, and coverage seem to differ by country, necessitating tailored approaches to policy shaping. The market-specific information in the sections that follow sheds light on individual countries' policies, payment structures, and program performance.

Table 1: Key market attributes.

Country	Health Expenditure as Percent of GDP^	Health Expenditure Per Capita (USD)^	Out-of-Pocket Spending as a Percentage of Overall Expenditure^	Number of Currently	Influenza Vaccination Coverage Rate for Adults
Australia	9.3	5000	9.3	6	70.0
Brazil	9.5	848	27.5	10	98.0
China	6.6	501	28.0	3	4.3#
Denmark	10.1	6217	13.8	4	52.0
France	11.3	4690	9.3	13	52.0
Germany	11.4	5472	12.7	9	38.8
Italy	8.8	2989	23.0	10	54.6+
Japan	10.9	4267	12.7	3	50.0
Mexico	5.4	520	42.1	7	82.3++
Romania	5.6	687	19.5	2	20.0+++
Spain	9.0	2523	22.2	13	65.5
Thailand	3.8	276	11.0	3	20.0++++
United Kingdom	10.0	4315	16.7	5	72.0
United States	16.9	10,624	10.8	14	69.8
Mean	9.2	3495	18.5	7.3	53.5
Median	9.4	3628	15.3	6.5	53.3

^Source: The World Bank [1].
*Data are all 2019 unless otherwise noted. # For >60-year-olds, + 2020 data, ++2014 data, +++2018 data, ++++2016 data.

Australia

Health system overview [2]

Australia has a regionally administered, universal public health insurance program (Medicare) financed through general tax revenue and a government levy. Enrollment is automatic for citizens, who receive free public hospital care and substantial coverage for physician services, pharmaceuticals, and certain other services. New Zealand citizens, permanent residents, and people from countries with reciprocal benefits are eligible to enroll in Medicare. Approximately half of Australians buy private supplementary insurance to pay for private hospital care, dental services, and other services. The federal government pays a rebate toward this premium and also charges a tax penalty on higher-income households that do not purchase private insurance.

In Australia's federalist system of government, all three levels of government (federal, state, and local) are collectively responsible for providing health care:

- The federal government provides funding and indirect support for inpatient and outpatient care through the Medicare Benefits Scheme (MBS) and for outpatient prescription medicine through the Pharmaceutical Benefits Scheme (PBS). It funds cancer screening and immunization programs that are provided free to targeted population groups. The federal government is responsible for regulating private health insurance, pharmaceuticals, and therapeutic goods.
- States own and manage service delivery for public hospitals, ambulances, public dental care, community health (primary and preventive care), and mental health care. They contribute their own funding in addition to that provided by the federal government. States are also responsible for regulating private hospitals, the location of pharmacies, and the health care workforce.
- Local governments play a role in the delivery of community health and preventive health programs, such as immunizations and the regulation of food standards.

The National Partnership on Essential Vaccines (NPEV), an agreement between the Commonwealth of Australia and the states and territories, guides the immunization program. The objective of the agreement is "to protect the Australian public from the spread of vaccine preventable diseases through the cost-effective and efficient delivery of immunization programs" under the NIP. The NPEV is intended to facilitate achievement of six key outcomes, which omit any explicit benchmarks for adults:

1. Minimize the incidence of vaccine preventable diseases in the eligible Australian population for diseases with vaccines listed under the NIP.
2. Minimize the incidence of vaccine preventable diseases in Aboriginal and Torres Strait Islander people for diseases with vaccines listed under the NIP.
3. Minimize the incidence of human papillomavirus (HPV) in the eligible Australian population.
4. Ensure that Australian HPV immunization data is provided to the Commonwealth annually.
5. Minimize the incidence of vaccine preventable diseases in the eligible Australian population in geographic areas of low coverage.
6. Ensure that vaccines listed under the NIP are managed in a way that minimizes wastage and leakage, with a target rate of wastage and leakage of 5% or lower [3].

The Australian Institute of Health and Welfare (AIHW) reports that spending on health goods and services in 2017-2018 was $185 billion, or $7,485 per person [4]. The World Bank, however, reports that 2018 health expenditures were 9.285% of GDP, and little over $5,000 per capita. OOP expenditures were 17.72% of the total [5]. Total federal spending on health in 2021-2022 is projected to be $98.3 billion, representing 16.7% of the national government's total expenditure [6]. A 2017 report estimated prevention spending at about $2 billion, or $89 per person, representing 1.34% of all health spending and 0.13% of GDP. The authors noted, however, that "the National Health Accounts typically understate total spending on prevention. Spending by agencies other than health departments is excluded from the national health accounts and not all prevention spending by health agencies is counted under the 'public health' tab. Actual spending on prevention may be anywhere between three and 12 times as much as is reported in national accounts." Additionally, cumulative government spending (Commonwealth, state, and territory contributions) varies widely across the

country [7]. Australia's Auditor General reports that funding has increased to more than $488.7 million for NIP vaccines in 2021-22 [8], a figure that excludes COVID-19 vaccines.

Adult immunization in Australia [9]

Privor-Dumm et al. identify Australia as a health security-focused country [10]. Adult immunization recommendations are age-based and risk-based, predicated on factors such as occupation, personal behaviors (men who have sex with men, injection drug users, sex industry workers, and inmates of correctional facilities), or medical conditions (e.g., those who are immunocompromised, blood-product recipients and those with bleeding disorders) [11]. Some recommended vaccines are funded through the NIP, state and territory programs, or through the workplace for certain groups, while other vaccines can be purchased privately by prescription. For adults, only seasonal influenza, pneumococcal, and zoster vaccines are funded through the NIP.

The National Immunisation Schedules vary by population: for all people, for non-indigenous people, and for all Aboriginal and Torres Strait Islander people [12]. A "whole-of-life" Australian Immunisation Register (AIR) was introduced to replace the Australian Childhood Immunisation Register (ACIR) in September 2016.

The AIR aims to capture all NIP-funded and most privately purchased vaccines given to people of all ages. There are separate registers for HPV (school-based) vaccinations and Q fever vaccinations. AIR reporting for children is mandatory – but it was voluntary for adults until July 2021, leading to under-reporting by an estimated 50% [13]. The current National Immunisation Strategy, 2019-2024, is largely focused on childhood immunization, though a key action for adults is to "improve monitoring and uptake of influenza, pneumococcal and herpes zoster vaccination [14]."

COVID-19 vaccination is free for everyone, including booster doses for those 18 and older. Vaccination is provided in government-run clinics, community pharmacies, and on-site in aged care homes for both workers and residents [15]. As of early January 2022, 94.5% of people 16 and older had a first shot; 91.6% had their second dose [16].

Diphtheria, tetanus, and pertussis vaccines are recommended, but not all are covered under the NIP. Diphtheria and tetanus vaccinations can be given as either diphtheria-tetanus (dT) formulation or, preferably, the adult formulation of the diphtheria-tetanus-acellular pertussis vaccine, dTpa.

A booster dose of a tetanus-containing vaccine is recommended, though not funded under the NIP, for adults:

- ≥50 years of age who have not received a tetanus-containing vaccine in the previous 10 years (but have previously completed a primary course).
- With tetanus-prone wounds, if more than 5 years have elapsed since a previous dose (tetanus immunoglobulin may also be required as outlined in the Immunisation Handbook) [17].

A single booster dose of a pertussis-containing vaccine is recommended for adults:

- ≥65 years of age who have not received a dose in the previous 10 years.
- In close contact with infants <6 months of age, if more than 10 years have elapsed since the previous dose.

Pertussis vaccination is recommended for women in the third trimester of pregnancy, or as soon as possible after birth if they were not vaccinated during pregnancy.

Yearly seasonal influenza vaccinations are funded for these groups:

- Adults 65 years and older.
- Pregnant women.
- Any individual 6 months of age or older whose underlying medical conditions put them at risk of severe influenza, including, but not restricted to, chronic respiratory conditions, cardiac disease, neurological conditions, obesity (BMI ≥40), chronic liver disease, and diabetes mellitus.
- Indigenous Australians ≥15 years of age (as well as those 6 months to <5 years of age), regardless of medical risk factors.

Measles, mumps, and rubella vaccinations are recommended for all adults born after 1966, but are not covered by all states and territories.

Pneumococcal vaccinations are available for certain adults. 23vPPV is funded under the NIP for:

- Non-Indigenous adults ≥65 years of age.

- Indigenous adults ≥50 years of age.
- Indigenous adults aged 15–49 years who have a condition that increases their risk of invasive pneumococcal disease (IPD).

In addition, 23vPPV is subsidized under the Pharmaceutical Benefits Scheme (PBS) for adults who have a condition that increases their risk of IPD but for whom 23vPPV is not funded under the NIP.

All adults who have a medical condition(s) that puts them at the greatest risk of IPD as outlined in the Immunisation Handbook, are recommended to receive a dose of 13vPCV. Hematopoietic stem cell transplant (HSCT) recipients are recommended to receive three doses. The potential introduction of an NIP-funded program that uses 13vPCV for adults is currently being evaluated.

Zoster vaccination is recommended for all adults aged ≥60 years who have not previously received a dose.

The zoster vaccine is funded under the NIP for adults aged 70 years, with catch-up for those aged 71–79 years also funded until October 2021.

Adults ages 20-64 are recommended to speak with their provider about catch-up vaccination if they missed any of the following vaccines (or are not sure if they had them): polio, varicella, and hepatitis B.

Adult vaccination coverage in Australia

Data available from the government are woefully outdated [18]. The AIHW conducted adult vaccination surveys of Australians aged 18 years or older in 2004 and 2009. Participants in the survey were asked about their recent experience of influenza and pneumococcal vaccination and about their medical and socio-demographic status. An adult seasonal influenza survey was conducted in 2014. Laboratory-confirmed influenza, invasive meningococcal disease, and invasive pneumococcal disease are included in the National Notifiable Diseases Surveillance System [19], which can allow for back-calculation estimates of coverage – but the most recent available datasets are from 2019.

National and state-based surveys have generally found self-reported influenza vaccination uptake in adults aged ≥65 years, who are predominantly vaccinated in general practice, to be fairly high: 70% or greater [20]. Data on younger adults are not available.

The National Immunisation Coalition noted in a 2021 white paper, "Enhancing Adult Vaccination Coverage Rates in Australia [13]," that the lack of current and complete data on adult vaccination is a critical issue. The Auditor-General's review of the immunization program called the AIHW's approach to monitoring coverage "partially effective," noting that "performance measures for immunization coverage are not fully adequate and, while Health has taken some action to assess performance, it does not systematically address issues raised in evaluations and program assessments [21]."

The national audit further reported that the AIHW "has not established an implementation plan for the national immunization strategies [21]." Perhaps as a consequence, the Immunisation Coalition estimates that only 51% of older Australian adults receive all government-funded vaccinations annually, compared to 93% of children and 73% of adolescents [13]. They estimate that coverage in eligible high-risk groups is even lower: around 40% of people with medical or occupational risk factors receive annual influenza vaccination, and only 13% of indigenous young adults with medical risk factors receive pneumococcal vaccination.

They conclude: "There is a need for governments, the media, providers and individuals to direct more attention towards the large numbers of adults who are unnecessarily susceptible to vaccine-preventable disease each year. Immunization is just as important for adolescents, older people, those with medical risk factors, pregnant women and other high risk groups as it is for children [22]." The Immunisation Coalition posits that there is a window of opportunity now: "Due to the COVID-19 pandemic, society has a heightened awareness of the benefit of vaccines, and this could be leveraged to promote adult vaccination more broadly," and they offer seven recommendations to achieve higher adult immunization coverage [13], shown in Figure 1 (right).

Figure 1: Evidence-based recommendations for improving adult immunization in Australia.

Strengthen vaccination monitoring and accountability	Monitor adult vaccination coverage rates reported to AIR following the introduction of mandatory reporting in July 2021, to inform potential policy options to improve coverage Step-wise introduction of targets for adult vaccination coverage as key performance indicators in the National Partnership Agreement on Essential Vaccines and the next National Immunisation Strategy, with appropriate support to providers to address barriers in vaccination Introduce benchmarking of adult vaccination coverage rates across Primary Health Networks, with appropriate support to providers to address barriers in vaccination
Improve access to vaccination	Promote the use by healthcare professionals of systems that provide notifications via digital health platforms and assessment tools to take advantage of opportunities (during office visits) to offer appropriate vaccines to patients, as part of a whole-of-life approach to preventative health Expand the range of services that offer routine vaccinations, particularly for medically at- risk populations Continue to provide flexible funding to State and Territory Governments and Primary Health Networks to design local programs to optimize access to vaccinations, with an emphasis on adult vaccination
Enhance public awareness and understanding	Design a nationally coordinated public health campaign that emphasizes a whole-of-life approach to preventive health, including: • Educational campaigns focusing on the role of vaccination in preventive health and raising awareness of the availability of vaccines for eligible adults on the NIP, including specific campaigns targeting each group (age-based, medically at-risk and indigenous and remote communities) • Campaigns should target both the general public and immunisation providers • Tools for self-assessment of vaccine eligibility and other preventive heath initiatives • Reminder letters (or smartphone app notifications) to provide advice to adults who are due to be vaccinated and access other preventative health services

Source: Immunisation coalition. Enhancing adult vaccination coverage rates in Australia. 2021. [13].

Brazil

Health system overview [2, 23]

Brazil's decentralized, universal public health system is funded with tax revenues and contributions from federal, state, and municipal governments. The administration and delivery of care are handled by municipalities or states. All residents and visitors, including undocumented individuals, can access free, comprehensive services, including primary, outpatient specialty, mental health, and hospital care, as well as prescription drug coverage.

Preventive services, including immunizations, are free. No application process is necessary. There is no cost-sharing for health care services. Nearly 25% of Brazilians, mostly middle- and higher-income residents, have private health insurance to circumvent bottlenecks in accessing care. Private health insurance costs, as well as health-related purchases, qualify as tax deductions.

The Ministry of Health is responsible for national coordination of the Brazilian health system, known as SUS (Sistema Único de Saúde), including policy development, planning, financing, auditing, and control. State government duties include regional governance, coordination of strategic programs (such as provision of high-cost medicines), and delivery of specialized services that have not been decentralized to municipalities. Health departments in 5,570 municipalities largely handle the management of SUS at the local level, including co-financing, coordination of health programs, and delivery of health services. Community participation in the public health system is guaranteed by the constitution at all levels of government. Health councils and health conferences are composed of 50% community members, 25% providers, and 25% health system managers. These councils and conferences are responsible for deliberating public health policies and monitoring their implementation.

Approximately 75% of Brazilian citizens rely solely on SUS. Private health insurance is voluntary and supplementary to SUS and regulated by the National Agency of Supplementary Health. In 2018, 23% of Brazilians had private medical/hospital insurance, and 9.6% had dental insurance. Nearly 70% of beneficiaries receive their private health insurance as an employment benefit [23]. The World Bank reports that 2018 health expenditure per capita was $848.389 or 9.514% of GDP. OOP represented 27.544% of overall health spending [24]. In 2017, the immunization budget was $1.25 billion.

Brazil's industrial policy has strongly encouraged local vaccine manufacturing. "Strengthening the Health Industrial Complex is also essential at this moment of crisis in the global production of immunobiological products. The expansion of vaccine production with good manufacturing practices is the only way to fill this gap in the supply of products offered by the PNI [the National Immunization Program] since budget resources alone have not been capable of keeping the vaccination rooms supplied [25]."

Table 2: Brazil's national immunization schedule.

Children	Adolescents and Adults
1. BCG 2. Hepatitis B 3. Pentavalent (DTP/Hib/Hep B) 4. IPV (Inactivated poliovirus) 5. OPV (Oral poliovirus) 6. RV (Human-attenuated oral rotavirus) 7. PCV-10 (10-valent pneumococcal) 8. Yellow Fever 9. MMR (Measles, Mumps & Rubella) 10. DTP (Diphtheria, Tetanus & Pertussis) 11. MenC (Meningococcal C conjugate) 12. Influenza 13. MMRV (Measles, Mumps, Rubella & Varicella) 14. Hepatitis A	1. Hepatitis B 2. Td (Tetanus, Diphtheria) 3. Yellow Fever 4. MMR (Measles, Mumps & Rubella) 5. Tdap (pregnant women) 6. Influenza 7. HPV 8. MenC
	Older Adults
	1. Influenza 2. PCV-23 3. Td 4. Yellow Fever 5. Hepatitis B

Source: Domingues et al. 2018 [26].

Adult immunization in Brazil

Privor-Dumm et al. identify Brazil as an evolving adult-focused country [10]. The PNI was created in 1973, and the first national immunization schedule was published in 1977 with four mandatory vaccines in the first year of life: tuberculosis, poliomyelitis, measles, and DTPw. The current immunization schedule for children includes 14 vaccines, for adolescents and adults, it includes eight vaccines; and for older adults (>60 years), it includes five vaccines [26], as shown in Table 2 on page 8.

Influenza: The first influenza vaccination campaign for adults was conducted in 1999. Brazil reportedly has one of the highest influenza vaccination rates of older adults (98.2%) and those with chronic conditions (86.3%) in the world, largely attributable to the strong government-led influenza vaccination campaign, which relies not only on remote communication but also on face-to-face mobilization.

The national campaign is highly organized and well-planned with clear target audiences, appropriate timelines, evidence-based information and the use of multiple communication tools. Campaign messages are widespread and visible in everyday life through websites, television, radio, newspapers, bus and subway panels. An enhanced and unique part of Brazil's campaign is a series of activities on the national mobilization day, including consultations and services across over 41,800 mobile vaccination spots [27].

Table 3: Measles cases, adults, Brazil, 2019.

Age	Population (millions)	Number of Cases	Incidence Rate (per 100,000)	Vaccination Coverage (%)
20-29	17.6	5651	32.1	58.2
30-39	15.6	2351	15.1	68.7
40-49	13	1115	8.6	63.2
≥50	20	89	0.4	20.1

Source: Domingues et al. 2020 [25].

However, a recent study of influenza vaccine coverage among adults found a lower rate: 73.0% (95% confidence interval: 70.6–75.2), falling short of the goal of 80% set by the national health authority. The most frequent reasons given for skipping vaccination were beliefs about the lack of efficacy and possible side effects of the vaccine.

The coverage of vaccination did not differ by socioeconomic characteristics. Older individuals, never smokers, having two or more chronic diseases, and being registered in the Family Health Program were positively associated with influenza vaccine uptake [28].

Coverage numbers should be interpreted with caution. Vaccination coverage monitoring requires improvement in modernization and informatization of the health care system [29] and integration of multiple electronic medical records and immunization registries across the decentralized SUS [25]. Measles cases among adults may offer insight into non-influenza vaccine coverage deficits.

A cross-sectional survey of physicians conducted June-August 2018 focused on the vaccines recommended by the Brazilian Society of Immunization (SBIm) for adults and older adults (years 2017-2018) found that the vaccines prescribed by the highest proportions of physicians were influenza (>90% of physicians for adults and older adults), hepatitis B (adults: 87%; older adults: 59%) and yellow Fever (adults: 77.7%; older adults: 58.5%). Under-prescription was reported by less than 20% of prescribing physicians for all recommended vaccines. The most common barriers to vaccination were high vaccine cost, lack of time during appointments, and lack of patient interest. Knowledge of target populations, dosage schedule, and availability in the SUS were generally low [30].

COVID-19: Seven vaccines are approved for use in Brazil: Pfizer-BioNTech, Gamaleya/Sputnik, Johnson & Johnson, Oxford/AstraZeneca (produced in country by Fiocruz), Serum Institute of India Covishield, Sinopharm, and Sinovac (produced in country by state-run Butantan). As of January 6, 2022, the government reports that 89.3% of the eligible population has received one dose and 74.1% are fully vaccinated [31].
Data on spending for vaccines is not available. However, the government

spent roughly $121.85 billion on pandemic response in 2020; that figure was slashed by 80% to $24.37 billion in 2021 [32]. On 21 September 2021, the Pan American Health Organization (PAHO) announced the selection of two centers in Argentina and Brazil as regional hubs for the development and production of mRNA-based vaccines in Latin America in a bid to tackle COVID-19 and future infectious-disease challenges. The Bio-Manguinhos Institute of Technology on Immunobiologicals at the Oswaldo Cruz Foundation (FIOCRUZ) was selected as the center in Brazil. The institute has a long tradition in vaccine manufacturing and has reportedly made promising advances in the development of an innovative mRNA vaccine against COVID-19 [33].

The campaign did not run smoothly initially. Despite an immunization program widely recognized as one of the world's largest and best, the rollout of the vaccine campaign was hampered by misalignment between the states and the federal government, with Brazil's President, Jair Bolsonaro, repeatedly discrediting the vaccination campaign, coupled with a lack of coordination at the federal level – with four health ministers during the pandemic, leading state governors to form a consortium to negotiate and procure vaccines [34] – and the absence of federal government support for scientific research. Pre-existing health inequities in access to care further constrained the program, and inequities have widened over the course of the pandemic [35]. At nearly 620,000 deaths, Brazil ranks second only to the US (slightly more than 832,000) in total deaths from COVID-19 as of January 6, 2022 [36].

In the current national COVID-19 vaccination plan [31], adults are prioritized for immunization across multiple target groups in a highly articulated scheme, shown in Table 4 (right).

Table 4: Brazil's current COVID-19 immunization scheme.

Brazil's COVID-19 Immunization Scheme		
Priority	**Group**	**Population (n)**
1	Institutionalized people aged 60 years or older	156,878
2	Institutionalized people living with disabilities	6472
3	Indigenous Peoples living in Indigenous lands	413,739
4	Health workers	6,688,197
5	People aged 90 years or older	893,873
6	People from 85 to 89 years old	1,299,948
7	People from 80 to 84 years old	2,247,225
8	People from 75 to 79 years old	3,614,384
9	Traditional Ribeirinhas peoples and communities	286,833
10	Traditional Quilombolas peoples and communities	1,133,106
11	People from 70 to 74 years old	5,408,657
12	People from 65 to 69 years old	7,349,241
13	People from 60 to 64 years old	9,383,724
14.1	People with comorbidities from 18 to 59 years old	18,218,730
14.2	People with permanent disabilities with BPC[4] from 18 to 59 years old	1,467,477
14.3	Pregnant and postpartum women from 18 to 59 years old	2,488,052
15	Permanently disabled people from 18 to 59 years old without BPC	6,281,581
16	Homeless people from 18 to 59 years old	140,559
17	Employees of the prison system except healthcare workers and Populations deprived of freedom	108,949 753,966
18	Basic education workers	2,707,200
19	Higher education workers	719, 818
20	Security and rescue forces and the Armed Forces	584,256 364,036
21	Collective road passenger transport workers	678,264
22	Subway and railway transport workers	73,504
23	Air transport workers	116,529
24	Waterway transport workers	41,515
25	Truck drivers	1,241,061
26	Port workers	111,397
27	Industrial workers	5,323,291
28	Urban cleaning and solid waste management workers	227,567
29	Adolescents 12-17 years old	1,851,854

Source: National plan for operationalization of vaccination against COVID-19. [31].

China

Health system overview [37]

China achieves near-universal coverage through the provision of publicly funded basic medical insurance. The urban employed are required to enroll in an employment-based program, which is funded primarily via employer and employee payroll taxes. Other residents can voluntarily enroll in Urban-Rural Resident Basic Medical Insurance, financed primarily by central and local governments through individual premium subsidies. Local health commissions organize public and private health care organizations to deliver services. The basic medical insurance plans cover primary, specialty, hospital, and mental health care, as well as prescription drugs and traditional Chinese medicine. Deductibles, copayments, and reimbursement ceilings apply. There is no annual cap on OOP spending. Complementary private health insurance helps cover cost-sharing and coverage gaps.

In March 2018, the State Council reorganized the central government's health care structure. The responsibilities of various agencies include the following:

- The National Health Commission is the main national health agency. The commission formulates national health policies; coordinates and advances medical and health care reform; and supervises and administers public health, medical care, health emergency response, and family planning services. The State Administration of Traditional Chinese Medicine is affiliated with the agency.
- The State Medical Insurance Administration oversees the basic medical insurance programs, catastrophic medical insurance, a maternity insurance program, the pricing of pharmaceutical products and health services, and a medical financial assistance program.
- The National People's Congress is responsible for health legislation. However, major health policies and reforms may be initiated by the State Council and the Central Committee of the Communist Party, and these are also regarded as law.
- The National Development and Reform Commission oversees health infrastructure plans and competition among health care providers.
- The Ministry of Finance provides funding for government health subsidies, health insurance contributions, and health system infrastructure.
- The newly created State Market Regulatory Administration includes the China Drug Administration, which is responsible for drug approvals and licenses.
- The China Center for Disease Control and Prevention, although not a government agency, is administrated by the National Health Commission.
- The Chinese Academy of Medical Science, under the National Health Commission, is the national center for health research.

Local governments (of prefectures, counties, and towns) may have their own commissions, bureaus, or health departments. Centers for disease control and prevention also exist in local areas and are likewise administered by local commissions, bureaus, or health departments. At the national level, the China Center for Disease Control and Prevention provides only technical support to the local centers.

Services covered: The benefit package is often defined by the local governments. Publicly financed basic medical insurance typically covers:

- Patient hospital care (selected provinces and cities).
- Primary and specialist care.
- Prescription drugs.
- Mental health care.
- Physical therapy.
- Emergency care.
- Traditional Chinese medicine.

A few dental services (such as tooth extraction but not cleaning) and optometry services are covered, but most are paid OOP. Home care and hospice care are often not included either. Durable medical equipment, such as wheelchairs and hearing aids, is often not covered.

Preventive services, such as immunization and disease screening, are included in a separate public health benefit package funded by the central and local governments; every resident is entitled to these without copayments or deductibles. Coverage is person-specific; there are no family or household benefit arrangements. Preventive services, such as cancer screenings and influenza vaccinations, are covered by a separate public health program. Children and the elderly have no copayments for

these services, but other residents have to pay 100% of these services OOP.

In 2018, China spent approximately 6.6% of GDP on health care, which amounts to CNY 5,912 billion (USD 1,665 billion), $501 per capita. Twenty-eight percent was financed by the central and local governments, 44% was financed by publicly funded health insurance, private health insurance, or social health donations, and 28% was paid OOP.

Adult vaccination in China

Privor-Dumm et al. characterize China as a health security-focused country [10]. China has the fastest growing older adult population of any nation: By 2050, more than one in four people in China (26.3%) will be 65 years or older. In this context, adult immunization is a critical imperative for individual and population health. However, China lacks a national adult immunization program on par with its extensive and free pediatric immunization program.

Vaccines are made available through the government's Expanded Program on Immunization (EPI) at no charge for all children up to 14 years of age. These government-purchased vaccines are called Category 1 vaccines under the Regulations on the Administration of Vaccine and Vaccination. In contrast, private-sector (Category 2) vaccines, such as Haemophilus influenzae type b vaccine (Hib), rabies vaccine, and influenza vaccine, are available in China, but are usually paid for OOP, as they are included in neither the EPI system nor government health insurance [38]. Following illegal pediatric vaccine sales in Shandong province, which increased vaccine hesitancy, sales volume growth rate of Category 2 vaccines decreased by 25.8% in the study area and by 48.8% in the region of the incident in April 2016 compared to April 2015 [39].

COVID-19 vaccination is at high levels among urban adults. As of 21 July 2021, Beijing reported 91% of residents fully vaccinated (17.7 million people); Shanghai and Wuhan reported rates of over 80% and 77%, respectively. Provincial coverage was lower: The northern province of Shanxi said 46.7% of its adults have received two doses as of 20 July, while the full inoculation rate for adults in eastern Zhejiang was 49.8% by 19 July. The National Health Commission had a target of 70% vaccination for several groups, including adults, by the end of 2021 [40].

In November 2021, nine months after China began offering COVID-19 vaccines to adults >60, nearly 80% had gotten at least one shot, but about 50 million remained unvaccinated. In some provinces, rates for those over age 70 are below 50%, with some areas only managing to get 30% of their over-80 population vaccinated. In response, health authorities announced a new drive to get older adults vaccinated – which was met with hesitancy and outright opposition from many families with seniors, who cited concerns about side effects as their main reason for reluctance [41].

Influenza vaccination is not funded by the central government or included in the NIP. The influenza vaccination rate is low and varies across the country. Coverage was only 1.9% in 2008-2009; the rate in urban adults >60 years was 4.3% in the 2011-2012 season [42].

The Chinese public is largely unaware of the significant adverse health impact from influenza, considering it as part of the "winter blues." Most Chinese seniors do not recognize annual influenza immunization as an important and effective measure for influenza prevention and, therefore, hesitate to get vaccinated. Providers often equate influenza with the "common cold" and do not acknowledge its disproportionately devastating consequences for older adults. Vaccine administration is not widely available in the community and is only allowed at hospital facilities and CDC local offices. Recent vaccine scandals, such as vaccine delivery after its expiration by some domestic manufacturers, have further eroded public confidence in influenza vaccination in China [43].

There is a diverse patchwork of reimbursement policies at the provincial, prefecture, and county levels. Since 2007, the Beijing municipal government has provided annual free influenza vaccines to local people aged 60 years and older between September and November. In response to this pilot program, 428 specific vaccination clinics coupled with a consulting hotline were established in Beijing.

Prioritizing older people in the campaign led to a substantial increase of uptake in

this group, from 1.69% in 1999 to 43% in 2010. Governments of prefecture-level cities such as Karamay and Xinxiang also provide free influenza vaccination for local seniors. In addition, 61 regions in China have launched reimbursement policies to subsidize the cost of influenza vaccine for older adults who are eligible for government health insurance [44].

Pneumococcal vaccination data in China are limited. Data from local areas indicate that pneumococcal vaccination rates are low among elderly people. In 2010, the rate of pneumococcal vaccination in residents of the Chaoyang District of Beijing aged ≥ 60 years and living in the community was 2.1%.

In 2014 1.8% of male residents of the Qingpu District of Shanghai aged ≥ 65 years were vaccinated, and 2% of female residents. In the same study, the vaccination rates were 1.6% for those aged 65- 79 years and 4.4% for those aged ≥ 80 years. In March 2015, a pneumococcal vaccination subsidy program for older residents aged ≥ 60 years was launched in Chengdu, and 1200 people were randomly selected for the survey. The vaccination rate was 42.1% in that program [42].

Denmark

Health system overview [45]

In Denmark's universal, decentralized In Denmark's universal, decentralized health system, the national government provides block grants from tax revenues to the regions and municipalities which deliver health services. All residents are entitled to publicly financed care, including largely free primary and preventive care, specialist, hospital, mental health, and long-term care services.

Danes can choose from two public insurance options. Practically all (98%) choose Group 1 coverage, under which general practitioners act as gatekeepers and patients need a referral to see specialists, except for a few specialties. The remaining 2% choose Group 2 coverage, which allows access to specialists without a referral, although copayments apply. Under both insurance options, access to hospitals requires a referral. Residents may purchase voluntary complementary insurance to cover copayments for outpatient drugs, dental care, and other services. Supplemental insurance, provided mainly by private employers, offers expanded access to private providers. Cost-sharing limits for adults and for children create a safety net.

The national government does not have a direct role in the delivery of health care services. There is no nationally defined benefit package for health care. Decisions about levels of service and new medical treatments are made by the regions within a framework of national laws, agreements, guidelines, and standards. Five regions governed by democratically elected councils are responsible for the planning and delivery of specialized health care services and play a role in specialized social care and coordination. The regions own, manage, and finance hospitals. They also finance the majority of services delivered by private general practitioners (GPs), office-based specialists, physiotherapists, dentists, and pharmacists, as well as specialized rehabilitation. Approximately 22% of doctors work in general practice. Almost all GPs are self-employed and are paid by the regions via capitation (about 30% of income) and fee-for-service (70% of income). Rates are set through national agreements with physician associations. The national government provides 80% of funding for the regions; 20% comes from municipalities. Municipalities are responsible for financing and delivering nursing home care, home nurses, health visitors, some dental services, school health services, home help, substance use treatment, public health and health promotion, and general rehabilitation.

The World Bank reports that health expenditures were 10.071% of GDP in 2018, or $6,216.769 per capita. OOP accounted for 13.765% of spending [46].

Adult immunization in Denmark

Covered adult immunization is chiefly age-based (for those 65 and older), with each vaccine recommended based on risk. Pneumococcal (PPSV23) and seasonal influenza vaccines are free and recommended for adults over age 65. No other adult vaccines are currently recommended for other adults, with the exception of COVID-19 and catch-up measles vaccine for those born outside Denmark and previously unvaccinated.

COVID-19 vaccination is recommended, voluntary, and free of charge for adults over age 18. The two vaccines approved for use are Pfizer-BioNTech and Moderna. Boosters are recommended

in addition to the primary series. The Danish Health Authority reports that 82.1% of eligible people have received a first dose; 78.7% have received two; and 51.2% have received three as of January 6, 2022 [47].

Pneumococcal: On 31 March 2020, in the beginning of the COVID-19 pandemic, the Danish Parliament decided to offer free vaccination with PPSV23 to all persons aged 65 and above and to other individuals at an increased risk of IPD, aiming for a vaccine coverage rate of 75%. Prior to this, persons with an elevated risk of contracting IPD have historically been recommended vaccination with PCV13 and/or PPSV23 with partial reimbursement. This vaccination strategy has proven unsuccessful as vaccination coverage among eligible patients has been very low.

The program started on 22 April 2020 with nursing home residents, those 65 and older with chronic disease, and those younger than 65 at increased risk of IPD. The second phase of the program began that autumn, expanding to all those 65 and older and those younger who belong to any risk group [48].

By November 2020, less than eight months after the introduction of the universal age-based vaccination program for persons aged 65 and above, the vaccination coverage in this age group reached 59%. This highlights the importance of easily administrable eligibility criteria, the opportunity for receiving PPSV23 vaccination concomitant with influenza vaccination for persons aged 65 and above, and an increasing public focus on preventing respiratory diseases by vaccination during the COVID-19 pandemic [49].

Influenza: Since 2002, seasonal influenza vaccination has been free to all adults aged 65 and older. The Staten Serum Institute (the public health authority) reports that the 2017-2018 influenza season "was unusual in terms of prevalence, duration and types of influenza virus in circulation. The season was prolonged and characterized by a very high level of influenza activity. The high level of activity was reflected in a high number of patients admitted to hospital with influenza and a substantial excess mortality among both adults and elderly people [50]." In the 2019/2020 season, influenza vaccine coverage among those ≥65 years was only 52%, which was in line with the coverage recorded in the 2018/2019 season. Thus, the coverage still lags far behind the 75% coverage target recommended by the WHO, which is also the vaccination target in Denmark [51]. For the five-year period 2015-2019, Eurostat reports an average coverage of 41% for adults 65 and older – reflecting yearly increases from 34% in 2015 to 52% in 2019 [52].

France

Health system overview [53]

The French government sets the national health strategy and allocates budgeted expenditures to regional health agencies, which are responsible for planning and service delivery. Enrollment in France's statutory health insurance system is mandatory. The system covers most costs for hospital, physician, and long-term care, as well as prescription drugs; patients are responsible for coinsurance, copayments, and balance bills for physician charges that exceed covered fees. The insurance system is funded primarily by payroll taxes (paid by employers and employees), a national income tax, and tax levies on certain industries and products. Nearly all – 95% – citizens have supplemental insurance to help with these OOP costs, as well as dental, hearing, and vision care.

The provision of health care in France is a national responsibility. The Ministry of Social Affairs, Health, and Women's Rights is responsible for defining the national health strategy. It sets and implements government policy for public health as well as the organization and financing of the health care system.
Over the past two decades, the state has been increasingly involved in controlling health expenditures funded by social health insurance (SHI). It regulates roughly 75% of health care expenditures on the basis of the overall framework established by Parliament.
The central government allocates budgeted expenditures among different sectors (hospitals, ambulatory care, mental health, and services for disabled residents) and regions.
The Ministry of Social Affairs, Health, and Women's Rights is represented in the regions by the Regional Health Agencies, which are responsible for coordinating population health and health care, including prevention and care delivery, public health, and social care. In general, there is limited coverage of preventive care; however, there is

full reimbursement for priority services — immunizations, mammograms, and colorectal cancer screenings, for example — as well as for preventive care for children and low-income populations.

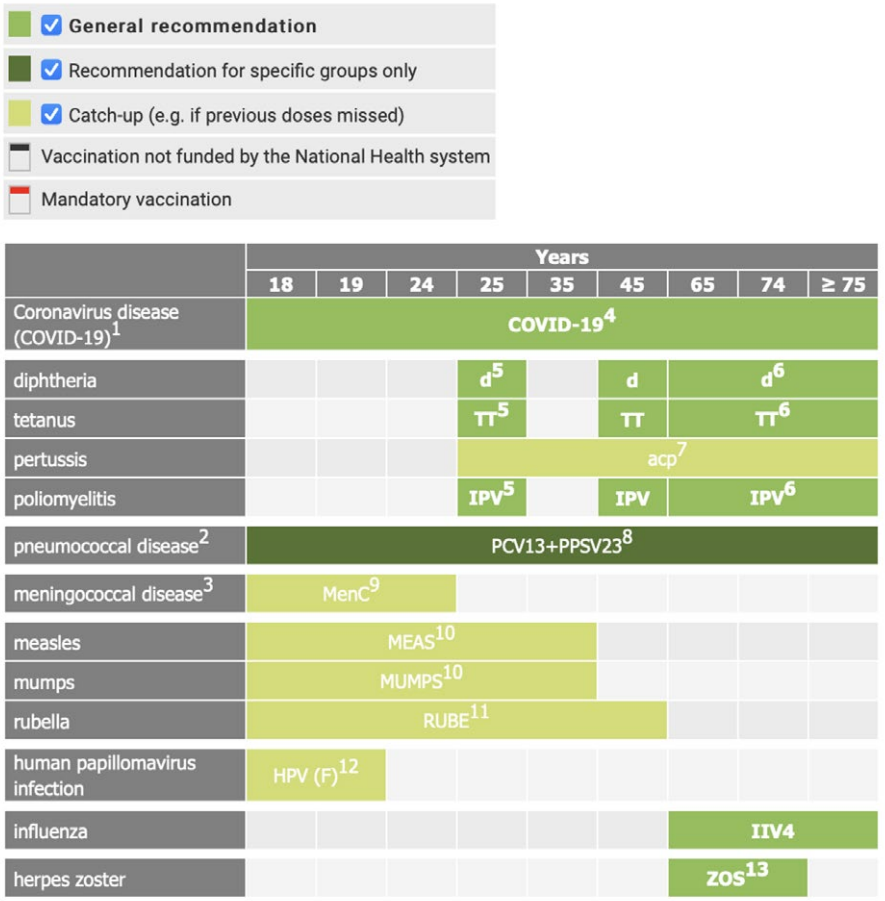
The World Bank reports that health expenditures were 11.258% of GDP in 2018, or $4,690.072 per capita. OOP accounted for 9.248% of overall spending [54]. The proportion of GDP allocated to prevention and public health in 2015 was estimated at 0.26%, and spending for vaccines was estimated at €8 per capita and 0.21% of health expenditures [55].

Adult immunization in France

Privor-Dumm et al. identify France as a disease prevention-focused country [10]. In France, about 13.4 million individuals over the age of 65 years are considered at risk for adult VPDs – a figure predicted to rise to 20 million by 2050. Despite recommended schedules and evidence on protective effects of vaccination, uptake rates are decreasing in France. Influenza vaccination rates decreased from 60% in 2010 to 46% in 2017, and pneumonia vaccination was at 20% coverage for adults [56]. Eurostat reports a five-year average influenza vaccination coverage rate for adults 65 and older of 50.7% for the period 2015-2019 [52]. Coverage rates for other vaccines are not available.

COVID-19: As of 20 January 2022, France had reported 15.65 million cumulative confirmed cases and 128,180 cumulative deaths. More than 133 million doses had been administered, and 79.4% of the populace had received at least one, with 75.6% fully vaccinated. The pandemic highlighted structural weaknesses of the health system, including its governance and decision-making processes, "especially the high level of bureaucracy, weak prevention culture and the lack of coordination between primary, social and hospital care providers. Weak prevention and primary care can explain a substantial part of the extremely rapid spread of the virus in French population during the first wave. The lack of coordination between nursing homes, hospitals and primary care providers has contributed to the high death toll in nursing homes." "The response to the first wave, including a full lock-down, was an emergency response that revealed the low level of preparedness for pandemics and the overly hospital-

Table 5: Adult vaccination schedule, France.



Source: ECED. [57].

IFPMA

centered provision of health care in France." During the second wave, this response evolved but "without fully managing to put in place an effective health strategy." In particular, the "government's communication, which oscillated between dramatization ('it's war!'), trivialization ('another little effort for a few months') and infantilization of the population, instead of factual and transparent communication, including on the debates preceding major decisions and divergences, weakened the public trust in the measures put forward [58]."

A recent insightful analysis of responses to COVID-19 in France, Spain, Italy, Germany, and the UK concludes: "The crisis has clearly highlighted well-known differences between centralized and decentralized systems. Yet focusing on this dichotomy is not sufficient. It is suggested that while the distribution of authority between central and regional governments matters, policy dynamics – that is, how different territorial levels interact in policy-making processes – are even more important in driving multi-level responses to the emergency. Whether these dynamics are hierarchical (France), competitive (Italy and Spain), cooperative (Germany) or mixed (the United Kingdom) depends on how pre-crisis institutional, sectoral and political 'causal forces' moderate the impact of an exogenous shock [59]." Accounting for a country's policy-making apparatus, power structure, and policy dynamics should be an important consideration in how to drive implementation of LCI beyond COVID-19.

Germany

Health system overview [60]

Health insurance is mandatory in Germany. Approximately 86% of the population is enrolled in statutory health insurance, which provides inpatient, outpatient, mental health, and prescription drug coverage. Administration is handled by nongovernmental insurers known as sickness funds. As of January 2019, there were 109 sickness funds. Sickness funds are financed through general wage contributions (14.6%) and a dedicated supplementary contribution (1% of wages, on average), both shared by employers and workers. Copayments apply to inpatient services and drugs, and sickness funds offer a range of deductibles. Germans earning more than $68,000 can opt out of social health insurance (SHI) and choose private health insurance instead. There are no government subsidies for private insurance.

The German health care system is notable for sharing decision-making powers among the federal and state governments and self-regulated organizations of payers and providers. Within Germany's legal framework, the federal government has wide-ranging regulatory power over health care but is not directly involved in care delivery. The Federal Joint Committee, which is supervised by the Federal Ministry of Health, determines the services to be covered by sickness funds. To the extent possible, coverage decisions are based on evidence from comparative-effectiveness reviews and health technology (benefit-risk) assessments.

The Federal Joint Committee also sets quality measures for providers and regulates ambulatory care capacity (the number of SHI-contracted physicians practicing), using needs-based population–physician ratios. The 16 state governments determine hospital capacity and finance hospital investments. States also supervise public health services. Regional associations of SHI-contracted physicians are required by law to guarantee the local availability of ambulatory services for all specialties in urban and rural areas. These regional associations also negotiate ambulatory physicians' fee schedules with sickness funds. SHI covers the following:

- Preventive services, including regular dental checkups, child checkups, basic immunizations, chronic disease checkups, and cancer screenings at certain ages.
- Inpatient and outpatient hospital care.
- Physician services.
- Mental health care.
- Dental care.
- Optometry.
- Physical therapy.
- Prescription drugs, except for those explicitly excluded by law (mainly "lifestyle drugs" like appetite suppressants) and those excluded following an unfavorable benefit-risk assessment.
- Medical aids.
- Rehabilitation.
- Hospice and palliative care.
- Maternity care.
- Sick leave compensation.

The World Bank reports that health

Table 6: Adult vaccination schedule, Germany.

- ☑ General recommendation
- ☑ Recommendation for specific groups only
- ☑ Catch-up (e.g. if previous doses missed)
- Vaccination not funded by the National Health system
- Mandatory vaccination

	Years		
	18	60	≥ 61
Coronavirus disease (COVID-19)[1]	COVID-19[5]		
diphtheria	d[6]		
tetanus	TT[6]		
pertussis	acp[7]		
poliomyelitis	IPV[8]		
pneumococcal disease[2]		PPSV23[9]	
measles[3]	MEAS[10]		
influenza[4]		IIV4[11]	
herpes zoster		ZOS[12]	

Source: ECDC. [61].

expenditures were 11.43% of GDP in 2018, or $5472.202 per capita. OOP accounted for 12.649% of spending. Spending on prevention and public health in 2016 was estimated at 0.07% of GDP and €16 per capita; immunization was estimated at 0.62% of overall health spending [55].

Adult immunization in Germany

Privor-Dumm et al. describe Germany's approach to immunization as being disease prevention-focused [10].

COVID-19: According to Our World in Data, as of 16 January 2022, there have been 8.02 million confirmed cases and 115.654 deaths in Germany. Nearly 75% of the population has received at least 1 dose of vaccine, and 72.1% are fully vaccinated [62]. Germany is reportedly planning to make vaccination mandatory for adults [63].

Influenza: Germany has adopted a risk-based influenza vaccination policy to recommend influenza vaccination in most at-risk groups, including citizens over the age of 60 years, pregnant women, healthcare workers and people with chronic medical conditions such as diabetes, asthma, or cardiovascular disease [64]. For the five-year period 2015-2019, Eurostat reports average vaccination coverage rate for adults 60 and older of just 36.68% [52].

Data for other antigens are not readily available.

Italy

Health system overview [65]

Italy's National Health Service (Servizio sanitario nazionale, or SSN) automatically covers all citizens and legal foreign residents. It is funded by corporate and value-added tax revenues collected by the central government and distributed to the regional governments, which are responsible for delivering care. Residents receive mostly free primary care, inpatient care, and health screenings. Other statutory benefits include maternity care, specialty care, home care, hospice care, preventive medicine, and pharmaceuticals. Patients make copayments for specialty visits and procedures and some outpatient drugs. Exempt from cost-sharing are pregnant women, patients with HIV or other chronic diseases, and young children and older adults in lower-income households. There are no deductibles for

residents. Private health insurance has a limited role in Italy's health coverage system.

The organization and delivery of health services is decentralized. Nineteen regions and two autonomous provinces are responsible for delivering care through 100 local health units, which deliver primary care, hospital care, outpatient specialist care, public health care, and health services related to social care. Regions enjoy significant autonomy in determining the macro structure of their health systems.

The local health units each have a general manager, who is appointed by the regional governor. The central government retains responsibility for national health policies and priorities, annual funding of the SSN, and allocation to regions. There is a goal of establishing a universal system of electronic records connecting every level, except primary. Primary care is provided by contracted self-employed and independent GPs and pediatricians, paid a capitation fee with the possibility of additional allowances for additional patient services. Capitation accounts for approximately 70% of a GP's overall payment.

Covered benefits include:

- Pharmaceuticals.
- Inpatient care.
- Preventive medicine
- Outpatient specialist care.
- Maternity care.
- Home care.
- Primary care
- Hospice care.

For reimbursable pharmaceuticals, reference prices are set according to cost-effectiveness studies carried out by the National Committee for Medical Devices and the National Drugs Agency, negotiated between the government and the manufacturer using criteria such as comparative cost-effectiveness.

Prices for non-reimbursable drugs are set by the market. Public financing accounted for 74.2% of total health spending in 2018, with total government expenditures standing at 6.404% of GDP and amounting to $2988.996 per capita. The public system is financed primarily by corporate tax (18.6% in 2018) and a fixed proportion of the national value-added tax revenue (60% in 2018). But regions may also generate their own additional revenue. Local health units are funded mainly through capitated budgets.

In 2018, an estimated 23.545% of total health spending was OOP, mainly for drugs not covered by the public system and for dental care but OOP expenses over EUR 129 (USD 181) per year are eligible for a tax credit amounting to 20% of their spending. All regions have adopted various tools to contain costs. In most cases, these include global budgets for hospital and outpatient care, bulk purchasing for drugs and medical products, and the procurement of services such as laundry, meals, cleaning, and sterilization.

Spending on prevention and public health in 2015 was estimated at 0.37% of GDP and €5 per capita; immunization was estimated at 0.20% of overall health spending [55].

Adult immunization in Italy

Privor-Dumm identifies Italy as being health security-focused [10]. In 2017, 10 vaccinations were made compulsory and free of charge for all infants and children up to age 16, though immunization remains voluntary for adults. The Italian National Immunization Plan is considered among the most advanced adult vaccination plans in Europe. However, available data indicate low adherence to vaccination recommendations [67].

Vaccination coverage data are available only for influenza; data for other vaccines are incomplete. However, available data indicate that coverage is low [68]. Eurostat reports small annual increases in influenza vaccination coverage rates for adults >65 over the 2015-2020 period: 48.65%, 49.90%, 52.00%, 52.70%, 53.10%, and 54.60%, respectively. The Italian National Immunization Plan target for influenza vaccination is 75% at minimum and optimally 95%.

A cross-sectional study of 700 adults in Southern Italy (mean age 58.7 years) with chronic diseases attending four public specialty clinics found fairly high levels of knowledge. Overall, 64.7% of the participants were aware that influenza can be prevented with vaccines and that patients with chronic diseases are at higher risk of developing severe complications. Less than half of the sample (42.1%) received influenza vaccine in the last season, and 46.9% confirmed willingness to receive influenza vaccination in the next season. The level of awareness was significantly

Table 7: Adult vaccination schedule, Italy.

- General recommendation
- Recommendation for specific groups only
- Catch-up (e.g. if previous doses missed)
- Vaccination not funded by the National Health system
- Mandatory vaccination

	Years				
	18	19	49	50-64	≥ 65
Coronavirus disease (COVID-19)[1]	COVID-19[2]				
diphtheria	d	d[3]			
tetanus	TT	TT[3]			
pertussis	acp	acp[3]			
poliomyelitis	IPV				
pneumococcal disease					PCV13+PPSV23[4]
meningococcal disease	MCV4[5]				
human papillomavirus infection	HPV (F/M)[6]				
influenza	IIV3[7]				IIV3
herpes zoster				ZOS	ZOS

Source: ECDC. [66].

lower among the elderly (>65y) and those with higher self-reported health. A significantly higher likelihood of vaccination was observed among the elderly (despite low awareness), the subjects with a higher knowledge about vaccine utility and safety, the participants with chronic respiratory diseases, and those who reported greater prescription drug use [69].

The national plan set vaccination coverage objectives for 2020 of 75% and 50% for pneumococcal and zoster vaccination among those aged ≥65 years.

COVID-19: An in-depth view of Italy's response to COVID-19 starts on page 46.

Japan

Health system overview [70]

Japan's statutory health insurance system provides universal coverage. It is funded primarily by taxes and individual contributions. Enrollment in either an employment-based or a residence-based health insurance plan is required. Benefits include hospital, primary, specialty, and mental health care, as well as prescription drugs. In addition to premiums, citizens pay 30% coinsurance for most services and some copayments. Young children and low-income older adults have lower coinsurance rates, and there is an annual household OOP maximum for health care and long-term services based on age and income. There are also monthly OOP maximums. The national government sets the fee schedule. Japan's prefectures develop regional delivery systems. Most residents have private health insurance, but it is used primarily as a supplement to life insurance, providing additional income in case of illness.

Japan's statutory health insurance system (SHIS) covers 98.3% of the population, while the separate Public Social Assistance Program for people who are impoverished covers the remaining 1.7%. Citizens and resident noncitizens are required to enroll in a SHIS plan; undocumented immigrants and visitors are not covered. The SHIS consists of two types of mandatory insurance:

- Employment-based plans, which cover about 59% of the population.
- Residence-based insurance plans, which include Citizen Health Insurance plans for unemployed

individuals ages 74 and under (27% of the population) and Health Insurance for the Elderly plans, which automatically cover all adults ages 75 and older (12.7% of the population).

Each of Japan's 47 prefectures, or regions, has its own residence-based insurance plan, and there are more than 1,400 employment-based plans.

All SHIS plans provide the same benefits package, which is determined by the national government:

- Hospital visits.
- primary and specialty care.
- Mental health care.
- Approved prescription drugs.
- Home care services provided by medical institutions.
- Hospice care.
- Physical therapy.
- Most dental care.

The World Bank reports that health expenditures were 10.953% of GDP in 2018, or $4266.587 per capita. OOP accounted for 12.748% of spending.

Adult immunization in Japan

Privor-Dumm et al. identify Japan as taking a health security-focused approach to immunization [10]. Nonetheless, for a wealthy and aging country, Japan remains an outlier in terms of attitudes to adult vaccination, with surveys showing that just 4.7% of adults in Japan agreed that vaccines were important, 25.1% agreed they were safe, and 9.9% agreed they were effective – despite grappling with an influenza epidemic in 2019 [71].

While vaccine uptake for pediatric routine vaccines is close to 100%, the uptake for non-pediatric vaccines remains low. NIP category B vaccination (flu and pneumococcal vaccines for elderly people) is not 100% funded [72], though for some populations (those over 65 and those 60-64 with chronic illness), these vaccines are free or have copayment support, depending on the local immunization schedule.

The International Longevity Centre-UK is working with Stripe Partners to identify barriers to adult vaccination in Japan and address low vaccine uptake. At a 2021 meeting [73], health experts cited these barriers:

- The perception that vaccination is for children.
- Paper-based systems.
- Low trust in government.
- Cost.
- Time and convenience.
- Government is cautious.
- Safety concerns.
- Health system structure's preference of treatment over prevention.

COVID-19: As of November 2021, Japan led the G7 nations in COVID-19 coverage, with 75.5% of the population of 126 million vaccinated. More than 90% of Japanese 65 and older had received both shots, while the rates for people in their 20s and 30s were 69% and 72% respectively, according to data from the prime minister's office. Teenagers had the lowest penetration at 65% fully inoculated. Given long-standing vaccine skepticism in Japan, experts are uncertain about why COVID-19 vaccination has proved so successful. Among the theories: a slow start and early shortage fostered a scarcity mentality with people thinking "they had to get shots quickly," with older adults being "mindful of the health risks and {having] a strong sense of urgency to get it. Their experience gave a sense of security and encouraged the rest of their families to get it too." Additionally: "There's strong peer pressure in Japan. Also, it wasn't politicized here, like in the US [74]". As of 13 January 2022, Our World in Data reports that 79% of the population is fully vaccinated and 80% is partly vaccinated [75].

Pertussis: Japan has yet to approve the adult tetanus, diphtheria, and acellular pertussis (Tdap) vaccine, nor has it included the vaccine in its NIP. Although four doses of pediatric diphtheria, tetanus, acellular pertussis, and inactivated polio vaccine (DPT-IPV) during infancy and childhood have been included in the Japanese NIP (at 3, 4, 5 to 11, and 12 to 23 months), individuals or their families have to pay for additional booster doses. In Japan, only sentinel pertussis surveillance was conducted until 2017; notifiable pertussis surveillance began in 2018. During the first year of this surveillance program, more than 11,900 pertussis cases were reported, including 530 cases of infantile pertussis in infants aged less than 6 months. Among 344 reported individuals hospitalized due to pertussis in 2018, 290 (84.3%) were infants aged less than 6 months. The possibility of underreported and undiagnosed cases suggests the actual disease burden of infantile pertussis

may be higher. Therefore, it is highly likely that the total burden of pertussis infection may have been underestimated in Japan. A survey of nearly 1,000 pregnant women and mothers provided information on pertussis infection and maternal vaccination, followed by seven questions. After reading the information, 93.0% and 92.6% of participants thought that the maternal Tdap vaccine should be approved by the Japanese government and be included in the NIP, respectively. Although only 67.6% of participants wished to have the maternal Tdap vaccine without government financial support after reading the information, 92.5% said they would have the vaccine with government financial support [76].

Influenza: Coverage is approximately 50%. In a 2019 study of attitudes and behaviors among a group of older outpatients, researchers found Influenza vaccination was associated with belief in vaccine efficacy, perceived susceptibility to vaccine-related adverse events, physician recommendations, and older age. They concluded that increasing the frequency of physician recommendations might lead to increased vaccination coverage [77]. A study to examine the impact of COVID-19 on influenza vaccination among persons >16 years who received treatment in an emergency room in a single hospital found overall influenza vaccination coverage was 43.7% (55/126 patients) in 2019/2020 and 50.8% (64/126 patients) in 2020/2021 [79].

Pneumococcal: Pneumonia is the third most common cause of death in Japan. Low vaccination rates are thought to be related to low levels of public subsidy. Since 2014, the national government has offered subsidies through a five-year national routine vaccination program of the 23-valent pneumococcal polysaccharide vaccine (PPV23) for older adults at age ≥65 years with 5-year age intervals. Those turning 65, 70, 75, 80, 85, 90, 95, and 100 years were eligible for subsidized PPV23 vaccination in each financial year. At the end of 2018, the completion of the five-year national immunization program, the estimated cumulative vaccination rate was 74%, up from 40.6% at the end of 2015. The complicated five-year age intervals in this vaccination program may potentially prevent some older adults from receiving a timely vaccination because they must wait to reach the next eligible age, which could delay vaccination for up to four years [79].

Mexico

Health system overview [80]

Mexico is a federation consisting of 32 states, including Mexico City. It is the 15th largest country geographically and 11th most populous country in the world with over 124 million residents, 77% of whom live in urban areas. The population is young, with nearly 27% under the age of 15, and only 7% who are 65 years and older. Income inequality and poverty are persistent health challenges. Of the 36 countries making up the OECD, Mexico has the highest level of income inequality. Poverty disproportionately affects rural residents: in 2016 about 58% of Mexico's rural residents were facing poverty, compared with 39% of the urban population.

The Mexican health system consists of three main components operating in parallel: 1) employment-based social insurance schemes, 2) public assistance services for the uninsured supported by a financial protection scheme, and 3) a private sector composed of service providers, insurers, and pharmaceutical and medical device manufacturers and distributors. The social insurance schemes are managed by highly centralized national institutions while coverage for the uninsured is operated by both state and federal authorities and providers.

Social insurance is provided by highly centralized, national institutions, while voluntary coverage for the uninsured was, until 2020, operated by both state and federal authorities and providers. The private sector, while regulated by the government, operates mostly independently. The social insurance subsystem is dominated by three national institutions that cover all salaried employees in the formal sector. The IMSS covers private sector employees and the Institute for Social Security and Services for State Employees (ISSSTE) covers federal government employees. In 2017, IMSS covered about 33% and ISSSTE 7.4% of the population, respectively. Both IMSS and ISSSTE organize, provide and regulate most of their own health services through vertically integrated, national organizations. However, a significant proportion of affiliates seek care outside social insurance institutions to get around access barriers or to access higher quality services. State governments fund health services for

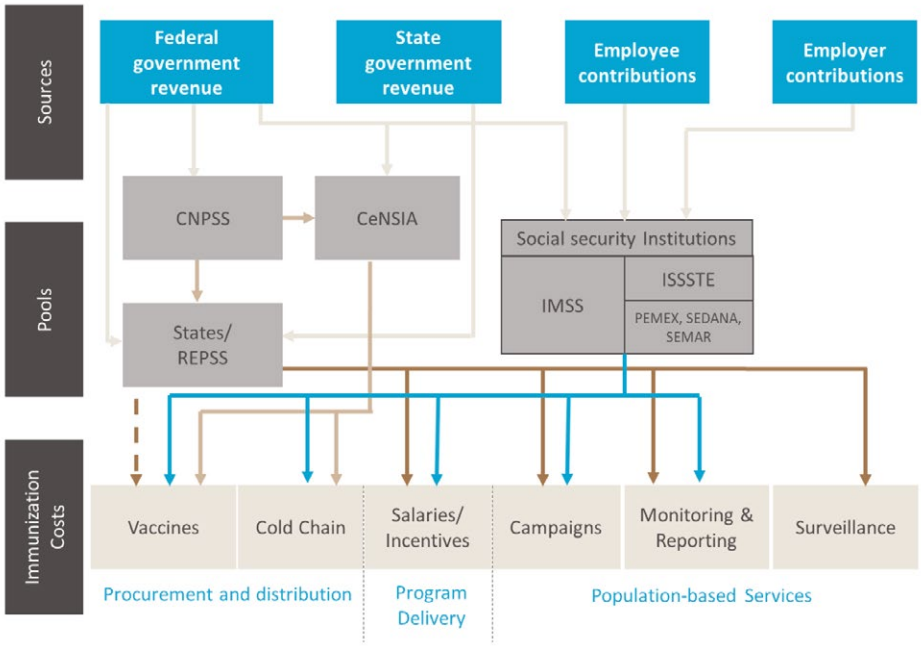
their civil servants primarily through their own social insurance institutes or through agreements with either ISSSTE or IMSS. In addition to IMSS, ISSSTE and MoH institutions, there are individual insurance funds for dedicated populations such as the military, navy and the oil company Petróleos Mexicanos (PEMEX), which all respectively fund and provide health services for their forces and employees. Approximately 8% of the population has private health insurance. Private practice is highly fragmented and most private services are paid OOP on a fee-for-services basis. Health care is provided free of charge to approximately 85% of the population.

The MoH and state governments and their health provider networks share responsibility for public health programs for the entire population, health coverage and social assistance for the uninsured poor, and financial protection for the self-employed and for those employed in the informal labor market. The MoH conducts and regulates national public health policy through interinstitutional collaboration strategies.

- Primary care is delivered through independent provider networks for specific population groups.
- While governmental health institutions do not allow the choice of primary care physician, patients pay OOP to access physicians in pharmacies or clinics outside their insurer's provider network.
- Primary care teams operate as a gateway to specialized and hospital care within their own networks and provide a wide range of restorative, prevention and health promotion services, including vaccination, family planning, prenatal care and pediatric care.
- Specialized public ambulatory care is scarce: institutional provider networks include most services within proprietary facilities, distinguishing between general and specialized ambulatory care, general (second level) hospitalization and high-specialty (third level) hospitalization.

Health care is highly fragmented and uncoordinated across various insurers and the states. Fragmentation also exists within the immunization program in the pricing, procurement, and delivery of vaccines between SSIs and CeNSIA. Decentralizing the procurement of vaccines to states only served to exacerbate this issue.

Figure 2: How immunization is financed in Mexico.



Source: Wilkason et al. 2018. [81].

National health spending has grown in recent years but is lower than the Latin America and Caribbean average and considerably lower than the OECD average Public spending accounts for 58% of total spending, with private contributions being mostly comprised of OOP spending. According to the World Bank, in 2018. OOP was 42.07% of overall spending. Government expenditures on health were $519.605 per capita, last among all OECD countries in 2018, and total health spending accounted for 5.371% of GDP [82], last among OECD countries save for Turkey. Figure 2, above, shows how immunization is financed in Mexico.

Adult vaccination in Mexico

Privor-Dumm characterizes Mexico as being health security-focused [10], which is reflected in the country's 2017 immunization law that guarantees vaccination as a universal right, legally obligating the government to provide access [81].

The Universal Vaccination Programme enjoys international recognition, being public and free and among the broadest scope worldwide, with coverage against 14 preventable diseases. For adults 60 and older, hepatitis B, influenza, PPV, and Tdap – and now COVID-19 – are covered by the NIP; two additional vaccines, varicella and hepatitis A, are covered only at a subnational level due to budgetary constraints.

All Mexicans are eligible to receive routine NIP vaccines at the public health center of their choice, free of charge. Vaccinations are promoted during three annual National Health Weeks, which include intensive community vaccination activities and other health promotion efforts. As of 2018, it was reported that coverage rates for NIP vaccines had been documented only through 2014.

A 2020 survey of Mexican men residing in the US (which has a broader set of recommendations than Mexico) found that Mexican adult men believe vaccinations (not just for influenza) are important for their health. However, they have limited knowledge in regard to the benefits of vaccines, frequency, cost, and where to get them. Almost half of respondents (n = 160) had not received a vaccine in the last 5 years, although a higher proportion of respondents aged 40 and older, when compared with the younger groups, reported being vaccinated within the last year. Almost 40% of those getting a vaccine in the last year received a tetanus vaccine due to work-related injuries. Younger respondents indicated a belief that vaccines are like medicine – to be taken when ill, not to prevent illness [83].

COVID-19: Mexico's COVID-19 vaccination program began 24 December 2020. As of 14 January 2022, Mexico had reported 4.26 million cumulative cases. As of 1 January, nearly 150 million doses had been administered; 63% of the population had received at least one; 56% were fully vaccinated [84]. Mexico has donated doses to Belize, Bolivia, Paraguay, Guatemala, Honduras, El Salvador, and Jamaica. Since March 2021, the US has donated 11 million doses to Mexico [85]. The country is one of the worst affected based on four metrics:

- Comparatively high numbers of reported cases and deaths, after accounting for differences in population size and testing levels.
- Comparatively high excess mortality from all causes, which reflects both the direct and indirect impact of COVID-19.
- Large inequities in the burden of disease across social groups and regions.
- Very high infection and mortality rates among health workers [86].

Influenza: Most influenza vaccines in Mexico are trivalent rather than quadrivalent. Switching to the latter could avert significant morbidity, mortality, and health spending, saving nearly $9 million in payer costs over a five year period [87]. Vaccination occurs during the influenza season (October to February) annually for adults 60 and older and for pregnant women. The OECD reports that coverage for those 65 and older was 82.3% in 2014, the most recent data available [88]. The Mexican influenza vaccination program does not include a recommendation for adults 50-59 years, unless they have risk factors for complications (diabetes, hypertension, obesity, chronic kidney disease and asthma, among others). A recent impact analysis for this age group found that influenza causes considerable morbidity and mortality in adults ages 50-59, along with substantial economic impact on the healthcare system, and recommended expanding the NIP to this group [89]. The authors have recently called for reforming the influenza immunization program: "By increasing vaccination coverage to 75% in the population aged 12–49 years with risk factors (diabetes, high blood pressure, morbid obesity, chronic renal failure, asthma, pregnancy), and expanding universal vaccination coverage to school-aged children (5–11 years) and adults aged 50–59 years, 7142–671,461 influenza cases; 1–15 deaths; 7615–262,812 healthcare visits; 2886–154,143 emergency room admissions and 2891–97,637 hospitalizations could be prevented (ranges correspond to separate age and risk factor groups), with a net annual savings of 3.90 to 111.99 million USD. Such changes to the current vaccination policy could potentially result

in significant economic and health benefits. These data could be used to inform the revision of a vaccination policy in Mexico with substantial social value [90]."

Pneumococcal: For adults >65 years, PPSV23 is recommended. Invasive pneumococcal disease is common in Latin America and the effectiveness of PPSV23 in adult patients varies significantly [91]. In adults ≥50 years of age in Latin American countries, including Mexico, community-acquired pneumonia (CAP) caused mainly by S. pneumoniae is associated with high rates of morbidity and mortality, with the incidence increasing substantially with age [92].

For children, Mexico has benefited from the inclusion of the 7-valent (PCV7) and 13-valent pneumococcal conjugate vaccines (PCV13) since their inclusion in the NIP in 2006 and 2010, respectively. PCV10 is available in the private market. An impact analysis found that "over a 9 year period, PCV7 and PCV13 have saved 1,840 lives and provided an overall net savings to the Mexican Health System of approximately $34.5 Billion MXN" and argued against the NIP moving from PCV13 to PCV10 as a cost-saving measure [93].

Following the introduction of PCV7 for children under 2 years, there has been a decrease in the transmission of the included serotypes to adults (no such change was found after the introduction of the PCV13 vaccine, including in the prevalence of serotype 19A). "This could be due to a herd effect but cannot be concluded with certainty. Serotypes 3 and 19A have low immunogenicity (PCV13), so they do not manage to generate a decrease in colonization of vaccinated children, so they continue to be transmitted to adults. It underscores the need for surveillance of specific populations, particularly adults (including those with CAP), because this population may be a reservoir for different serotypes and the effects seen in children do not reflect protection of older and susceptible community members [91]."

Hepatitis B: In 2016, WHO member states endorsed the 69th World Health Assembly's Global Health Sector Strategies towards eliminating Hepatitis B (HBV) infections by 2030. As of 2020, Mexico lacked a national plan to address viral hepatitis, "a major obstacle for the development and implementation of actions and procuring funding." Further, the lack of a plan "has not only failed to establish national policies and strategies in the fight against viral hepatitis, but also interfered with resource allocation for studies of HBV and HCV epidemiology, clinical investigation as well as basic and applied scientific research [94]" and likely explains the absence of data on HBV vaccination coverage.

The 2018 estimated prevalence of hepatitis B surface antigen (HBsAg) in the Mexican adult population was 0.51%, representing 411,000 cases unevenly distributed by age:

- 40-49 years 13,000
- 60-69 years 354,000
- >70 years 44.000

This prevalence was higher than previously estimated (0.21% in 2000) and it was higher in women than in men (0.54% versus 0.46%, respectively) [95].

Romania

Health system overview [96, 97]

The Romanian healthcare system is a social health insurance system that has remained highly centralized despite recent efforts to decentralize some regulatory functions. It provides a comprehensive benefits package to 89% of the population in 2017, with the remaining population having access to a minimum package of benefits. Every insured person has access to the same health care benefits regardless of their socioeconomic situation, but there are inequities in access to health care across many dimensions, such as rural versus urban, and health outcomes also differ across these dimensions. The Romanian population has seen increasing life expectancy and declining mortality rates, but both remain among the worst in the European Union.

Public sources account for over 80% of total health financing. However, that leaves considerable OOP payments, representing almost a fifth of total expenditure. The share of informal payments also seems to be substantial, but precise figures are unknown. In 2014, Romania had the lowest health expenditure as a share of GDP among the EU Member States. In line with the government's objective of strengthening the role of primary care, the total number of hospital beds has been decreasing. However, health care provision remains

Table 8: Adult vaccination schedule, Romania.

	General recommendation
	Recommendation for specific groups only
	Catch-up (e.g. if previous doses missed)
	Vaccination not funded by the National Health system
	Mandatory vaccination

	Years
	≥ 65
Coronavirus disease (COVID-19)	COVID-19[2]
influenza[1]	IIV3

Source: ECDC. [99]

characterized by under-provision of primary and community care and inappropriate use of inpatient and specialized outpatient care, including care in hospital emergency departments.

The numbers of physicians and nurses are relatively low in Romania compared to EU averages. This has mainly been attributed to the high rates of workers emigrating over the past decade, exacerbated by Romania's EU accession and the reduction of public sector salaries due to the economic crisis. Reform in the Romanian health system has been both constant and yet frequently ineffective, due in part to the high degree of political instability. Recent reforms have focused mainly on introducing cost-saving measures, for example, by attempting to shift some of the health care costs to drug manufacturers by clawback and to the population through co-payments and on improving the monitoring of health care expenditure.

The World Bank reports that domestic government health expenditures were 5.557% of GDP in 2018, or $687.254 per capita. OOP accounted for 19.458% [98].

COVID-19: As of 15 January, Our World in Data reports 1.9 million cumulative confirmed cases and a little over 59,000 deaths. As of 9 January, 42% of the population had received at least one vaccination dose, and 41.4% were fully vaccinated. Similar to other EU countries, COVID-19 vaccines (both mRNA- and adenovirus-based) have been widely available to Romanians. Vaccination began on 27 December 2020 after emergency use authorization was granted by the European Medicines Agency. At the time, national surveys indicated that only around 30% of Romanians would be willing to receive a vaccine against COVID-19. During the first few months, the vaccination campaign progressed as planned, but then it stalled. By the surge of the fourth wave, only approximately 30% of Romanians were fully immunized, one of the lowest COVID-19 vaccination coverages in Europe. By mid-October 2021, a catastrophic fourth wave of the COVID-19 pandemic in Romania raised international concern due to a rapid surge in the number of infections and the high associated mortality. WHO sent experts to Romania to evaluate the ongoing situation, including the status of the COVID-19 vaccination campaign, and to help with an action plan [100].

Influenza: Eurostat reports influenza vaccination coverage has doubled from 2014, when it was 10%, falling to 7.80% in 2016; rising to 16.10% in 2017; and hitting 20% in 2018 [52]. More recent data are not available.

Spain

Health system overview [101]

Spain's health system is characterized by very strong primary care, which is the core of the system. The underlying principles and goals of the national health system continue to focus on universality, free access, equity and fairness of financing. Care is free at the point of delivery, with the exception of outpatient pharmaceutical prescriptions and certain prosthesis. The health system has three statutory subsystems: the universal national health system (Sistema Nacional de Salud, SNS); Mutual Funds catering for civil servants, the Armed Forces and the judiciary

(MUFACE, MUGEJU, and ISFAS); and the Mutualities focused on assistance for Accidents and Occupational Diseases, known as "Collaborating Mutualities with the Social Security." The private sector is an important player in the Spanish health system. The private sector provides voluntary health insurance schemes to individuals. It constitutes the alternative network for 80% of the civil servants insured within the mutual funds; it provides dental care and optical care not covered by the national health system, and it is closely intertwined with the public sector in hospital and pharmaceutical care.

The SNS operates both nationally and regionally, with 17 regions ("Autonomous Communities") being responsible for care provision under the center's strategic guidance. Primary care is essentially provided by public providers, specialized family doctors and staff nurses, who provide preventive services to children, women and elderly patients, and acute and chronic care. Primary care doctors are the first contact point and the gatekeepers of the system. The core package includes a comprehensive package of primary health care benefits not subject to OOP: acute and chronic care, health promotion and prevention activities, physiotherapy, mother and child care, mental health care, palliative care, medical counseling, basic dental health services, and specialized health care benefits (for example, any diagnostic and therapeutic procedure to be provided as outpatient specialized care, inpatient acute or long-term care, day-care surgical or medical care, palliative care, acute or long-term mental health care, home care, organ transplants, emergency care).

"Vaccinations are covered in all age groups and, where appropriate, risk groups, according to the current vaccination schedule approved by the ICNHS and the competent health administrations, as well as those that may be indicated, in general population or risk groups, for situations that epidemiologically advise it [102]."

The SNS has been improving information at all levels, including expanding an Abridged Electronic Medical Record with relevant clinical information among Autonomous Communities, together with the development of the electronic prescription, the registry of professionals (not yet fully operative) and the improvement in the health care information system (specialized care, primary care). This may offer opportunities to improve registry systems.

The World Bank reports that health expenditures were 8.977% of GDP in 2018, or $2522.644 per capita. OOP accounted for 22.165% of expenditures [103]. Spending on prevention and public health in 2014 was estimated at 0.18% of GDP and €3 per capita; immunization was estimated at 0.15% of overall health spending [55].

Adult immunization in Spain

Privor-Dumm et al. describes Spain as having an approach to immunization that has an evolving adult focus [10]. A group of experts convened in 2018 to examine the status of adult immunization in Spain made several important conclusions:

- Adult immunization is deficient in breadth of recommended vaccines and in uptake of those that are recommended.
- There is low health care worker and public understanding of the value and importance of vaccination for adults.
- Low coverage translates to missed opportunities for reducing morbidity, mortality, and health spending.
- In addition to physicians, nurses and pharmacists have important roles to play in increasing vaccination coverage rates.
- The money spent on vaccines should be seen not as an expense but an investment.
- The media are also important in disseminating truthful information and in eliminating hoaxes and misinformation [102].

COVID-19: As of 15 January 2022, according to Our World in Data, cumulative confirmed cases amounted to 8.09 million, with nearly 2.5 million added in the December-January period. There have been nearly 91,000 confirmed deaths. As of 13 January, nearly 87 million vaccine doses had been administered; more than 86% of the population had received at least one dose, and 82% were fully vaccinated [105].

Influenza: Eurostat reports that influenza vaccination coverage for adults >65 years was 65.50% in 2020, up from 54.30% the prior year [52]. Coverage among healthcare workers is estimated at less than 40% [102].

Table 9: Adult immunization in Spain.

- General recommendation
- Recommendation for specific groups only
- Catch-up (e.g. if previous doses missed)
- Vaccination not funded by the National Health system
- Mandatory vaccination

	Years		
	18	64	≥ 65
Coronavirus disease (COVID-19)[1]	COVID-19[1]		
diphtheria	d[2]		d[3]
tetanus	TT[2]		TT[3]
pertussis	acp[4]		
hepatitis B	HepB[5]		
pneumococcal disease	PPSV23 / PCV+PPSV23[6]		PPSV23[7]
meningococcal disease	MCV4[8]		
measles	MEAS[9]		
mumps	MUMPS[9]		
rubella	RUBE[9]		
varicella	VAR[10]		
human papillomavirus infection	HPV (F)[11]		
influenza	IIV[12]		IIV[13]

Source: ECDC. [104].

Pneumococcal: It is estimated that approximately half the population ages 50 and older have risk factors for pneumococcal disease and would be candidates for vaccination, but uptake is inadequate. PPV23 is financed by all the Autonomous Communities in Spain, in risk groups and systematically for people over 60 years in each Autonomous Community. Only five Autonomous Communities (Castilla León, Madrid, Galicia, Asturias and La Rioja) finance vaccination of adults 60-65 years of age with a valent conjugate vaccine. Lack of financing does not mean it cannot be recommended [102].

Thailand

Health system overview [106]

Universal health care (UHC) for Thai citizens, introduced in 2002, extended the scope of coverage to 18 million people who were uninsured and to a further 29 million who were previously covered by less comprehensive schemes. A Migrant Health Insurance Scheme has also been added. Additional coverage is provided through the Civil Servant Medical Benefit Scheme (CSMBS) and social health insurance covers salaried professionals. The World Bank reports that domestic general government health expenditures were 3.793% of GDP in 2018, or $275.917 per capita. OOP accounted for 11.011% of spending [107].

The administrative system in Thailand is made up of 76 provinces plus the Bangkok Metropolitan Area, which has its own administration system.

- **Provincial:** There are 9,770 health promoting hospitals or health centers delivering health services at primary care level. They provide holistic health services including health promotion and prevention, primary treatment and rehabilitation at sub-district level. There are a further 771 community hospitals providing secondary health service at district level.
- **Bangkok metropolitan area:** There are 68 public health centers responsible for primary care, similar to the health promoting hospitals in the provinces. There are a further 39 public hospitals and 92 private hospitals in the metropolitan area of Bangkok.

Immunization is integrated in the primary care units of all public health facilities in Thailand. Private hospitals and clinics also play an important

role in providing vaccination service in Thailand. Unofficial data from the vaccination coverage survey conducted in Thailand in 2018 revealed that the private sector was responsible for 30% of all immunizations provided to children in Bangkok. However, the figure for private sector involvement in other provinces is lower at around 10-15%.

The NIP was introduced in Thailand in 1977, and since 2005 it has consistently achieved immunization coverage of around 96–99% among Thai children. Schools provide routine immunization for HPV for girls in Grade 5 (11 years of age), and Td for both boys and girls in Grade 6 (12 years of age). Vaccination rates among children along the Thailand-Myanmar border are notably lower. Thailand has a comprehensive multi-year plan for immunization for the period 2017-2021 and an annual work plan for immunization activities each year.

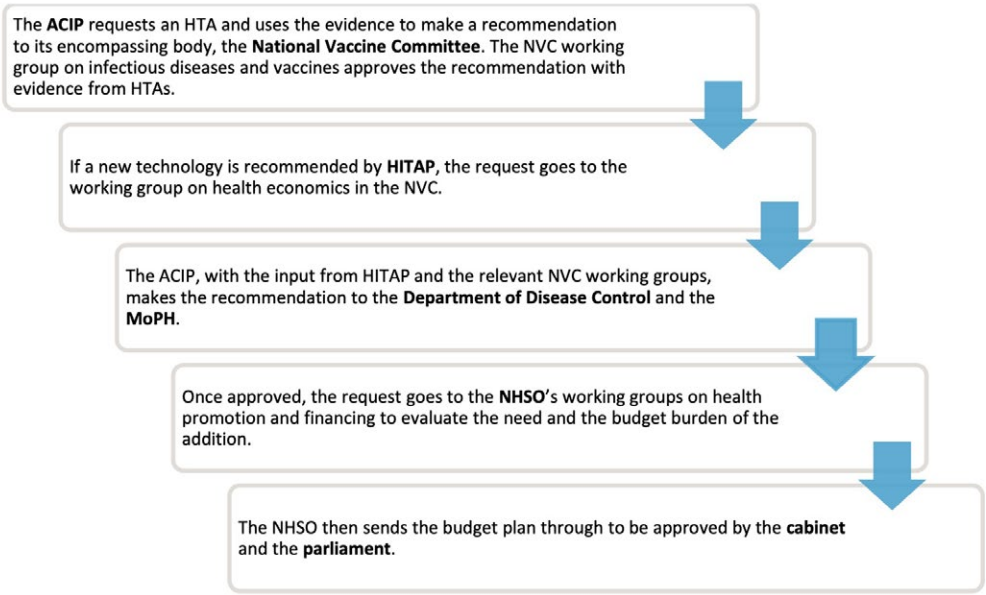
Adult immunization in Thailand

The WHO Joint Reporting Form indicates only three recommended adult vaccines [108]: seasonal influenza for pregnant women and adults 65 and older, meningococcal vaccine up to age 55, and tetanus-diphtheria boosters.

Immunization is a centralized program and provided free of charge for the entire population through the UHC program. Introducing new materials or procedures into the UHC benefits package is a very evidence-based process in Thailand through use of their advanced health technology assessment institution, HITAP. The process is depicted in Figure 3 (right). HITAP is a parastatal institution mandated since 2007 to perform needed HTAs for Thailand. These assessments develop the necessary evidence to provide introduction recommendations and aid in deciding which products and technologies should be purchased and included in the UCS benefits package. It is an influential HTA institution globally and many developing countries, especially in the region, which do not have similar capacity, look to HITAP for technical assistance in their own decisions. The Philippines does not have its own HTA institution but partnered with HITAP to assess the cost-effectiveness of the pneumococcal conjugate vaccine. In Thailand, HITAP's findings are highly regarded [109].

The Royal College of Physicians of Thailand [110] recommended immunization schedule for adults and

Figure 3: Decision-making process for NIP introductions.



Source: Coe and Gergen. 2017. [109].

elderly includes both age-based and risk-based recommendations, a broader list than what is currently covered by the national immunization program:

Vaccines for all adults and elderly if no contraindications

- Influenza vaccine – especially for adults over 65 years old.
- Pneumococcal vaccine – for all adults over 65 years.
- Hepatitis B vaccine – for patients who need hemodialysis or frequently receive blood products. It is also recommended for patients with heart disease, chronic obstructive pulmonary disease, cirrhosis, chronic kidney disease, diabetes, and immunocompromised patients.
- Diphtheria, tetanus, and pertussis

vaccines – every 10 years.

- Human papillomavirus (HPV) – protects against the human papillomaviruses that cause cervical cancer. It is recommended for females aged between 9-26.

Vaccines for patients who are at risk or have chronic health conditions

- Influenza vaccine – people aged 19-62 with chronic health conditions such as heart disease, asthma, chronic obstructive pulmonary disease, people who have to be admitted at least 1 time per year from chronic diseases such as diabetes, kidney disease, hematologic condition, and immunocompromised patients.
- Pneumococcal vaccine – people aged between 19-64 years with heart disease, asthma, chronic obstructive pulmonary disease, cirrhosis, chronic kidney disease, diabetes, cigarette smoking and alcoholism.
- Varicella (chickenpox) vaccine – If you have not had chickenpox (varicella), if you have not had varicella vaccine, or if you do not have an up-to-date blood test that shows you are immune to varicella, you should get vaccinated especially for teachers, childcare workers, and non-pregnant women of child-bearing age.
- Shingles vaccine – recommended for adults 60 years and older. It protects against shingles and the complications from the disease.
- Human papillomavirus vaccine – prevents anal and penile cancer. The vaccine is recommended in males aged between 19-26 years, especially for men in sexual relationships with men.
- Hepatitis A vaccine – especially adolescents and young adults.
- Japanese encephalitis vaccine – recommended for people who will travel for Hajj and Umrah in Saudi Arabia and people who will travel to areas where the disease is common.

COVID-19: As a popular destination for Chinese tourists, it was in Thailand that the first COVID-19 patient outside of China was identified on 13 January 2020. Thailand's response to the COVID-19 pandemic has been guided by the "Integrated Plan for Multilateral Cooperation for Safety and Mitigation of COVID-19," which was drafted by the Ministry of Public Health for the following objectives: (1) Reducing the chances of the virus transmission into Thailand, (2) Everyone in Thailand and Thai people abroad are safe from COVID-19, (3) Mitigating the health, economic, social impacts and increasing national security [111]. According to Our World in Data [112], as of 16 January, Thailand had recorded a total of 2.31 million cases and 21,898 deaths. As of 27 December 2021, 102.68 million doses had been administered, covering 73% of the population, a remarkable achievement given the lack of experience with routine adult immunization.

Table 10: Performance of the thai adult seasonal influenza vaccination program.

Targeted Population	Percent Coverage in 2016
Healthcare workers	>60%
Pregnant women	4%
Persons with chronic disease	14%
Persons ≥65 years of age	20%

Source: Mantel et al. 2020. [114].

Influenza: Thailand has a National Strategic Plan for Influenza Preparedness. The Government of Thailand is investing in the local development of influenza vaccines to ensure availability of a vaccine in the event of a future pandemic. Free influenza vaccination is provided annually from May-September to high-risk populations in Thailand, including persons ≥65 years, persons with a self-reported chronic illness, pregnant women [year-round], persons who have obesity and children 6 months to 2 years old. The total number of people eligible for free influenza vaccination is estimated at >20 million, which is approximately 30% of Thailand's population [113].

The seasonal influenza vaccination program targets the following groups of adults with varying coverage rates [114], as shown in Table 10, above.

In 2018, a retrospective study of randomly selected medical records of patients with diabetes in Bangkok found that influenza vaccination coverage was 39.6% and pneumococcal coverage was 17.4% for this risk group [115].

Pneumococcal: The Thai Advisory Committee on Immunization Practices (ACIP) recommends routine PCV13 for adults ages 65 years and older, followed with PPV23 one year later. For people with diabetes younger than 65 years, only PPV23 is suggested to be administered and repeated every 5 years. However, we could not ascertain whether it has been incorporated into the NIP. As of 2020, it had not [116].

Td: Current guidelines recommend vaccination every 10 years. Uptake data are not available.

United Kingdom[5]

Health system overview [117]

All English residents are automatically entitled to free public health care through the National Health Service, including hospital, physician, and mental health care. The National Health Service budget is funded primarily through general taxation. A government agency, NHS England, oversees and allocates funds to 191 Clinical Commissioning Groups (CCGs), which govern and pay for care delivery at the local level. Approximately 10.5% of the population "tops up" and carries voluntary supplemental insurance to gain more rapid access to elective care.

The precise scope of services covered by the NHS is not defined in statute or by legislation, and there is no absolute right for patients to receive a particular treatment, though the statutory duty of the Secretary for Health is to ensure comprehensive coverage. In practice, the NHS provides or pays for the following:

- Preventive services, including screenings, immunizations, and vaccination programs.
- Inpatient and outpatient hospital care.
- Maternity care.
- Physician services.
- Inpatient and outpatient drugs.
- Clinically necessary dental care.
- Some eye care.
- Mental health care, including some care for those with learning disabilities.
- Palliative care.
- Some long-term care.
- Rehabilitation, including physiotherapy (such as after-stroke care).
- Home visits by community-based nurses.
- Wheelchairs, hearing aids, and other assistive devices for those assessed as needing them.

The volume and scope of these services are generally a matter for local decision-making by CCGs.

In 2018, the World Bank reported that health spending was 9.997% of GDP or $4315.428 per capita. OOP was 16.708% of overall health expenditures [118]. Spending on prevention and public health in 2014 was estimated at 0.41% of GDP [55].

Adult immunization in England

Privor-Dumm et al. characterize the UK as being disease prevention-focused [10]. Yet the UK Green Book [119] – the national immunization guide – includes just three routine adult vaccines: pneumococcal polysaccharide vaccine (PPV) at 65 years of age; inactivated influenza vaccine at 65 and older (and for pregnant women and others based on risk); and shingles vaccine at 70.

However, this modest routine program is complemented by an extensive schedule of risk-based vaccines listed below the information on routine vaccines. Data on numbers of individuals vaccinated non-routinely is not available.

COVID-19: All adults in the UK are now eligible for first, second and booster doses. Fourth doses as a booster have been recommended for severely immunosuppressed individuals, a minimum of three months after their third dose. In England, Northern Ireland, and Scotland, all adults over 18 can book their booster dose. In Wales, invitations to book booster doses will be sent out from the local health boards. The gap between the second dose and booster dose has been reduced to a minimum of three months from six months [120]. According to Our World in Data, 15.18 million confirmed cases had been recorded as of 15 January 2022, and 152.021 deaths. As of the same date, 136.39 million doses had been administered, accounting for 76.4% of the population; 47.91 million are fully vaccinated [121].

Influenza: Influenza immunization has been recommended in the UK since the late 1960s, with the aim of directly protecting those in clinical risk groups who are at a higher risk of influenza associated morbidity and mortality. In 2000, the policy was extended to include all people aged 65 years or over (see later for age definition). The list

of conditions that constitute a clinical risk group where influenza vaccine is indicated are reviewed regularly by the Joint Committee on Vaccination and Immunisation (JCVI). In 2010, pregnancy was added as a clinical risk category, and in October 2014 the JCVI advised that morbid obesity (defined as BMI 40+) should be considered a risk factor for seasonal influenza vaccination.

Vaccination is currently recommended for all adults ages older than age 50 [120]; pregnant women; those in long-term residential care homes; carers; frontline health and social care workers; close contacts of immunocompromised individuals; those ages 6 months to 65 years in at risk groups, including those with these health conditions:

- Respiratory diseases, including asthma.
- Heart disease, kidney disease or liver disease.
- Neurological conditions including learning disability.
- Diabetes.
- Immunosuppression, a missing spleen, sickle cell anemia, or celiac disease.
- Being seriously overweight (BMI of 40 and above).

Coverage rates for the period 2000-2017 are shown in Table 11, on right.

Physicians have the latitude to prescribe immunization in other circumstances. The most recent influenza vaccination data (from November 2021) show a significant disparity in coverage among targeted groups: 79.7% of those 65 and older were vaccinated; only 42.4% of those under 65 in a risk group were, and 46.2 % of those 50-64 [122]. Eurostat reports that influenza vaccination coverage for those >65 was 71.97% in 2018, the most recent year available [52].

Pneumococcal [124]: PPV vaccination is recommended for adults aged 65 and over. Pneumococcal vaccines (PPV and PCV) are also recommended for people of all ages with some health conditions who are at greater risk of complications from pneumococcal disease. This includes people with:

- Immunosuppression, a missing spleen, sickle cell anemia, or celiac disease.
- Chronic liver disease, kidney disease, or heart disease.
- Chronic lung conditions.
- Neurological conditions including learning disability.

Table 11: Green book data on influenza coverage in England.

Influenza Season	% Adult Coverage (Risk Group %)	Pregnant Women Coverage (%)
2000/2001	65.4	
2001/2002	67.5	
2002/2003	68.6	
2003/2004	71.0	
2004/2005	71.5 (39.9)	
2005/2006	75.3 (48.0)	
2006/2007	73.9 (42.1)	
2007/2008	73.5 (45.3)	
2008/2009	74.1 (47.1)	
2009/2010	72.4 (51.6)	
2010/2011	72.8 (50.4)	38.0
2011/2012	74.0 (51.6)	27.4
2012/2013	73.4 (51.3)	40.3
2013/2014	73.2 (52.3)	39.8
2014/2015	72.7 (50.3)	44.1
2015/2016	71.0 (45,1)	42.3
2016/2017	70.5 (48.6)	44.9

Source: UK Green Book. [123]
Note: Uptake among pregnant women is difficult to estimate accurately because certainty about the denominator is challenging. The available data in the table likely underestimate uptake.

- Diabetes.
- Cochlear implants.
- Cerebrospinal fluid leaks.
- Complement disorders.
- People who are exposed to metal fumes (for example, welders) are at higher risk of pneumococcal disease and may also be offered PPV.

Zoster [125] vaccination is recommended and offered free of charge for all people in their 70s. Adults aged 80 or over are not offered the shingles vaccine. In December 2017, Public Health England published an evaluation of the first three years of the shingles vaccination program. By 31 August 2016, uptake of the vaccine varied between 58% for recently targeted cohorts and 72% for the first routine cohort. Across the first three years of vaccination for the three routine cohorts, incidence of herpes zoster fell by 35% and of postherpetic neuralgia fell by 50%. The equivalent reduction for the four catch-up cohorts was 33% for herpes zoster and 38% for postherpetic neuralgia. The authors conclude that the program had a population impact equivalent to about 17,000 fewer episodes of herpes zoster and 3,300 fewer episodes of postherpetic neuralgia among 5·5 million eligible individuals in the first three years [126]. Zoster vaccine coverage in 2021 varied across age groups: from a low of 47.9% in 71-year-olds to a high of 76.8% in 76-year-olds [127].

The extensive risk-based vaccination program in England

Anthrax: Workers with potential low-level risk of exposure, including farm workers, veterinary surgeons, zookeepers, abattoir workers and butchers, construction workers, microbiology laboratory workers, workers in industries handling imported animal products and those involved in storing or distributing material from any of those categories. Additionally, workers in a small number of occupations may face high-level exposure from deliberate or accidental spore release: laboratory workers in high-containment facilities, first responders, military personnel, environmental decontamination teams.

Cholera: Immunization may be considered following a risk assessment for relief or disaster aid workers, travelers.

Diphtheria: Laboratory staff, HCWs, travelers, those without confirmed prior vaccination.

Hepatitis A: Travelers, patients with severe liver disease or hemophilia, men who have sex with men (MSM), injecting drug users (IDU), laboratory workers, staff of some large residential institutions, sewage workers, people working with primates, and (under certain circumstances) some food packagers and handlers, day-care staff, HCWs.

Hepatitis B: Both pre- and post-exposure prophylaxis are recommended for MSM, IDU, people who change sexual partners frequently, close family contacts of a case or person with chronic infection, families adopting children from high/intermediate prevalence areas, foster families, individuals receiving regular blood/blood products and their carers, patients with chronic renal failure or chronic liver disease, inmates, staff and residents of facilities for those with learning difficulties, travelers, HCWs and laboratory workers, morticians and embalmers.

HPV: Males and females in cohorts eligible for vaccination in the national program remain so until their 25th birthday; older adults who have not completed their series can be offered completion doses. There is a national program targeting MSM, and transgendered people may also be offered vaccination.

Japanese encephalitis: Travelers.

MMR: MMR vaccine can be given to individuals of any age and should be offered opportunistically and promoted to unvaccinated or partially vaccinated younger adults – particularly those born before 1990. New GP registration and entry into college, university or other higher education institutions, prison or military service also provides an opportunity to check an individual's immunization history. Those who have not received MMR should be offered appropriate MMR immunization. The decision on when to vaccinate older adults needs to take into consideration the past vaccination history, the likelihood of an individual remaining susceptible and the future risk of exposure and disease. Per the Green Book, in 2016 "routine antenatal testing of women for rubella susceptibility ceased. Pregnant women should have their vaccine status checked during or after pregnancy, for example, at the post-natal check, and be offered any outstanding doses of MMR soon after delivery. MMR vaccine should not be offered in pregnancy."

Meningococcal: Children and adults with complement disorders or on Eculizumab therapy (those on humanized monoclonal antibody therapy may be at increased risk of invasive meningococcal infection). Given the increased risk, additional vaccinations against meningococcal disease are advised for individuals with asplenia or splenic dysfunction or when a complement disorder is diagnosed depending on age and vaccination history.

Pertussis: Since October 2012, vaccination has been recommended for pregnant women. "The purpose of the program is to boost antibodies in these women so that high levels of passive antibody are transferred from mother to baby. This should protect the infant against pertussis infection until they can be vaccinated at eight weeks of age. Pregnant women should be offered dTaP/IPV vaccine from week 16 of each pregnancy (for operational reasons, vaccination is probably best offered at, or after the fetal anomaly scan at around 20 weeks)."

Polio: Per the Green Book, "Individuals born before 1962 may not have been immunized or may have received a low-potency polio vaccine; no opportunity should be missed to immunize them. Td/IPV is the appropriate vaccine for such use."

Rabies: Laboratory workers routinely working with rabies virus, those routinely handling bats, veterinarians and techs, workers at Defra-authorized quarantine premises and carriers, and travelers to enzootic areas.

Smallpox and vaccinia: Workers in laboratories where pox viruses (such as monkeypox or genetically modified vaccinia) are handled, and others whose work involves an identifiable risk of exposure to pox virus (e.g., certain HCWs and first responders), should be advised of the possible risk and vaccination should be considered.

Tetanus: Travelers, emigres, and those traveling/immigrating to England from areas of conflict or where they may have been marginalized, laboratory workers, those with incomplete vaccination history.

Tick-borne encephalitis: Travelers to endemic areas; individuals who hike, camp, hunt, or do fieldwork (forestry, woodcutting, farming, military) in endemic areas, laboratory workers.

Tuberculosis: HCWs, laboratory workers, veterinary or abattoir workers at risk of exposure, travelers and emigres.

Typhoid: Laboratory personnel who may handle S. typhi in the course of their work and travelers visiting endemic areas.

Varicella: HCWs, laboratory staff.

Yellow Fever: For laboratory workers handling infected material and for travelers to countries requiring immunization or at risk of transmission.

United States

Health system overview [128]

The US health system is a mix of public and private, for-profit and nonprofit insurers and health care providers. The federal government provides funding for the national Medicare program for adults ages 65 and older, certain younger people with disabilities, and people with end-stage renal disease. It also funds programs for veterans and low-income people, including Medicaid and the Children's Health Insurance Program. States manage and pay for aspects of local coverage and the safety net.

Private insurance, the dominant form of coverage, is provided primarily by employers. The uninsured rate, 8.6% of the population in 2020, is down from 16% in 2010, the year that the landmark Affordable Care Act (ACA) became law. Public and private insurers set their own benefit packages and cost-sharing structures within federal and state regulations.

National health expenditures (projected) 2021: $4.217 trillion.

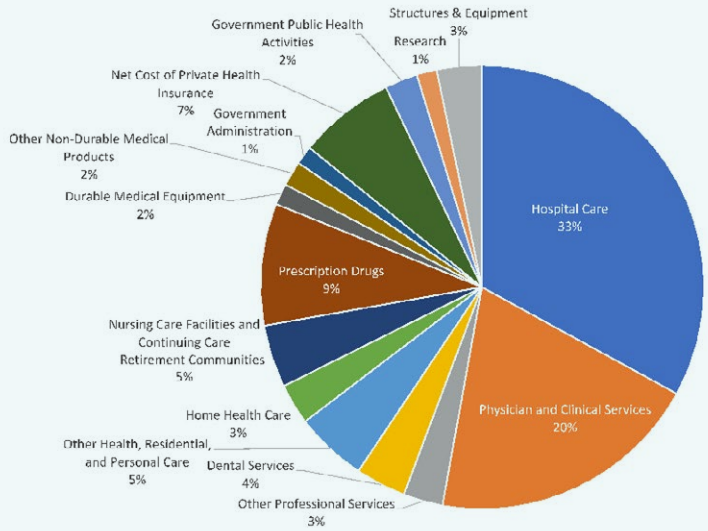


Figure 4: United States estimated health expenditures in 2021.

Source: CMS [130].

The World Bank reports that government health expenditures were 16.885% of GDP in 2018, or $10623.85 per capita. OOP accounted for 10.809% of expenditures [129]. The Centers for Medicare and Medicaid Services (CMS) estimates 2021 health expenditures

[130] at $4.217 trillion, 18.2% of GDP, with government public health representing 2% of the total, as shown in Figure 4, (page 33). Spending was nearly evenly split between public and private sources of payment: private spending accounted for 51% and public expenditures for 49%.

The ACA requires individual marketplace and small-group market plans (for firms with 50 or fewer employees) to cover 10 categories of "essential health benefits":

- Ambulatory patient services (doctor visits).
- Emergency services.
- Hospitalization.
- Maternity and newborn care.
- Mental health services and substance use disorder treatment.
- Prescription drugs.
- Rehabilitative services and devices.
- Laboratory services.
- Preventive and wellness services and chronic disease management.
- Pediatric services, including dental and vision care.

Most people assume – wrongly – that the ACA requires adult vaccinations to be covered with no cost sharing to the beneficiary. That's partially true. The Act requires new private health insurance plans to cover many recommended preventive services without any patient cost-sharing. For adults, required immunizations are those recommended by the Advisory Committee on Immunization Practices (ACIP) [131]. As new recommendations are issued or updated, coverage must commence in the next plan year that begins on or after exactly one year from the recommendation's issue date. Some private insurance plans are exempt (so-called "grandfathered" plans) if they were purchased on or before March 23, 2010, when the ACA was signed into law [132]. Non-grandfathered plans are required to cover the following ACIP-recommended immunizations as shown in Table 12, right, effective September 23, 2010.

The different parts of Medicare help cover specific services:

Medicare part A - Hospital insurance
Part A covers inpatient hospital stays, care in a skilled nursing facility, hospice care, and some home health care.

Medicare part B - Medical insurance
Part B covers certain doctors' services, outpatient care, medical supplies, and preventive services.

Table 12: Private health insurance coverage for immunizations.
Source: CDC [131].

Vaccination	Population
Haemophilus Influenzae Type b	Adults with risk factors
Hepatitis A	Adults with risk factors
Hepatitis B	Adults with risk factors
Human Papillomavirus (HPV)	Adults 18 – 26 who did not finish initial vaccination series or have not been previously vaccinated
Influenza	All adults
Measles, Mumps, Rubella	Adults 18-58
Meningococcal	Adults with risk factors
Pneumococcal vaccines	Adults with risk factors; all adults ages 65 and older
Td booster, Tdap	All adults
Varicella	All adults
Zoster	Adults age 50 and older

Medicare part D - Prescription drug coverage
Helps cover the cost of prescription drugs (including many recommended vaccines) [133].

People in Medicare receive some immunization coverage. Medicare Part B pays for influenza, pneumococcal, Hepatitis B, and any vaccines directly related to the treatment of an injury or direct exposure to a disease or condition, such as rabies and tetanus. Medicare Part D plans, which are administered by private insurers, may or may not cover zoster, MMR, and Tdap.

Medicaid provides health coverage to more than 76 million people, including eligible low-income adults, children, pregnant women, elderly adults, and people with disabilities. Medicaid is administered by states, according to federal requirements. The program is funded jointly by states and the federal government [134]. Immunization

coverage in Medicaid is variable by state [135]. Most state Medicaid agencies cover at least some adult immunizations but may not offer coverage of all ACIP-recommended vaccines [136].

Adult immunization in the US

Privor-Dumm et al. describe the US as being disease prevention-focused [10]. A total of 14 antigens are targeted for adults ages 19 and older, in a combination of risk- and age-based recommendation. (See Table 14, page 36 for risk-based recommendations.) But with such a confusing patchwork of coverage, it is no wonder that adult vaccination rates remain low in the United States and far below national targets, leaving millions of adults susceptible to vaccine preventable diseases and their potentially severe consequences. Additionally, with the aging of the US population, the public health impact of vaccine-preventable diseases and their complications in adults is likely to grow [137].

The most recent available data from the 2018 National Health Interview Survey show that most adults in the United States are missing one or more routinely recommended vaccines. At least 3 out of every 4 adults are missing one or more of four routinely recommended vaccines: influenza, pneumococcal, zoster, and tetanus toxoid-diphtheria (Td) or tetanus toxoid-diphtheria-pertussis (Tdap). Many adults are missing other vaccines recommended for them based on their age, medical conditions, occupation, or other factors.

In addition, many adults are also missing vaccines recommended ideally during childhood or adolescence; for example, nearly half of females and three-fourths of males ages 19-26 years are missing HPV vaccination. Racial and ethnic disparities in adult vaccination coverage are also prevalent and have widened for some vaccines in recent years.

The Vaccines National Strategic Plan: 2021-2025 notes that adult vaccination rates remain low overall and continue to lag well behind those for children [138]. For instance, during the 2019–2020 season, influenza vaccination coverage among adults was only 48%. The annual burden of VPDs is particularly high among adults, with approximately 1 million cases of herpes zoster each year, more than 3,000 cases of acute hepatitis B infections, and about 40,000

Table 13: 5 goals of the US vaccines national strategic plan: 2021-2025.
Source: CDC [139].

Goal	Subgoals
Goal 1: Foster innovation in vaccine development and related technologies	1.1 Support the development of innovative, safe, and effective vaccines to prevent infectious diseases of public health significance 1.2 Support the development and uptake of technologies to improve vaccine manufacturing, storage, distribution, and delivery mechanisms
Goal 2: Maintain the highest levels of vaccine safety	2.1 Minimize preventable vaccine-related adverse events 2.2 Improve the timely detection and assessment of vaccine safety signals to inform public health policy and clinical practice 2.3 Increase awareness, understanding, and usability of the vaccine safety system for providers, policymakers, and the public
Goal 3: Increase knowledge of and confidence in routinely recommended vaccines	3.1 Counter vaccine mis- and disinformation and increase public support for the individual and societal benefits of vaccination 3.2 Increase provider capacity to promote knowledge of the benefits of immunization and increased vaccine acceptance by the public 3.3 Ensure key decision- and policymakers receive accurate and timely information on vaccines and strategies to promote vaccine uptake 3.4 Reduce disparities and inequities in vaccine confidence and acceptance
Goal 4: Increase access to and use of all routinely recommended vaccines	4.1 Increase the availability of vaccines in a variety of settings 4.2 Reduce disparities and inequities in access to and use of routinely recommended vaccines across the lifespan 4.3 Strengthen data infrastructure, including Immunization Information Systems, to track vaccine coverage and conduct surveillance of vaccine-preventable diseases 4.4 Reduce financial and systems barriers for health care providers to facilitate delivery of routinely recommended vaccines 4.5 Reduce financial and systems barriers for the public to facilitate access to routinely recommended vaccines 4.6 Promote public-private partnerships to increase the capacity of the health system to deliver vaccines for routine use during outbreaks
Goal 5: Protect the health of the nation by supporting global immunization efforts	5.1 Support vaccine research and development to address vaccine-preventable diseases of global public health importance 5.2 Support global partners in efforts to combat vaccine misinformation, disinformation, and hesitancy worldwide 5.3 Support global partners to strengthen immunization systems 5.4 Increase coordination of global immunization efforts across federal agencies and with global partners

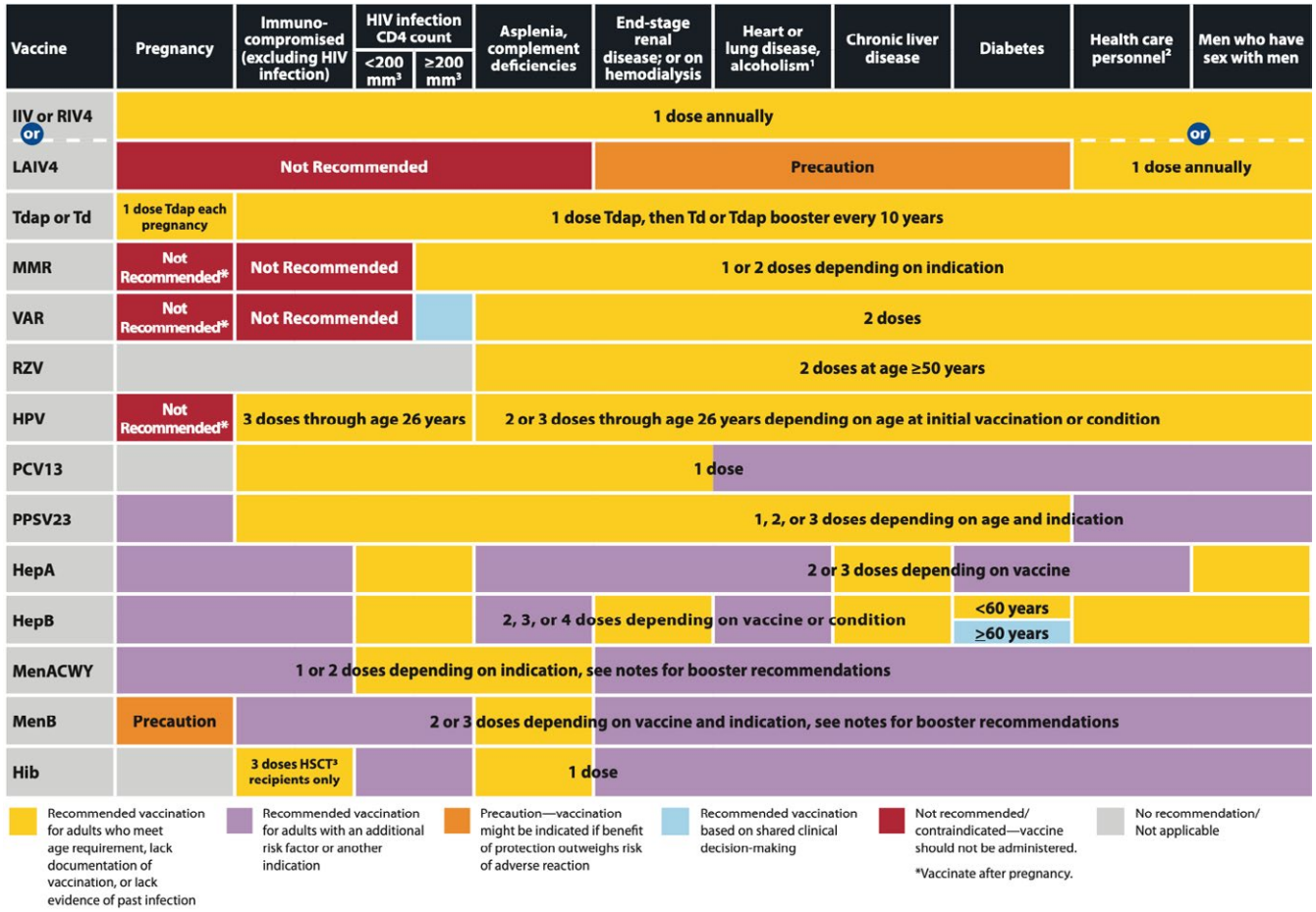
cases and 4,000 deaths from invasive pneumococcal disease. Large and prolonged outbreaks of hepatitis A occurred in multiple states in 2016–2018 among people experiencing homelessness. Only about one-third of pregnant women received both influenza and pertussis vaccines in 2018 [138]. The plan lays out five high-level goals to eliminate VPDs, as shown in Table 13 shown on previous page.

COVID-19: As of 16 January 2022, the US has 65.7 million cumulative cases and 850,608 deaths. Nearly 527 million doses have been administered, amounting to 75% of the population with at least one, and 207.37 million fully vaccinated [140]. All adults are eligible for boosters, as well as those 12 years and older (Pfizer) and those 18 and older (Moderna and Johnson & Johnson) [141].

Seasonal Influenza: Recommended for all adults over age 19. During the 2019-2020 influenza season, vaccination coverage with ≥1 dose of influenza vaccine among adults ≥18 years was 48.4%, an increase of 3.1 percentage points from the prior season. Adults 65 and older had the highest coverage rate: 69.8% [142].

Table 14: Recommended adult immunization schedule by medical conditions and other indications, US, 2021.

Source: Source: CDC [131]. Note: Extensive notes are available through the link providing comprehensive information on risk-based target populations.



Country actions during the covid-19 pandemic

The work group identified several countries as having taken important actions on adult immunization during the course of the COVID-19 pandemic: Argentina, Belgium, Indonesia, Italy, and the Philippines.

These countries differ widely on multiple parameters, as shown in Table 15 right.

Coverage rates for COVID-19 vaccines are related to population size, economic development, and health expenditure as a percentage of GDP: As would be expected, LMICs trail in achieving broad coverage and are nowhere near the 70% proportion most public health experts see as the threshold for herd immunity.

COVID-19 vaccination levels may also be correlated with seasonal influenza vaccination coverage – though this hypothesis should be tested with a broader dataset.

What is clear, however, is that COVID-19 vaccination coverage is not reliably associated with the number of recommended vaccines. Both the Argentina and Philippines adult calendars include 3 recommended vaccines (including COVID-19), but Argentina has achieved >74% population coverage, while The Philippines is just above 51%.

Table 15: Country variables in the response to COVID-19.

	Argentina	Belgium	Indonesia	Italy	Philippines
Population (millions)	45.9	11.8	275.1	62.4	110.8
Economic Classification	UMIC	HIC	LMIC	HIC	LMIC
Health Expenditure (% GDP) 2018	9.62	10.32	2.87	8.67	4.40
# of Rec. Adult Vaccines (incl. C19)	3	10	1	10	3
Seasonal Influenza Coverage % of ≥65YO	55.3	59.1	N/A	54.6	N/A
COVID-19 % fully vx'd (as of 22 Jan 2022)	74.3	76.0	43.8	75.5	51.2

Sources: Population data: The CIA World Factbook [143]. Economic classification: The World Bank [144]. Health expenditure: The World Bank [145]. Adult vaccines: Argentina, Indonesia, Philippines [146]. Belgium, Italy [147]. Seasonal influenza coverage: Argentina [148]. Belgium [88]. Indonesia: Not available Italy [88]. Philippines: Not available COVID-19 vaccination coverage: Our World in Data [149].

Argentina

Health system overview [150]

Healthcare is decentralized to the provinces, which have autonomy. In 2016, the government of Argentina introduced a Universal Health Plan.

Argentina consists of 23 provinces and a federal district (the Autonomous City of Buenos Aires). Its use of a federal system of government results in a largely decentralized public health system in which ministries of health at the provincial level are responsible for providing basic public health services in their provinces. The Argentinian health system consists of three sectors: public, social security, and private. The public health system is financed by taxation and provides the majority of health services free of charge to users. The social security sector (Obras Sociales) is a form of health insurance for those working in the formal sector that is financed by employer or employee contributions. It is managed largely by trade unions, which commission private health service providers to provide care for the people who are covered.

Health expenditure

Argentina expends 9.12% of annual GDP on health services, an increase over expenditure in 2016 of 7.54% of GDP, and higher than the average in Latin America. Argentina implemented a Universal Health Plan in 2016 since which time expenditure has risen. Because of decentralization, there are inequities in distribution of funds for the healthcare system. Privor-Dumm et al. describe Argentina as a health security-focused country [10].

Argentina's response to COVID-19

The onset of the SARS-CoV-2 pandemic coincided with the arrival of a new government led by Alberto Fernández. One of the first steps taken by the new administration was to restore the Ministry

of Science and Technology, which had been relegated by the previous government to a smaller section under the control of the Ministry of Education. The recreation of the Ministry of Science and Technology was accompanied by a commitment to substantially increase funding to support science and technology. The new Ministry of Science and Technology created a Coronavirus Unit and called on the National Scientific and Technical Research Council (CONICET) and the National Agency for Promotion of Science and Technology to work together to concentrate the efforts of the entire scientific community on the challenges posed by COVID-19. Several CONICET institutes dedicated to fundamental research rapidly reorganized their facilities, structure and operations to work collaboratively toward improving our diagnosis and understanding of SARS-CoV-2 infection within Argentina. The Coronavirus Unit has provided support for more than 100 basic and translational research initiatives. These projects are directed at critical goals, including the creation of new diagnostic kits, therapeutic approaches and epidemiological platforms. Given the ongoing difficulties in acquiring diagnostic reagents in the international market, several research groups undertook the important task of manufacturing reagents and generating kits within Argentina, among other research projects [151].

But Argentina's response to COVID-19 has been marred by a violent police response towards people accused of breaking the rules. On 20 March 2020, the government imposed a nationwide lockdown requiring people to quarantine at home, closing down businesses and schools, and restricting travel and movement. Security officers were given enforcement authority, meaning that the police could stop and question virtually anyone on the streets. Media outlets and local human rights groups have reported dozens of alleged human rights violations by the national and provincial security forces tasked with enforcing these measures [152]. Throughout 2020, the government vacillated on lockdowns and easing restrictions.

The pandemic and the containment measures had a significant economic impact, with a GDP contraction of around 10% of GDP in 2020 [153]. The government also took a number of tax, employment, and fiscal measures aimed at guaranteeing access to food, sustaining the income of the most vulnerable sectors, facilitating access to credit for companies and small businesses, and granting aid so companies affected by the quarantine can pay their workers' salaries (estimated cost is 5% of GDP). This includes a special bonus for people who receive the lowest pensions, as well as for poor families with children. Also, increased assistance to food banks including at schools, and more resources for social programs reaching over 9 million people. Price ceilings were established for essential products including food and sanitary products. Layoffs were prohibited until 30 November 2020. Monetary policy has been expansionary to lower interest rates in a context of high inflation [154].

On 21 September 2021, the PAHO announced the selection of two centers in Argentina and Brazil as regional hubs for the development and production of mRNA-based vaccines in Latin America in a bid to tackle COVID-19 and future infectious-disease challenges. Sinergium Biotech, a private sector biopharmaceutical company, was selected as the center in Argentina. Sinergium will partner with pharmaceutical mAbxience, which belongs to the same group, to develop and manufacture active vaccine ingredients. The two companies are reported to have extensive experience in the production and development of vaccines and biotechnological medicines [33].

According to Our World in Data, as of 22 January 2022, Argentina had recorded 7.79 million cumulative cases of COVID-19, and nearly 119.000 deaths. More than 84.6 million doses had been administered; 86.1% of the population had received at least one dose, and 75.1% were fully vaccinated. Figures 5 and 6 on the following pages overview the COVID-19 situation over time.

Figure 5: COVID-19 cases, tests, positive rate, and R0, Argentina.

Source: Our World in Data [155].

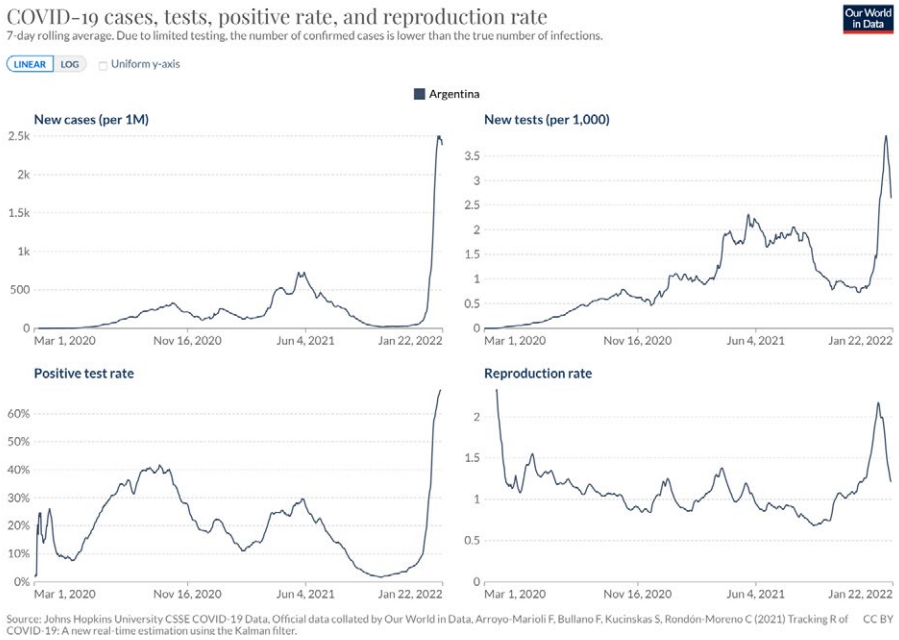
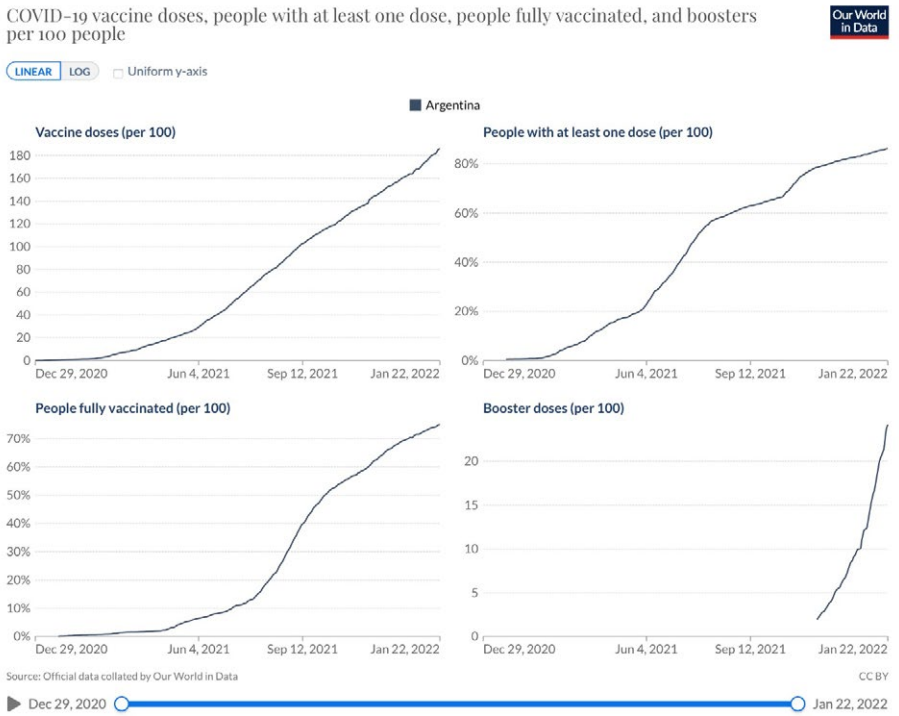


Figure 6: COVID-19 vaccination in Argentina.

Source: Our World in Data [156].



IFPMA

Belgium

Health system overview [157]

The Belgian health system covers almost the entire population for a large range of services. The main source of financing is social contributions. The provision of care is from independent medical practice, with free choice of physician and care facility, and predominantly fee-for-service payment. Health insurance is compulsory, from the National Institute for Health and Disability Insurance (NIHDI). The Ministry of Health (MoH, Federal Public Service Health, Food Chain Safety and Environment – Health Directorate) is responsible for the general organization and planning of the health system. The health insurance budget and health policy are negotiated between government, patients, employers, salaried employees and self-employed workers. A real growth cap on expenditure was established in 1995 to set the budget of the compulsory health insurance.

Health promotion and disease prevention fall under the responsibility of federated entities but inter-ministerial conferences between Federal State and federated entities on public health also play an important role. They also manage the funds for the prevention of substance abuse, vaccination, screening campaigns, nutrition plans, initiatives regarding oral health in schools and tobacco cessation programs but a number of decisions directly related to public health are taken by the Federal Government.

Pharmaceuticals, including over-the-counter medicines, are exclusively distributed through community and hospital pharmacies.

Health expenditure

In 2017, health expenditure was 10.3% of GDP and health expenditure was US$ 5,119.10 PPP. Seventy-seven percent is funded by the public sector. Voluntary health insurance represents 5.12% of health expenditure. Patients' OOP payments were 17.63% in 2017. Official co-payments represented about 22% of patients' OOP payments in 2017.

Adult immunization in Belgium [158]

Privor-Dumm et al. describe Belgium's approach to vaccination as having an evolving adult focus [10]. Although a number of vaccines are recommended for adults, as shown in Table 16 (above),

Table 16: Adult immunization schedule, Belgium.

Source: ECDC [158].

- General recommendation
- Recommendation for specific groups only
- Catch-up (e.g. if previous doses missed)
- Vaccination not funded by the National Health system
- Mandatory vaccination

	Years			
	18	19	64	≥ 65
Coronavirus disease (COVID-19)[1]	COVID-19[5]			
diphtheria	d[6]			
tetanus	TT[6]			
pertussis	acp[6]			
poliomyelitis[2]	IPV[7]			
hepatitis B	HepB[8]			
pneumococcal disease[3]		PCV13+PPSV23[9]	PCV13+PPSV23[10]	
varicella	VAR[11]			
influenza[4]	IIV4[12]		IIV4[13]	
hepatitis A	HepA[14]			

not all are reimbursed by the National Health System in Belgium. Influenza vaccination coverage in eligible persons is 59.1% [159].

Belgium's response to COVID-19

Belgium registered the first confirmed COVID-19 case on 4 February 2020. The government implemented a range of measures to contain the pandemic, including closures of schools and non-essential businesses, limiting movement to essential needs, as well as banning all gatherings and non-essential travel abroad.

The economy contracted by 6.4% in 2020 as private consumption and investment slumped. A strong rebound in Q3 was brought to a halt by a renewed lockdown to stem a second wave of infections in Q4. Activity picked up again in 2021 Q1, with growth primarily driven by robust business and residential investment as well as a positive contribution from net exports.

Over the course of 2021, the government attempted to ease restrictions in phases, conditional on health outcomes and had to reimpose stricter measures several times as the virus rebounded. The government also instituted a series of fiscal measures to bolster the economy [153].

Table 17: COVID-19 vaccination scheme, Belgium.

Source: Belgian government website [160].

Month	Who
January	Residents and personnel in residential care centers, healthcare staff (doctors, nurses, etc.) in hospitals
February	Personnel from first line care (GPs, pharmacists, etc.), collective care institutions (disability care, etc.), and other hospital staff
March	Everyone aged 65 and above
April	People with a higher risk due to specific healthcare issues (see further)
June	Everyone from the age of 12

In order to ensure that the roll-out of the vaccination program ran smoothly, a taskforce for Operationalization of the COVID-19 Vaccination Strategy was set up under the auspices of the Government Commissariat for Corona.

The taskforce is responsible for the development of the vaccination strategy. It consists of scientists, representatives of federal and state government services, crisis managers, and, where necessary, representatives of professional organizations and technical working groups. In addition, a core team of about 10 people is involved in day-to-day operations.

The four federal states are responsible for the practical organization of the vaccination. This is done in close consultation with the taskforce [160]. Belgium instituted a phased vaccination plan starting in January 2021, as shown in Table 17, above.

Those eligible for vaccination received an invitation by post, text message, and/or email. Non-residents are eligible for vaccination if they stay in the country more than 9 months. They were required to register online or by phone.

Regions implemented their own plans for implementation. Vaccine choice was disallowed. Although vaccination uptake rose steadily through 2021, reaching more than 70% of the population fully vaccinated as of 2021, surging cases prompted the federal government to impose a vaccination mandate for HCWs starting 1 January 2022. Workers have a three-month window to be vaccinated.

During that period, those who remain unvaccinated will be notified of a suspension of their contract unless they can provide a certificate of recovery from COVID-19 or negative tests on a regular basis and will be temporarily unemployed.

From April, workers without a proper justification for their refusal can be dismissed. According to estimates, some 60,000 health workers across the country of 11.5 million people are not vaccinated against COVID-19 [161]. Rallies against mandates have followed.

Figure 7: COVID-19 cases, tests, positive rate, and R0, Belgium.

Source: Our World in Data [162].

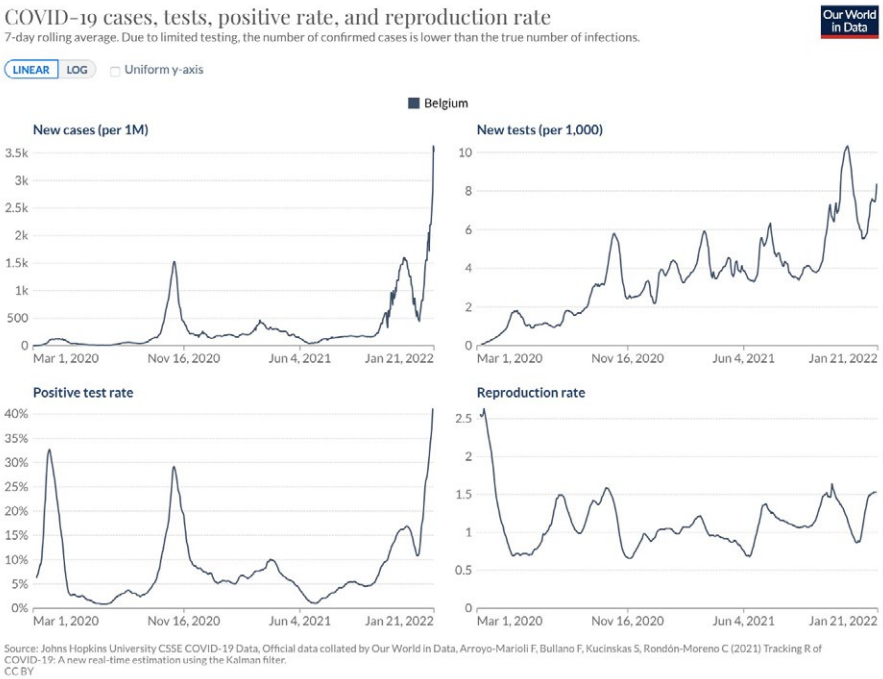
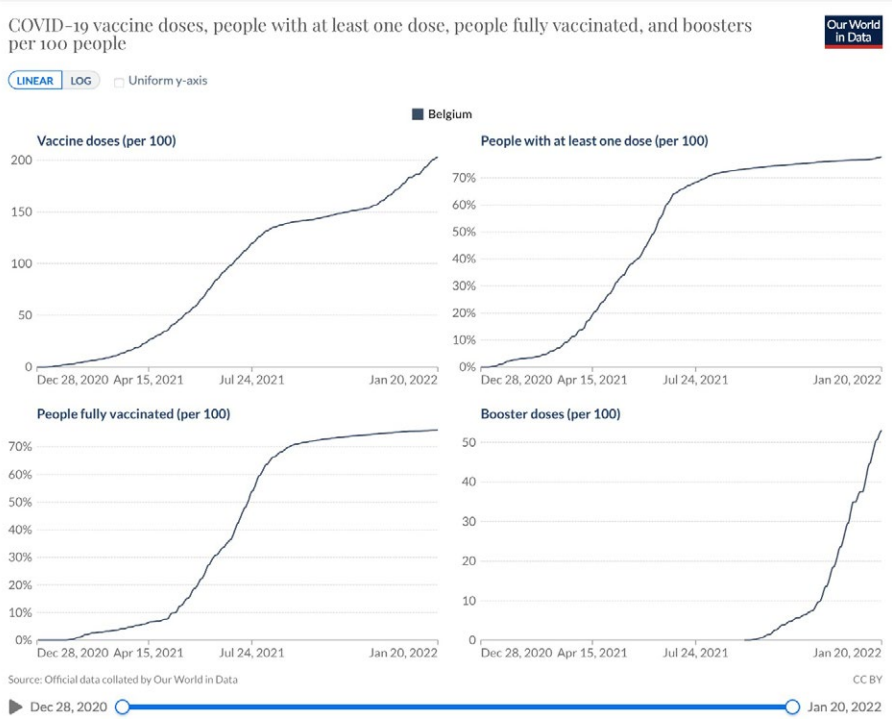


Figure 8: COVID-19 vaccination in Belgium.

Source: Our World in Data [163].



Indonesia

Health system overview [164]

Health indicators in Indonesia have improved significantly over the last 30 years, but risk factors for NCDs have also increased and progress on maternal mortality and communicable diseases has been slow and incidences of tuberculosis (TB) and malaria continue to be high.

The health system is made up of a mixture of public and private providers and financing. The public system is administered with central, provincial and district government responsibilities. Responsibilities for the central government include some tertiary and specialist hospitals, health strategy, standards and regulation, and financial and human resources.

Provincial governments are responsible for provincial-level hospitals, technical oversight and monitoring of districts, and coordination across districts within the province. District/municipal governments manage district/city hospitals and public health community health centers (puskesmas). Private providers include not-for-profit and charitable hospitals and clinics, for-profit providers, and dual practice HCWs.There is an active surveillance and outbreak response system and regular national surveys to measure and monitor key aspects of population health.

Health expenditure

Nominal health spending steadily increased by 222% overall over 8 years, but health spending as a proportion of GDP remained relatively stable. As of 2016, at 3.3% of GDP, Indonesia's total health expenditure (THE) was among the lowest in the world (the average for lower middle-income countries is 6.1 % of GDP [165]. In 2016, government budgetary spending accounted for 44.7% of THE and OOP for 37.3 %. Other private sources accounted for 17.5% of spending.

Public expenditure on health, 1.4% of GDP, and 7.8% of total government expenditure in 2016 is only about half of spending in countries of similar income level (about 2.7% of GDP). This amounts to just US$49 per capita, well below regional and lower middle-income averages, and the recommended US$110 per capita needed to deliver an essential UHC package.

On average, subnational governments have met the legal requirement to allocate a minimum of 10% of their budgets for health, but only 33% of districts are able to meet the minimum threshold. Furthermore, this benchmark does not guarantee adequate financing, because in some districts, salaries are included in the mandated targets.

More than two-thirds of total public expenditures on health occurs at the subnational level with the remainder from the central government. The bulk of district revenue comes from central budgets, but allocation of these transfers is unconditional, and spending is at the discretion of district governments. Dana Alokasi Khusus (DAK) - a special allocation fund — is the largest source of supply-side financing earmarked for health.

Given the high rate of OOP expenditure, the government has introduced various social insurance programs, such as the Social Safety Net for Healthcare, Askeskin, Jamkesmas, and the most recent national health insurance scheme, the Jaminan Kesehatan Nasional (JKN). The JKN pools contributions from members and the government under a single health insurance implementing agency (BPJS Kesehatan). The aim was to reach universal coverage by 2019, with a comprehensive benefit package and minimal user fees or co-payments. The introduction of the JKN has significantly influenced management and delivery of health services, but OOP expenditure continues to be above average. 484 essential drugs are made available by the MoH. The central government also monitors pharmaceutical production capacity in the country and regulates drug prices and sets price ceilings.

Health spending on public health and prevention is relatively low compared to restorative services. Access to hospital beds and puskesmas (public health centers) remain below WHO standards and lag behind other Asia-Pacific countries. Salaries for public staff are covered through government budgets.

Indonesia has wide use of mobile technology and is the eighth-largest Internet user globally. But the adoption and use of information technology in the health system, including electronic medical records, is still limited and not well coordinated.

Adult immunization in Indonesia

The MoH funds drugs, vaccines, and basic services for puskesmas, which deliver the basic immunization program, but immunization can also be accessed through private providers. The national immunization program is limited to basic immunization for children: hepatitis B, BCG, polio, diphtheria, pertussis, tetanus, measles, Hib, PCV and uses the pentavalent vaccine distributed by Bio Farma, the national vaccine supplier. The central government is also responsible for providing technical assistance, developing guidelines, monitoring and evaluation, and maintaining quality and training. The immunization program still faces significant challenges related to decentralization and availability of funding, including geographical disparity, limited outreach activities, cold chain issues, and vaccine hesitancy. The government planned to improve the quality of the basic immunization program by adding five more new vaccines in 2019 while improving the availability of vaccines in the district pharmaceutical unit from 77% in 2015 to 95% in 2019. Recommendations for adult immunization are limited to Td in women of childbearing age [166].

Indonesia's response to COVID-19

The Indonesian Government has successfully coordinated health resources across the country and has allocated US$14.9 billion to its health sector response as of September 2021. Indonesia was one of the first countries in the world to announce free COVID-19 vaccinations for its adult population.

As of September 2021, the COVID-19 vaccination program expanded to include 12-17-year-olds and was administering over 1.2 million doses a day. The government is pushing for full country-wide vaccination in the first quarter of 2022 – remarkable considering the lack of adult immunization experience and infrastructure, reflected in discrepancies in vaccine availability and coverage across the country [167].

Populations in Jakarta and Bali are almost fully vaccinated, while areas such as Aceh and West Papua have managed to vaccinate only about 20% of residents [168].

The World Bank cites two success factors:

- Timely and decisive action – "Indonesia recognized the importance of timely vaccination to mitigate the impact of the pandemic and worked rapidly to procure sufficient vaccines for its population as soon as they became available. While the global vaccine shortage has become a major issue for other countries, Indonesia has been able to secure steady supplies and significantly increase its vaccination program."
- Adaptive, adequate, and flexible financing – "The government has made significant commitments to the health sector, for economic recovery, and towards the social impact mitigation, amounting to over US$50 billion so far. This commitment has been secured from the government budget through reprioritization and also by mobilizing external resources [169]."

The World Bank was the first institution to offer emergency financing for Indonesia's COVID-19 response in early March 2020. At the government's request, the financing was channeled through an innovative Program for Results operation, possibly the first time this has been used in an emergency setting anywhere in the world.

This financing model has offered greater flexibility in how results are reached, while ensuring spending is appropriately prioritized and accountable. The World Bank will continue providing technical support to Indonesian health officials as they address these challenges. Partnerships with the Asian Infrastructure Investment Bank, KfW, the Government of Australia, and the Gates Foundation have been crucial to success, as has the willingness of other bilateral partners and UN agencies to work in close coordination.

As of 10 January 2022, with nearly 43% fully vaccinated, the government started its booster campaign, with shots free to elders and those unable to pay (criteria not defined). All others will have to pay OOP. The program was planned to start once vaccine coverage had reached 70%. Figures 9 and 10, on the following pages, give an overview of the situation over time.

Figure 9: COVID-19 cases, tests, positive rate, and R0, Indonesia.

Source: Our World in Data [170].

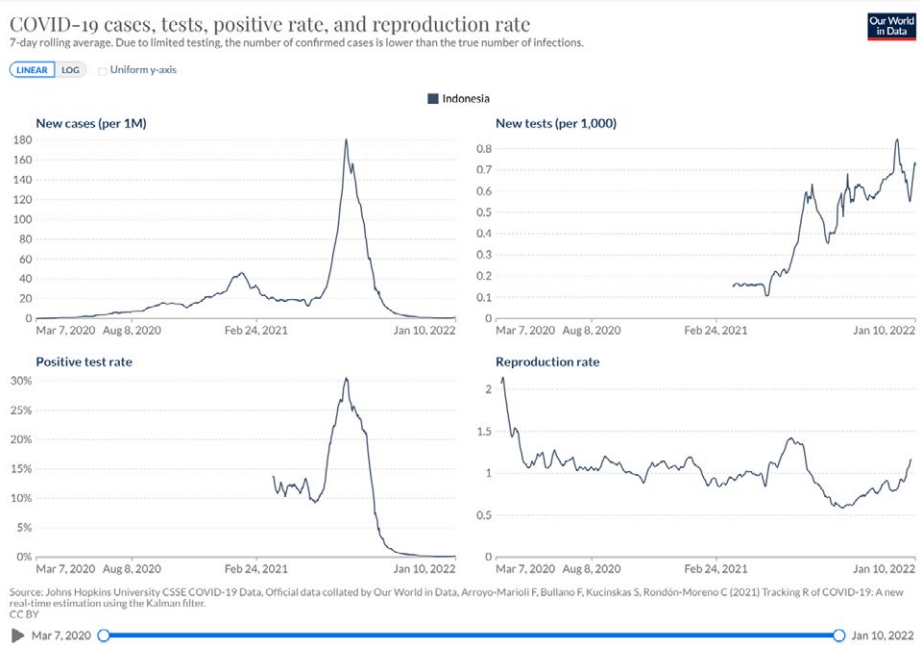
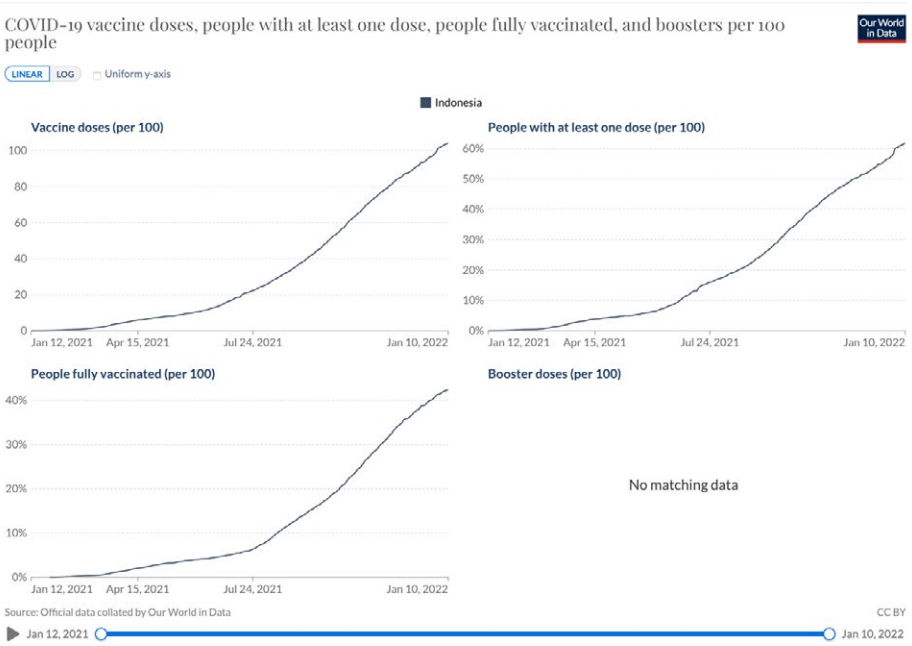


Figure 10: COVID-19 vaccination in Indonesia.

Source: Our World in Data [171].



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Italy response to COVID-19

Note: An overview of Italy's health system and adult immunization is on pages 61-63.

On 31 January 2020, the Italian cabinet declared a 6-month national emergency after the detection of the first two COVID-19 cases in Rome in two Chinese tourists traveling from Wuhan. Italy was the first European country to be heavily swept by the COVID-19 pandemic and was the first to introduce stringent lockdowns in a series of measures culminating in a national lockdown on 22 March 2020 that essentially prohibited all movements of people across the country, as well as the closure of all non-essential business activities. Two months after the beginning of the first wave, the estimated excess deaths in Lombardy, the hardest hit region in the country, reached a peak of more than 23,000 deaths, equivalent to an excess mortality of +118% compared to the average mortality rate of the period 1 January–30 April 2015–2019 [172].

Privor-Dumm describes Italy as being health security-focused [10]. But the country's initial response to COVID-19 was "confused, dilatory and inadequate [173]," despite having a national plan (dating from 2006) to respond to an influenza pandemic.

- Initial state-of-emergency declarations were met by skepticism by both the public and many in policy circles (as was true in many countries).
- The national government issued a series of incremental decrees ("mini-lockdowns") that were insufficient to stem the exponential spread of the virus and may have contributed to the spread when people fled an area locked down to other parts of the country. The head of the Italian Protezione Civile said, "The virus is faster than our bureaucracy."
- Italy's decentralized regional governments responded differently to the pandemic, and some of those policy approaches – e.g., rigorous and extensive testing and tracing in Veneto, but not in Lombardy – drove better outcomes.
- This same heterogeneous approach was applied to data: regions collected, analyzed, and reported data variously, leading to difficulties in interpreting cases, illnesses, hospitalizations, and even deaths [174].

On 1 April 2021, Italy made vaccination mandatory for healthcare workers [175], substantially consisting of two groups:

- The first group includes all those who perform health care jobs. This would include physicians, nurses, and pharmacists, but also obstetrics, medical radiology health technicians, orthopedic technicians, audiology technicians, cardiovascular physiopathology and perfusion technicians, dental hygienists, dietitians, and biomedical laboratory health technicians.
- The second group includes workers in long-term-care facilities, senior living homes, nursing homes, care homes, rest homes, convalescent homes and similar facilities. The obligation to be vaccinated is not connected with the type of job but the location, making checks and enforcement of the law more difficult. Managers of these covered facilities, as well as the employers of those who work there, have the obligation to ensure checks are performed [176].

Despite having one of Europe's highest vaccination rates, as of 15 October 2021, a new universal, mandatory use of the COVID-19 Green Pass was required in all remaining industries. Italy's Green Pass – a domestic COVID-19 passport that indicates if someone is fully vaccinated or has recently tested negative for the virus – is required for any employees who work onsite. The Green Pass was also required for travel (buses, metro, trains, long-distance travel, hotels) and indoor venues (restaurants, theaters, cinemas, gyms, swimming pools, sporting and other events) [177]. Concurrently, the government expanded mandatory vaccination to police, teachers, military, administrative staff in schools and hospitals, and prison guards [178]. Refusal results in suspension from work without pay, but not dismissal. Initially, the requirement was to expire 31 December 2021, but has been extended in the face of the Omicron surge.

On 5 January 2022, Italy made vaccination mandatory for all adults over 50, to ease pressure on the health system and reduce fatalities. The measure also removes the option of testing rather than vaccination for workers 50 years and older starting 15 February. The measure is currently set to expire on June 15.

As of 10 January, 75% of the population was fully vaccinated and 40% boosted [179]. Figures 11 and 12, following pages, overview Italy's response over time.

Figure 11: COVID-19 case, tests, positive rate, and R0, Italy.

Source: Our World in Data [180].

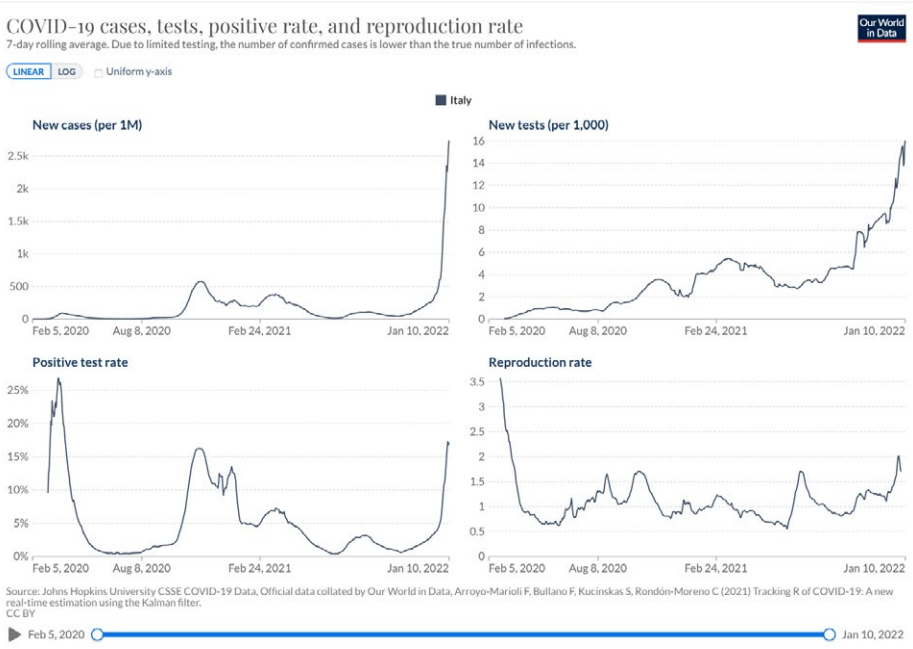
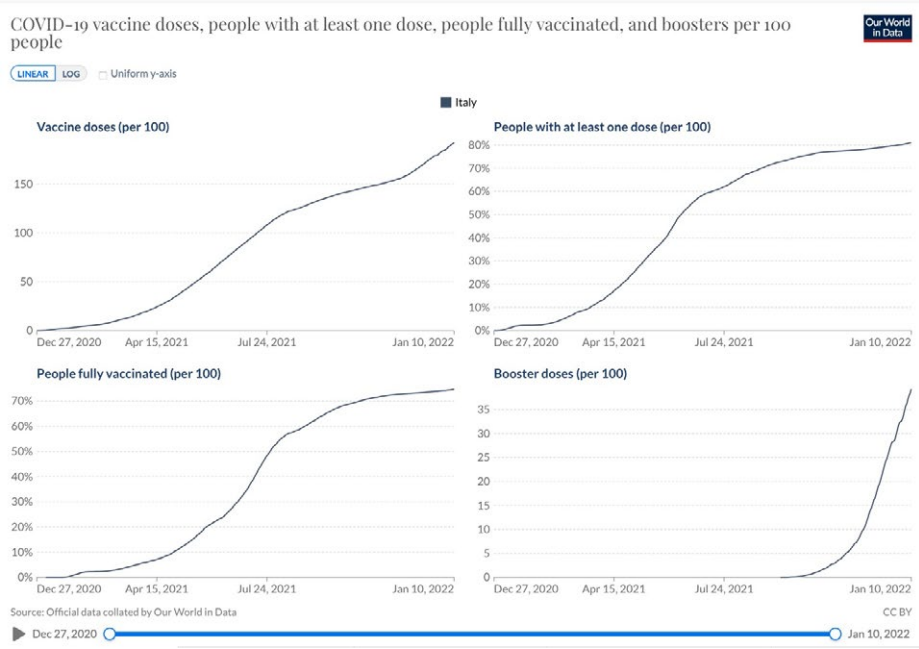


Figure 12: COVID-19 vaccination in Italy.

Source: Our World in Data [181].



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The Philippines

Health system overview [182]

Health governance has been decentralized since 1991. Health services are delivered by government facilities under the national and local governments. The Department of Health (DOH) supervises government corporate hospitals, specialty and regional hospitals. The Department of National Defense runs the military hospitals, and the provincial governments manage and operate district and provincial hospitals.

Municipal governments provide primary care, including preventive and promotive health services and other public health programs through the rural health units, health centers and barangay health stations (BHS). Large and independent cities provide both hospital services and primary care services. The DoH funds regional and apex hospitals, while local government units (LGUs) fund primary- and secondary-level care. In the private sector, health care is generally paid for through user fees at the point of service. The private sector's share of total hospital beds increased from 46% in 2003 to 53% in 2016.

The DOH provides national policy direction and strategic plans, regulatory services, standards and guidelines for health and leadership, technical assistance, capacity-building, linkages and coordination with other national government agencies, LGUs and private entities in implementing health. The LGUs, (provincial, city and municipal governments), are responsible for local health programs and services.

Social health insurance, administered by the Philippine Health Insurance Corporation (PhilHealth), was introduced in 1995 and has expanded rapidly in the past 5 years, with a goal of universal health coverage since 2010. PhilHealth reimburses government as well as private health facilities. It reportedly covers 92% of the population, but financial protection is limited, resulting in a high level of household OOP payment.

Public health services are generally provided by LGU health centers and hospitals. LGU health staff are generally salaried but the health staff in accredited institutions are also entitled to a proportion of the capitation fund from PhilHealth.

Health expenditure

Government health expenditure has increased significantly in nominal terms and has raised spending on public health since 2007, but this has been eclipsed by private sector funding sources. The budget of the DOH, which had the lion's share of the national budget for public health services, has increased from PHP 10 billion in 2005 to PHP 123 billion in 2016. PhilHealth premiums comprised the largest line item at PHP 44 billion (36%). Various disease prevention and control programs comprise 6.5% (at PHP 8 billion) and immunization and vaccines 3.2% (PHP 4 billion).

The Expanded Senior Citizens Act of 2010 [Republic Act No. 9994 grants a 20% discount and exemption from the value-added tax (VAT) on the purchase of medicines, pneumococcal vaccines and other essential medical supplies, accessories and equipment.

Adult immunization in The Philippines

Privor-Dumm et al. characterize The Philippines as being child-focused and cost-sensitive [10]. Vertical programs, like immunization, TB control, family planning and others, are implemented at the local government level with technical guidance and in-kind commodity support from the DoH. But there is insufficient institutional capacity for effective program implementation, monitoring, and evaluation. Many Filipinos suffer from VPDs such as measles and diphtheria and immunization rates have fallen. The national immunization program is largely limited to basic immunization for children: BCG, HepB, Penta, HPV, MMR, IPV, Td [146].

Only three vaccines are recommended for adults: PPSV and influenza to those ≥60 years, and Td to all pregnant women. No immunization coverage data are available [146].

The Philippines' response to COVID-19

In the Philippines, the Inter-Agency Task Force on Emerging Infectious Diseases (IATF) was convened by the national government in January 2020 to monitor the outbreak in Wuhan, China. The first case of local transmission of COVID-19 was confirmed on 7 March 2020. On 8 March, the entire country was placed under a State of Public Health Emergency. By 25 March, the IATF

released a National Action Plan to control the spread of COVID-19. A community quarantine was initially put in place for the national capital region (NCR) starting 13 March 2020 and it was expanded to the whole island of Luzon by 17 March. The initial quarantine was extended up to 30 April 2020. Several quarantine protocols were then implemented based on evaluation of IATF:

- Community Quarantine (CQ) refers to restrictions in mobility between quarantined areas.
- In Enhanced Community Quarantine (ECQ), strict home quarantine is implemented, and movement of residents is limited to access essential goods and services. Public transportation is suspended. Only economic activities related to essential and utility services are allowed. There is a heightened presence of uniformed personnel to enforce community quarantine protocols.
- Modified Enhanced Community Quarantine (MECQ) is implemented as a transition phase between ECQ and GCQ. Strict home quarantine and suspension of public transportation are still in place. Mobility restrictions are relaxed for work-related activities. Government offices operate under a skeleton workforce. Manufacturing facilities are allowed to operate with up to 50% of the workforce. Transportation services are only allowed for essential goods and services.
- In General Community Quarantine (GCQ), individuals from less susceptible age groups and without health risks are allowed to move within quarantined zones. Public transportation can operate at reduced vehicle capacity observing physical distancing. Government offices may be at full work capacity or under alternative work arrangements. Up to 50% of the workforce in industries (except for leisure and amusement) are allowed to work.
- Modified General Community Quarantine (MGCQ) refers to the transition phase between GCQ and the New Normal. All persons are allowed outside their residences. Socio-economic activities are allowed with minimum public health standards.
- Local governments are tasked to adopt, coordinate, and implement guidelines concerning COVID-19 in accordance with provincial and local quarantine protocols released by the national government [183]. The government launched a 4-pillar socioeconomic strategy against COVID 19, which includes support to vulnerable groups and individuals, expanded resources for frontline medical workers, as well as fiscal and monetary measures [184].

The Philippine response to COVID-19 has been described as one of the longest and strictest lockdowns in the world. Quarantines were enforced by armed security personnel in a manner described in April by United Nations High Commissioner for Human Rights Michelle Bachelet as "highly militarized." Instead of investing in testing or ensuring a timely rollout of vaccines, Duterte's approach was to put the Philippines on a war footing [185].

The government's reliance on draconian measures was a consequence of securitizing COVID-19 and framing the virus as an existential threat. This framing was reinforced with a narrative characterizing the country as being at war against an "unseen enemy," which became the "pasaway," a Filipino word meaning an obstinate, stubborn person. As the perpetual enemy of health and order, the pasaway became the target of disciplining and policing. The targeting of the pasaway was informed by deep-seated class prejudices and Duterte's authoritarian tendencies [186]. In June 2021, President Duterte threatened to jail anyone refusing to be vaccinated; in August, he said vaccine refusers should be shot; and in September that they should be detained in their homes, a policy of questionable constitutionality [187].

In May 2021, House Bill 9252, "Mandatory COVID-19 Immunization Act of 2021," alarmed the public as it sought to require all Filipinos to receive the vaccine for free at any government hospital or health center, except for those persons unfit due to medical conditions. That same month, President Duterte signed into law the "COVID-19 Vaccination Program Act of 2021."

This law allocates ₱500 million for the COVID-19 National Vaccine Immunity Fund to compensate vaccine recipients who experience serious adverse effects or die after vaccination. It lays out a framework for strategic policy-making, decisions and delegation of IATF and the

Figure 13: COVID-19 case, tests, positive rate, and R0, The Philippines.

Source: Our World in Data [191].

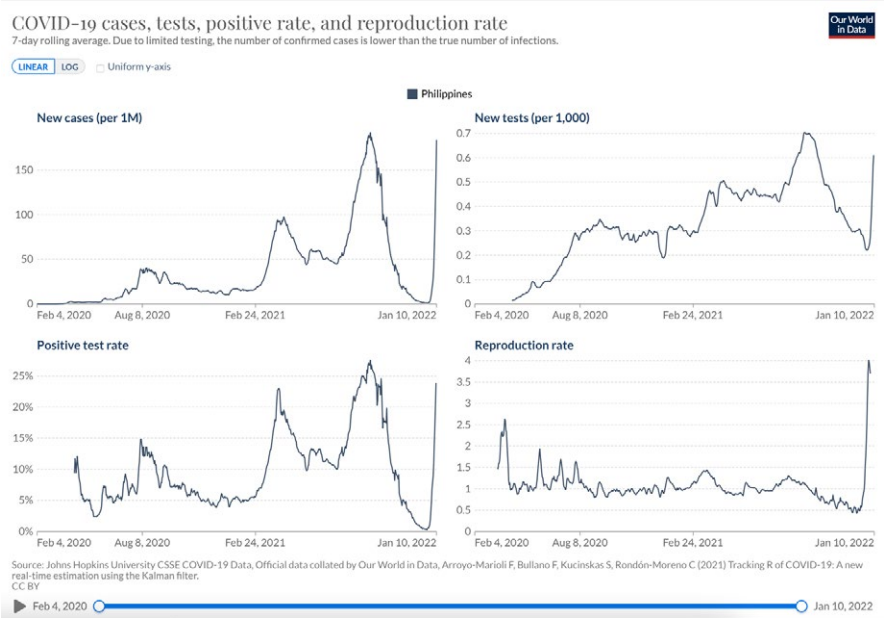
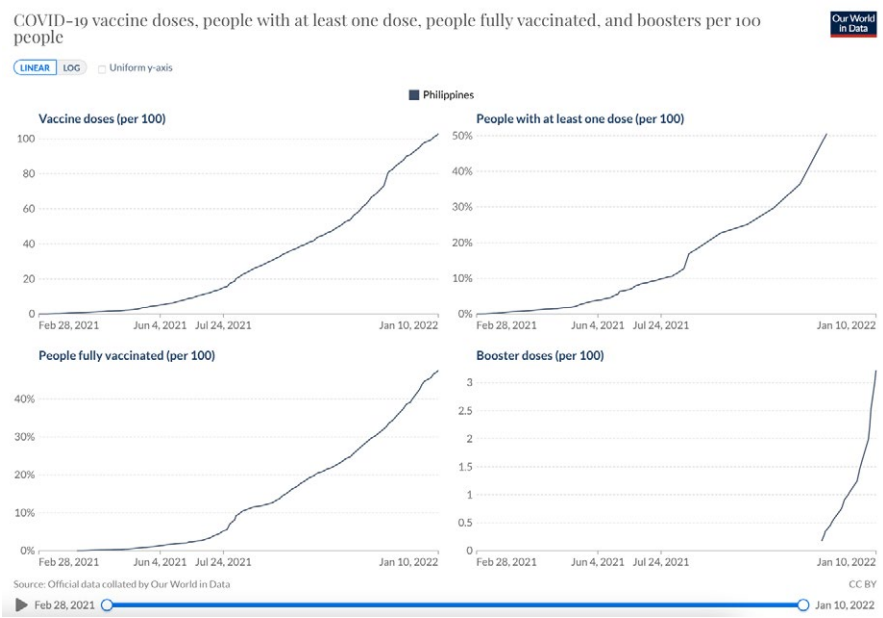


Figure 14: COVID-19 vaccination in The Philippines.

Source: Our World in Data [192].



NTF [188]. Even so, the country's rollout has been slow and erratic.

On 1 December 2021, a rule requiring vaccination or a negative test for workplace entry went into effect. Many people haven't been able to access vaccines due to logistical and supply delays. Workers are required to pay for their own tests. Restaurants and government agencies were also allowed to refuse entry or deny service to individuals who remain partly or wholly unvaccinated, with the measures part of a wider push by the government to boost the overall vaccination rate, which as of 10 January was just under 48% fully vaccinated and 3.22% boosted.

However, vaccine hesitancy is deep-rooted [189]. Many Filipinos are refusing to be jabbed with Chinese-made shots [185] and a recent poll found that fear of vaccination's side effects was a major concern [190]. Figure 13 and figure 14, page 50, give an overview of The Philippines' COVID-19 situation over time.

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