

14 Investing in health system resilience

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This chapter identifies a set of priority investment areas needed to strengthen resilience, reinforcing the foundations of countries' health systems and their ability to respond to evolving pandemics and other emerging shocks. It then produces order-of-magnitude estimates of the expected costs of such investments, drawing extensively from existing OECD data and analytical studies. These priority investments represent an estimated 1.4% of GDP, on average across OECD countries (ranging from 0.6% to 2.5%), compared with pre-pandemic expenditure of 8.8%. A combination of targeted spending and measures to reduce wasteful spending could mitigate the overall increases in health spending in the medium to long term.

Key findings

The COVID-19 pandemic demonstrates the cascading health and economic consequences that major shocks can generate when health systems are not resilient enough. It has highlighted that health systems are underfunded in many countries. To avoid the catastrophic effects of future shocks, targeted investments are needed to strengthen resilience, reinforcing the foundations of countries' health systems and their agility to respond to pandemics and other evolving threats.

Priority investments in stronger health system resilience represent around 1.4% of GDP, on average across OECD countries. This broad order-of-magnitude estimate is calculated in relation to the level of spending in 2019, before the pandemic. Only a small proportion of the targeted spending (0.13% of GDP, on average) relates to capital expenditure. However, both the capital and current spending identified refers to permanent financial allocations to specific areas. This would, therefore, result in a step increase in overall health expenditure levels rather than a one-off funding injection.

Some OECD countries have been addressing some measures outlined in this chapter since the pandemic began. However, additional health expenditure in recent years has consisted of unplanned financing of the emergency response to the pandemic, rather than long-term planned investments to strengthen resilience. Therefore, additional spending to improve health system resilience is not purely a matter of spending more – it is also about spending well on targeted, priority investments, in areas where health systems proved insufficiently resourced to withstand the shock of the pandemic, including:

- **Protecting underlying population health** through additional spending on preventive care. This is expected to cost about 0.3% of the GDP, on average (ranging from 0.13% to 0.53% across countries, according to their current profile of funding for health systems). Such spending comprises funds for enhanced preventive care and mass population health programmes.
- **Fortifying the foundations of health systems** by investing in core equipment and better harnessing of health information. This is estimated to cost 0.4% of GDP, on average (ranging from 0.26% to 0.63% across countries), and includes investments in core equipment and infrastructure, and health information systems.
- **Bolstering health professionals working on the frontline**, which accounts for around half of the total additional costs, on average, at 0.7% of GDP (ranging from 0.03% to 1.55% across countries). It includes funds to ensure sufficient numbers of health and long-term care professionals, and the creation of a medical reserve.

If these investments had been made on top of existing health spending, the average OECD health spending to GDP ratio would have reached 10.1%, compared to the actual baseline average of 8.8% in 2019. This increase equates to 9% of total expenditure on health by OECD countries, or USD 627 billion (USD 460 per capita). To put this in context, it is similar to total public funding for prescription drugs across OECD countries in 2019.

The total investment cost ranges from 0.6% to 2.5% of GDP across OECD countries, depending on how much a country is already spending in some of the investment areas. For example, some OECD countries with relatively few human and/or physical resources in Latin America and central and southern Europe are estimated to need an injection nearer the upper end of the range; whereas countries such as Australia, Germany and the Netherlands are expected to require much less.

Irrespective of the exact amount needed, funding such investments requires buy-in from ministries of finance as well as health ministries and social security institutions. In the current context of tight public finances in most OECD countries, a combination of targeted spending and measures to reduce wasteful spending could be used.

14.1. Priority investments are needed to strengthen health system resilience

With the world well into its third year since the pandemic began, COVID-19 continues to have a significant and lasting impact. It is placing more pressure on health systems that were often overstretched even before the pandemic. The health crisis also caused major economic and social disruption, from which many countries are only now emerging.

This chapter identifies a set of priority investment areas needed to strengthen health system resilience. It then provides broad order-of-magnitude estimates of the expected costs of these investments, drawing extensively from existing OECD data and analytical studies.

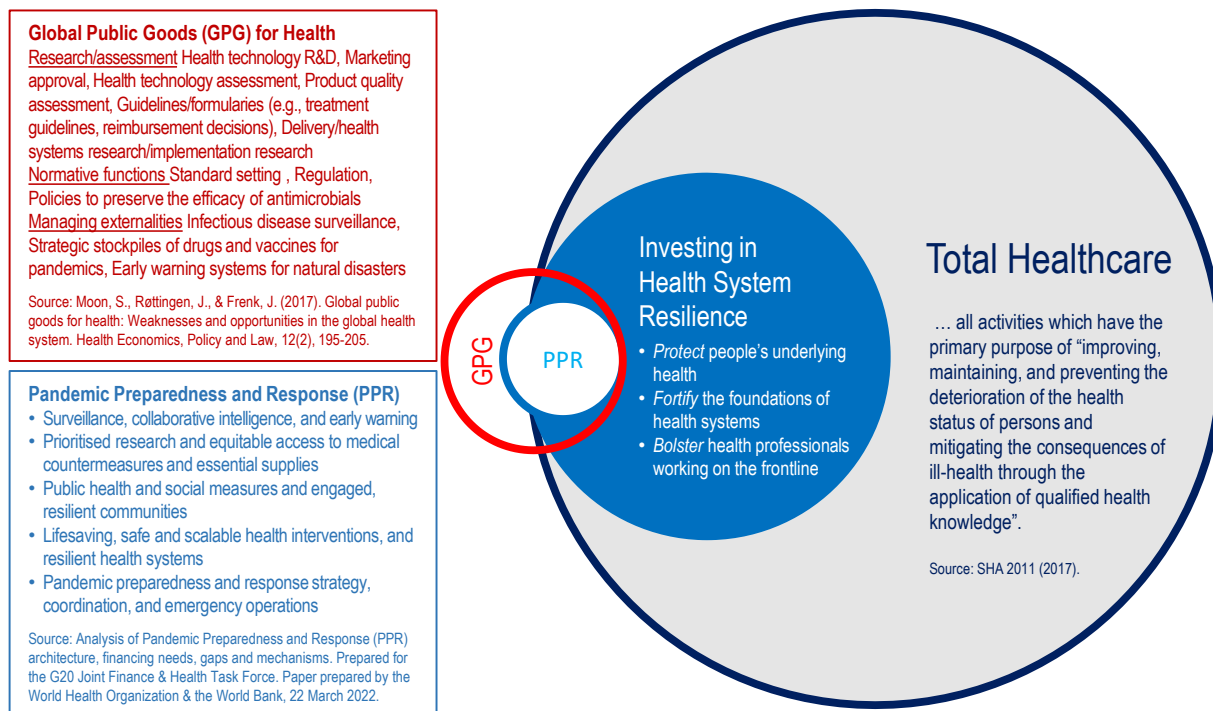
The return from such investments extends beyond the health benefits of fewer lives lost and reduced morbidity. More resilient health systems are at the core of stronger, more resilient societies – enabling substantial economic and societal benefits by avoiding stringent and costly containment measures and the other disruptive effects of future crises.

Previous OECD work highlighted the enormous potential to make savings by tackling wasteful spending and to realise efficiency gains across the health sector (OECD, 2017^[1]). Using such savings to help fund more resilient health systems is particularly important, given the current context of tight overall public finances in most OECD countries. Nevertheless, the order-of-magnitude estimates for the priority investments identified in this chapter mean that additional funds are still likely to be needed. Therefore, a combination of targeted spending and measures to reduce wasteful spending could mitigate the overall increases in health spending in the medium to long term. Further, the various investments need to be considered over varying – although in some cases linked – time scales. For example, while increasing availability of medical equipment and infrastructure could in theory be done in the short term, expanding the number of health care professionals to operate such equipment cannot be achieved quickly.

The overall scale of investment identified in this chapter expands beyond the international initiatives to invest nationally, regionally and globally in pandemic preparedness and response and the need to increase spending on global public goods (see chapters on containment and mitigation, and on global public goods). The G20 Joint Taskforce on Health and Finance has highlighted the vulnerabilities in the international community's ability to prevent, detect and respond effectively to pandemic threats (G20 HLIP, 2021^[2]). In this report, the concept of resilience embraces but goes beyond the preparedness spending needs of low- and middle-income countries identified by the Taskforce, to analyse more broadly the overall health system investments needed to build resilience, from a national perspective (Figure 14.1).

Resilience is thus understood as the ability of systems to plan for, absorb, recover from and adapt to major shocks such as COVID-19 (OECD, 2022^[3]). Resilience is not simply about minimising risk and avoiding shocks: it is also about recognising that shocks *will* happen. Such shocks are defined as high-consequence events that have a major disruptive effect on society. Along with COVID-19, this includes other highly infectious pathogens or emerging diseases, but it also covers natural hazards or human-caused disasters that can lead to massive surges in health care needs. The investment areas and indicative cost estimates are therefore relevant for combatting both COVID-19 and other major emerging shocks.

Figure 14.1. Spending on health system resilience, pandemic preparedness and global public goods



Investments to strengthen health system resilience can be grouped into three overarching pillars (Figure 14.2). These aim to:

- protect people's underlying health
- fortify the foundations of health systems
- bolster health professionals working on the front line.

This chapter identifies the key investments for each pillar. These are based on emerging evidence of the most effective policies in combatting COVID-19, combined with a review of experiences with managing previous major health shocks (see the OECD Digital Hub on Tackling the Coronavirus, <https://www.oecd.org/coronavirus>). Such investments also have the benefit of making health systems better positioned to combat gradual societal transitions, such as demographic change and the increasing burden of chronic conditions.

Figure 14.2. The pillars to strengthen health system resilience

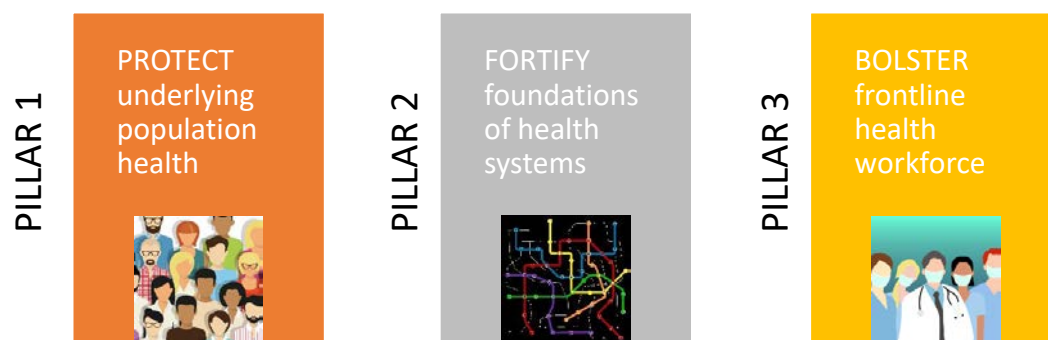


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 Source: Morgan and James (2022⁽⁴⁾), "Investing in health systems to protect society and boost the economy: Priority investments and order-of-magnitude cost estimates", <https://doi.org/10.1787/d0aa9188-en>.

While investments require resources up front and over time, they offer a substantial return – both during a health shock and during “normal” times. This chapter focuses on the costs of implementing priority investments in health systems resilience. Into the third year of the pandemic, many countries may have already begun addressing some of the gaps in investment identified. The amount of additional investment needed thereby varies by country, reflecting existing capacities. Each country has areas where greater investment is needed and other areas where additional spending may not be required. Such variation is reflected in the range of estimates, notwithstanding that costing reflects broad order-of-magnitude estimates rather than any precise cost-accounting analysis. For further detail on the costing methodology used, see Morgan and James (2022^[4]).

14.2. How much will it cost to strengthen health system resilience?

In total, priority investments identified in this chapter are estimated to represent around 1.4% of GDP on average across OECD countries. The total investment cost ranges from 0.6% to 2.5% across OECD countries, depending on how much a country is already spending in some of the investment areas. The trajectory for these investments is based on an increase in the ratio of health spending to GDP of this magnitude being reached at some point in the medium-term future (Figure 14.3).

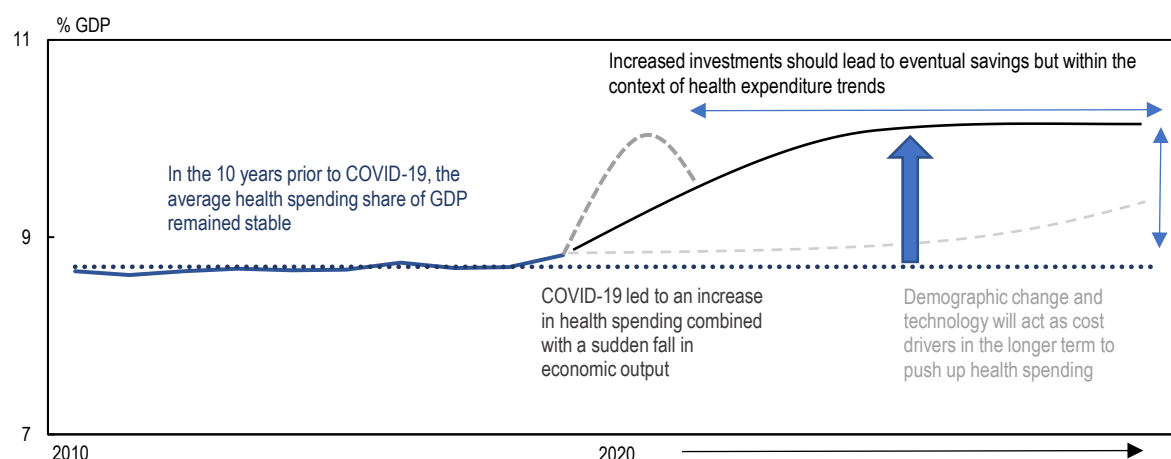
This order-of-magnitude estimate is set in the context of the pre-pandemic situation: the total cost of these investments is calculated in relation to the level of spending in 2019. In other words, if all these investments had been made on top of existing health spending, the average OECD health spending to GDP ratio would have reached 10.1%, compared to the actual baseline average of 8.8% in 2019. This increase equates to 9% of total expenditure on health by OECD countries, or USD 627 billion (USD 460 per capita). To put this in context, it is similar to total public funding for prescription drugs across OECD countries in 2019.

The 0.9 percentage point jump in the ratio of health spending to GDP observed in 2020 and 2021 (with some countries reporting an increase of more than 2 percentage points) could be highlighted as a significant step towards meeting this target. However, this large increase was driven as much by a significant fall in GDP as by the additional funding for the health sector in response to the pandemic.

Some OECD countries have begun addressing some measures outlined in this chapter – for example, increasing salary levels for nurses and care workers, or funding additional intensive care unit capacity. However, an important part of additional expenditure by governments has tended to be unplanned financing to “firefight” the pandemic, rather than long-term planned investments to strengthen resilience.

Only a small proportion of the targeted spending (0.13% of GDP, on average) relates to capital expenditure: that is, core equipment for the health sector covering medical and non-medical equipment and IT infrastructure. However, both the capital and current spending identified refer to permanent financial allocations to the specific areas. For instance, it is suggested that spending on prevention and public health services should in future account for a minimum of 4% of health expenditure. This would, therefore, result in a step increase in overall health expenditure levels rather than a one-off funding injection. For comparison, the last across-the-board increase in the health spending share of GDP occurred during the Global Financial Crisis in 2008-09, when average expenditure on health across OECD countries increased sharply, from about 7.9% prior to the crisis in 2007, to stabilise at around 8.7% of GDP from 2011.

Figure 14.3. A trajectory: Medium-term spending implications of investing in more resilient health systems



Source: OECD Secretariat calculations.

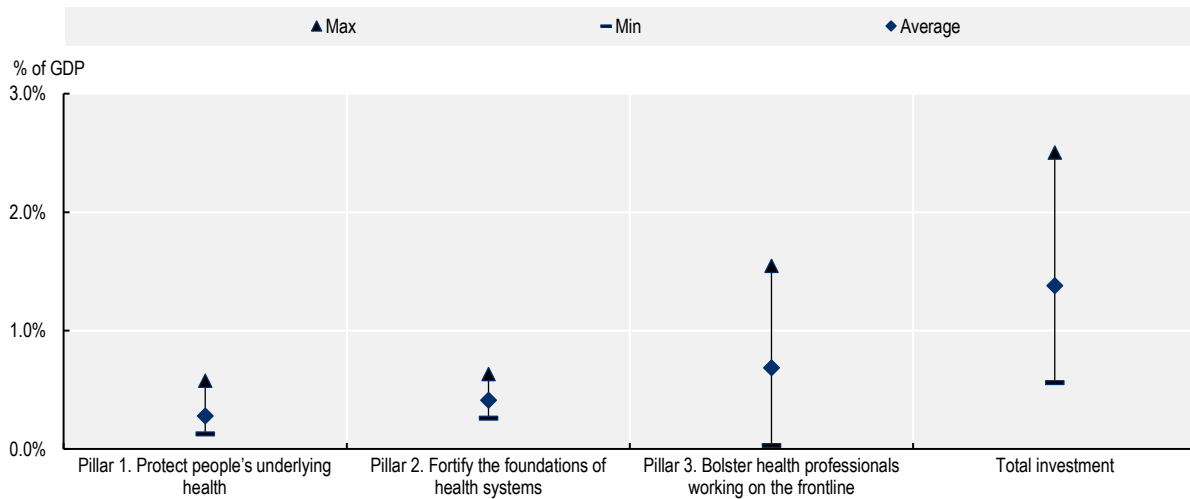
By pillar, bolstering health professionals working on the front line (Pillar 3) accounts for around half of this investment cost, on average, at 0.7% of GDP (Table 14.1, Figure 14.4). Additional spending on preventive care (Pillar 1) is expected to cost about 0.3%, on average. Together, these can be seen as broadly consistent with recent analysis calling for countries to allocate an additional 1% of GDP to primary health care (WHO, 2021^[5]). In addition, foundational investments in core equipment and better harnessing of health information (Pillar 2) are estimated to cost another 0.4% of GDP, on average.

Table 14.1. Order-of-magnitude investment cost estimates, as a share of GDP (relative to 2019 baseline)

Investment	Rationale and main cost drivers	Average	Range
Pillar 1. Protect people's underlying health		0.28%	0.13-0.53%
Enhanced preventive care	Improve public health systems, strengthen peoples' underlying health Public health surveillance, infection prevention and control, combatting major risk factors	0.10%	0.03-0.26%
Mass population programmes	Reinforce people's natural defences, strengthen containment and mitigation Vaccination programmes, extra testing and personal protective equipment during acute periods	0.18%	0.06-0.42%
Pillar 2. Fortify the foundations of health systems		0.41%	0.26-0.63%
Sufficient core equipment	Enable health professionals to respond to surges in demand Hospital beds and other medical equipment, IT infrastructure	0.13%	0.00-0.34%
Well-harnessed health information	Improve patient monitoring, strengthen containment and mitigation Software, operational processes, data scientists, IT skills of health workers	0.28%	0.18-0.34%
Pillar 3. Bolster health professionals working on the front line		0.69%	0.03-1.55%
Sufficient health and long-term care professionals	Effective case management for affected individuals, care continuity for others Additional health workers, higher salaries for nurses and care workers	0.66%	0.00-1.52%
Medical reserve	Surge capacity that can be called on in times of high need Recurrent training for health professionals in a medical reserve	0.03%	0.03-0.03%
Total		1.38%	0.56-2.51%

Source: OECD Secretariat calculations.

Figure 14.4. Investment range by pillar, as a share of GDP (relative to 2019 baseline)



Source: OECD Secretariat calculations.

14.3. How much will it cost to strengthen health system resilience by cost component?

Pillar 1: Protect people's underlying health

Investment 1: Enhanced preventive care

Preventive care is one of the cornerstones of an effective health system (see the chapter on care continuity). In broad public health terms, whether interventions are targeted at individuals or populations, the aim is to enhance health status and maintain a state of low risk for diseases, disorders or conditions. Effective preventive care policies limit the occurrence of new diseases and reduce the incidence of existing communicable and non-communicable diseases.

COVID-19 has demonstrated the importance of strong infection prevention and control policies in health care settings. This includes health and long-term care workers adopting a number of common-sense precautions – notably hand hygiene, environmental cleaning, decontamination of medical equipment, aseptic techniques and injection safety (WHO, 2021^[6]). Of particular concern in recent years is an increasing degree of antimicrobial resistance (AMR). The OECD report *Stemming the Superbug Tide: Just A Few Dollars More* showed that the burden of AMR on population health can be drastically reduced through cost-effective policies such as ending over-prescription of antibiotics, offering rapid testing for patients to determine whether they have viral or bacterial infections, encouraging delays in prescribing antibiotics and promoting better hygiene (OECD, 2018^[7]). The report concluded that additional targeted spending equivalent to an average of USD PPP 2.0 per capita could halt the superbug tide (see Box 14.1 for a discussion of the impact of the COVID-19 pandemic on AMR initiatives).

Investing more in health promotion and disease prevention also improves people's underlying health. Such investments are critical for health system resilience. Healthier populations are less vulnerable to COVID-19 and are likely to be more resilient to future shocks. Yet despite clear progress in certain areas – such as preventive cancer screening programmes, policy levers to lower smoking and alcohol consumption and improve healthy diets – much more can still be done to reduce the major risk factors for health of harmful alcohol use, obesity, smoking and opioid use. These risk factors not only increase the risk of non-

communicable diseases but also make people much more vulnerable to COVID-19, other infectious diseases and certain disasters.

To tackle harmful alcohol consumption, the 2021 OECD report *Preventing Harmful Alcohol Use* identified a package of the most effective interventions, including raising alcohol taxation, regulation of alcohol advertising, sobriety checkpoints to counter drink-driving and alcohol counselling in primary care (OECD, 2021^[8]). Additional innovative policies include minimum unit pricing and statutory bans on alcohol advertising targeting children. The study found that a mixed package of the most cost-effective interventions would cost on average around USD PPP 2.5 per capita.

The OECD report *The Heavy Burden of Obesity* listed food labelling, advertising restrictions and mass media campaigns as some of the key policies already implemented – to differing extents – in many OECD countries (OECD, 2019^[9]). Additional policy measures that show promise include menu labelling, prescribing physical activity and workplace wellness programmes. This report points to an average per capita cost of USD 9.0.

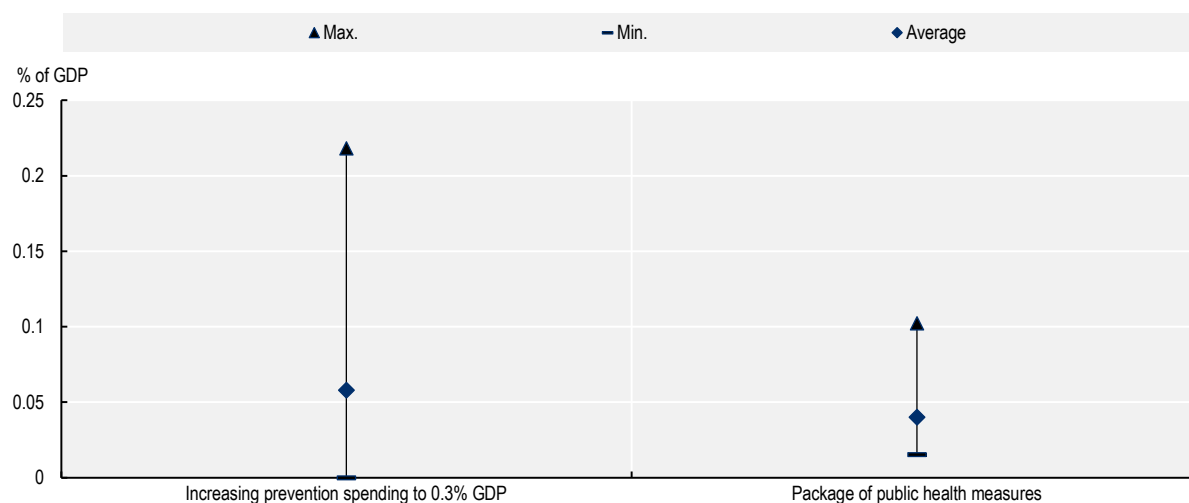
For other public health challenges such as tobacco and substance abuse (OECD, 2019^[10]), less work has been done to date on assessing the cross-country costs of a suitable package of measures. Nevertheless, a level of investment similar to the package of measures to tackle alcohol abuse is assumed. Taken together, a package of public health measures – targeting major health risk factors and antimicrobial resistance – would amount to a modest increase of around USD 15 per capita (equivalent to 0.04% of GDP on average).

At a broad population level, experience from the COVID-19 pandemic has shown that an effective public health surveillance system is an important policy lever to improve preparedness – particularly in monitoring and controlling the spread of an infectious disease (OECD/European Union, 2020^[11]). This requires a well-functioning national public health system with trained staff, adequate availability of diagnostic laboratory equipment, and the capacity to ramp up testing and monitoring rapidly as future public health crises arise (see the chapter on containment and mitigation).

While a growing body of evidence shows that many health promotion and disease prevention measures can improve health outcomes at relatively low cost, health spending data show that only around 2.7% of overall health spending is allocated to prevention activities (Gmeinder, Morgan and Mueller, 2017^[12]). In terms of the share of GDP, spending across OECD countries on prevention activities currently varies from less than 0.1% to 0.6%.

After considering the package of population health measures outlined above (equating to around USD 15 per capita), a conservative spending target for all prevention spending of at least 0.3% of GDP is set. This level of spending would match some of the higher-performing public health systems among OECD countries should see systems adequately resourced to meet future crises. The additional annual expenditure requirements range from zero (for those countries already meeting this target) to 0.22% of GDP, with an average additional cost of 0.06% of GDP (Figure 14.5).

Figure 14.5. Investing in prevention and public health systems, as a share of GDP



Note: The package of public health measures is based on per capita costings in 2019 prices to tackle AMR, alcohol, obesity, smoking and opioids. This is added to currently reported spending on prevention and then raised to a minimum of 0.3% of GDP to represent additional spending needed to strengthen public health systems.

Source: OECD Secretariat calculations.

Box 14.1. Adverse impacts of the COVID-19 pandemic on tackling antimicrobial resistance

Antimicrobial resistance is a widely recognised public health challenge with global implications. In 2015, the international community made a commitment to tackling this challenge in the Global Action Plan to tackle AMR (AMR-GAP). The AMR-GAP urged countries to scale up interventions that broadly aim to promote the prudent use of antibiotics in human and animal health; scale up infection prevention and control measures; strengthen surveillance capacity consistent with the One Health approach; improve AMR awareness and understanding in the general public and among health workers; and invest in AMR-relevant development and research (WHO, 2015^[13]).

In recent years, the OECD countries made important strides in developing their own action plans to tackle AMR. In 2021-22, the number of OECD countries with AMR action plan stood at 34, a notable increase from 23 in 2016-17 (WHO, FAO and OIE, 2021^[14]). Earlier OECD analysis demonstrated that action plans from OECD countries are well-aligned with the strategic priorities and interventions recommended in the AMR-GAP (Özçelik et al., 2022^[15]).

The COVID-19 pandemic disrupted the implementation of AMR-relevant initiatives outlined in national action plans as health workers diverted their attention to responding to the COVID-19 pandemic.

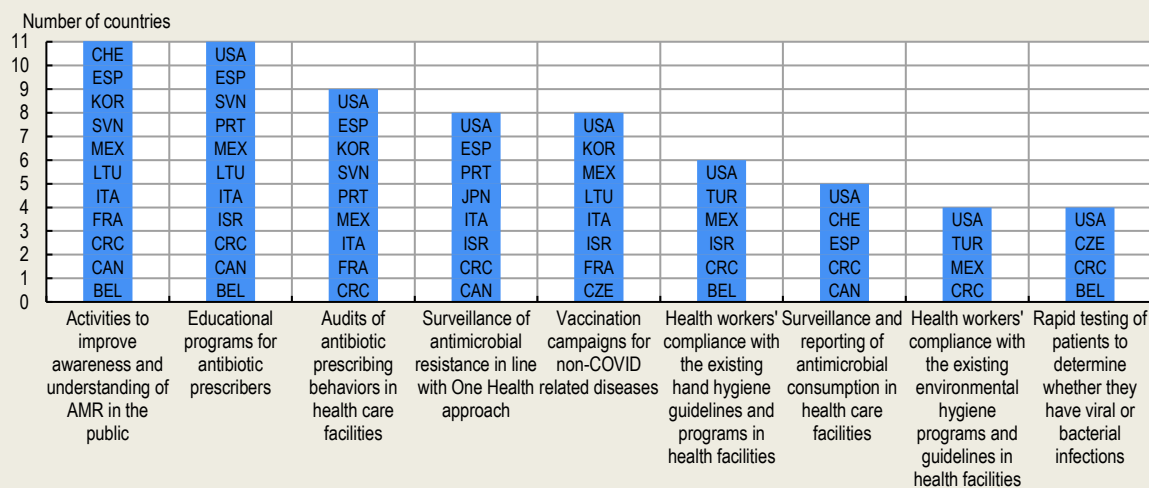
OECD countries experienced a range of disruptions in implementing actions to tackle AMR in their own settings, as highlighted and in Figure 14.6 below:

- Initiatives to improve AMR awareness and understanding in the general public and educational programs targeting antibiotic prescribers were most interrupted by the pandemic, with 11 out of 26 OECD countries that participated in the OECD Resilience of Health Systems Questionnaire reporting some level of interruption in these activities.

- Nine OECD countries experienced interruptions in the monitoring of antibiotic prescribing behaviours in health care facilities.
- Eight OECD countries faced disruptions in the AMR surveillance activities with the One Health framework and vaccination campaigns for non-COVID related diseases.

Many countries also experienced disruptions in compliance with existing hand hygiene and environmental cleaning guidelines in health care facilities and rapid testing capacity. In addition, OECD countries reported delays in efforts to revise/update their AMR action plans. Combined, these findings suggest that the COVID-19 pandemic presents an important threat to tackling the AMR burden.

Figure 14.6. AMR-relevant activities and programs were adversely impacted by COVID-19



Source: OECD analysis on Resilience of Health Systems Questionnaire, 2022.

OECD countries have been deploying diverse approaches to reduce the adverse impact of the COVID-19 pandemic on their AMR priorities

Many OECD countries have pursued a range of strategies to minimise the adverse effects of the COVID-19 pandemic on their AMR burden. For instance:

- In Belgium, additional financial resources were made available for hospitals to reinforce their antibiotic stewardship and infection prevention and control measures.
- In Korea, online education programs were scaled up to avoid lagging behind in AMR management policies.
- In Portugal, efforts to ensure the continuity of AMR-relevant measures relied on maintaining close contact with local hospitals and regional AMR teams.
- In the United States, AMR remained one of the top priorities of the Centres for Disease Control (CDC). Investments have continued in key prevention strategies, such as early detection and containment, infection prevention. Further, additional funding was provided to antibiotic developers to expand the number of clinical study sites to mitigate site closures due to the COVID-19 pandemic.

Building on previous analytical work, the OECD is developing a new publication that will shed light on the effectiveness and cost-effectiveness of One-Health strategies to tackle AMR

Previous OECD analysis found that the health and economic burden of hospital acquired infections and AMR can be stemmed through a package of policies, which are considered as best buys due to their high beneficial impact on population health and affordability (OECD, 2018^[7]). These policy packages that combine health care and community-based interventions can cost as little as USD 2 per capita and yield savings of around USD 3 per capita each year, while averting millions of deaths. Infection prevention and control policies significantly contribute to the success of this package. Improving hand hygiene in health care settings saves about USD 16.5 in reduced health care expenditure for every USD invested. In line with the One-Health approach, the new OECD analysis will expand the scope of work to quantify the effectiveness and cost-effectiveness of interventions that go beyond the human health sector.

Investment 2: Mass population programmes, such as vaccination programmes

In addition to stronger public health, countries need to be prepared for mass population programmes that protect people's underlying health, and enable the health systems of countries to absorb and respond to the acute stage of a shock.

In the COVID-19 context, this comprises developing and maintaining vaccination campaigns. This investment includes staffing and other associated delivery costs, as well as the costs of the vaccines themselves. This excludes the expected costs of research and development for new vaccines and treatments for COVID-19 and other emerging pathogens – see Morgan and James (2022^[4]) for a further discussion. Testing has proved an important complementary policy prior to and in parallel with vaccination campaigns, particularly during the various stages of a pandemic. For these and other mass programmes, populations that are more trusting of governments, science and the rule of law are more likely to comply with these and other interventionist public health policies (see chapters on COVID-19 outcomes, and on containment and mitigation, for further discussion of trust).

Mass vaccination programmes have reduced the risk of serious illness from COVID-19, and consequently hospitalisations. Most OECD member countries have aimed to administer two or three COVID-19 vaccine doses to the vast majority of their population. There is considerable uncertainty as to how frequently COVID-19 vaccinations or boosters will be needed into the future. Some researchers cite emerging evidence that three doses is sufficient to provide long-lasting protection from new as well as existing variants, while others emphasise post-COVID-19 syndrome or “long COVID” and the need for annual vaccination campaigns against influenza, at least for the more vulnerable groups of the population (Rubin, 2021^[16]; Dolgin, 2021^[17]; Muecksch et al., 2022^[18]).

For vaccines, the purchase cost of a vaccine against COVID-19 – particularly early on in the pandemic – was variable: media reports give a range from as low as USD 3 to over USD 30 (Morgan and James, 2022^[4]). As with mass testing, these costs may fall over time. But these figures do not include the associated costs of delivery. A comprehensive study investigating the total cost (including the cost of delivery) of vaccinating against 17 pathogens over a lifetime in seven western European countries gave a five-fold cost range of EUR 44 to EUR 226 per pathogen (Ethgen et al., 2016^[19]). Narrowing down these estimates to only vaccination costs for healthy individuals (as opposed to vaccinations for people with health complications) gave a range of EUR 37 to EUR 132 per pathogen.

For testing, data collated from eight OECD countries of the cost of a polymerase chain reaction (PCR) test in 2020, together with associated delivery and laboratory costs, point to an average per capita cost of around USD 80 (ranging from around USD 55 to USD 100). Again, unit costs for testing have tended to fall – for example, as the extended use of antigen tests for COVID-19 provided an initial result without the

need for a laboratory process. A conservative approach is taken, whereby such potential cost reductions over time are not accounted for in cost estimates.

To reach an estimate of the level of expenditure required to perform effective testing and vaccination on an annual basis, unit cost estimates are combined with the share of the population expected to need each of these interventions. A one-to-one relationship is assumed for simplicity between mass testing and vaccinations. That is, as vaccinations are gradually scaled up, testing is concurrently scaled down at the same rate.

A range of scenarios is examined, given the uncertainty around vaccine availability and effectiveness in reducing severity of disease, and the needed levels of diagnostic testing. A low scenario assumes 40% of the population aged under 65 years are tested or vaccinated against COVID-19 each year, with 80% coverage for the population aged 65 years and over. A high scenario assumes 80% coverage for people aged under 65 years and 95% coverage for people aged 65 years and over. The mid-point scenario assumes 60% coverage for people aged under 65 years and 80% coverage for people aged 65 years and over. Combining this mid-point coverage with an assumed annual unit cost of USD 100 for diagnostic testing and/or vaccination, the additional spending required is equivalent to 0.15% of GDP on average, ranging from 0.05% to 0.35%.

COVID-19 has demonstrated the importance of ensuring sufficient supplies of personal protective equipment (PPE) to absorb and respond to the acute stage of a health shock. All countries will need to have the capacity to ramp up PPE supplies and testing efforts for future COVID-19 peaks, or indeed for other emerging infectious pathogens (see the chapter on securing supply chains).

To maintain adequate stocks of PPE to absorb and respond to the acute stage of a health shock, estimates of additional spending needs are based on having sufficient supplies in hospitals, primary care and long-term care (LTC) facilities for a 100-day wave of COVID-19 (or other emerging pathogen with an equivalent degree of infectiousness). The quantities of specific PPE needed are based on an epidemiological model developed by Johns Hopkins University – of additional PPE needs over and above what is needed in normal times (Johns Hopkins University, 2020^[20]). The calculation is that, on a per capita basis, 10.28 gloves, 0.97 isolation gowns, 0.54 medical-grade masks and 0.17 N95 masks will be needed during a 100-day wave (on average) with sustained suppression measures in place. Added in this report are needs for face shields and goggles. Multiplied by unit cost estimates from the World Health Organization (2020^[21]) with a 10% price mark-up, this translates into an average cost of USD 10.75 per capita to provide sufficient PPE within health and LTC settings.

Pillar 2: Fortify the foundations of health systems

Investment 3: Sufficient core equipment

The COVID-19 pandemic saw health care systems, and hospitals in particular, placed under immense strain. Some countries lacked sufficient physical resources – notably in terms of hospital beds and other medical equipment to respond to the sudden influx of COVID-19 patients and their subsequent treatment (OECD/European Union, 2020^[11]). Investing to provide a base level of core equipment needs is seen as a prerequisite to strengthening overall health system resilience and continuing to meet standards of care during a shock.

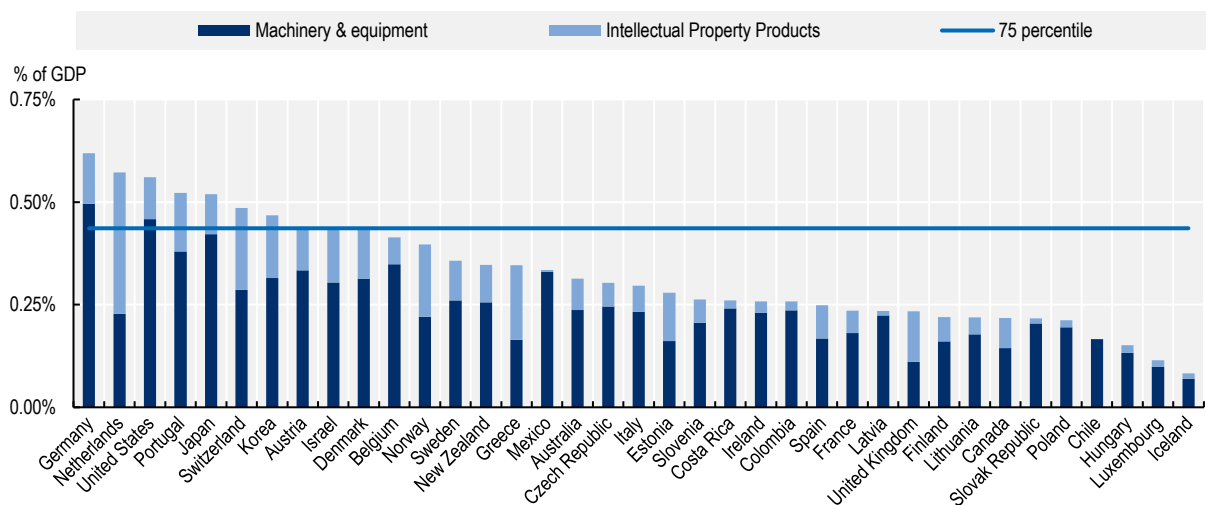
Having sufficient medical equipment in intensive care units and other settings helps avoid potentially catastrophic delays in diagnosing and treating patients, as well as minimising circumstances where there are more patients than beds. However, ensuring that sufficient capacities are available in times of crisis may result in some redundancy in normal times, creating an opportunity cost. There are no hard and fast guidelines or international benchmarks regarding the optimal level of equipment and technology, and variability is wide across OECD countries. Still, the critical importance of maintaining some spare capacity

to deal with surges is clear – too little investment in medical equipment will lead to strains in service provision and preventive care efforts, thereby undermining health system resilience (see chapters on critical care surge and care continuity).

Non-medical equipment is also important – notably computers and other IT equipment. An adequate physical IT infrastructure provides the basis for trained health professionals to monitor patient health, both in acute situations and in the long term. Used correctly, telemedicine can make care more responsive, leading to increased quality and efficiency (see the chapter on digital foundations).

On average, OECD countries invest around 0.25% of GDP each year on transport, machinery and equipment (both medical and non-medical) and IT hardware in the health and social care sector. Based on the scenario that all OECD countries should strive to reach the 75th percentile level in terms of annual investment in equipment, this would result in an average increase as a share of GDP of 0.08%. The same approach can determine the level of capital spending needed to maintain responsive health information systems, beyond the physical IT hardware; that is, spending on development of software and databases. Again, an increase in capital spending to bring the level up to the 75th percentile would equate to an average increase of 0.05% of GDP (Figure 14.7).

Figure 14.7. Average investment in machinery, equipment and intellectual property products in the health and social sectors as a share of GDP, 2016-19



Note: Refers to average expenditure on gross fixed capital formation on machinery, equipment and intellectual property products from 2016 to 2019 in the health and social care sectors. Data not available for Türkiye.

Source: OECD National Accounts Table 8A. Capital formation by International Standard Industrial Classification of All Economic Activities rev4.

Investment 4: Well-harnessed health information

Beyond capital investments, better use of health data is critical (see the chapter on digital foundations). This reflects ongoing deficiencies in the health sector – a sector where correct decisions can have considerable impact, but one that remains “data rich but information poor” (Oderkirk, 2021^[22]). Improved IT linkages are needed to move information to where it is needed, not only within the health system but also externally; for example, facilitating whole-of-government decision making by balancing information on health system capacity versus containment and mitigation decisions.

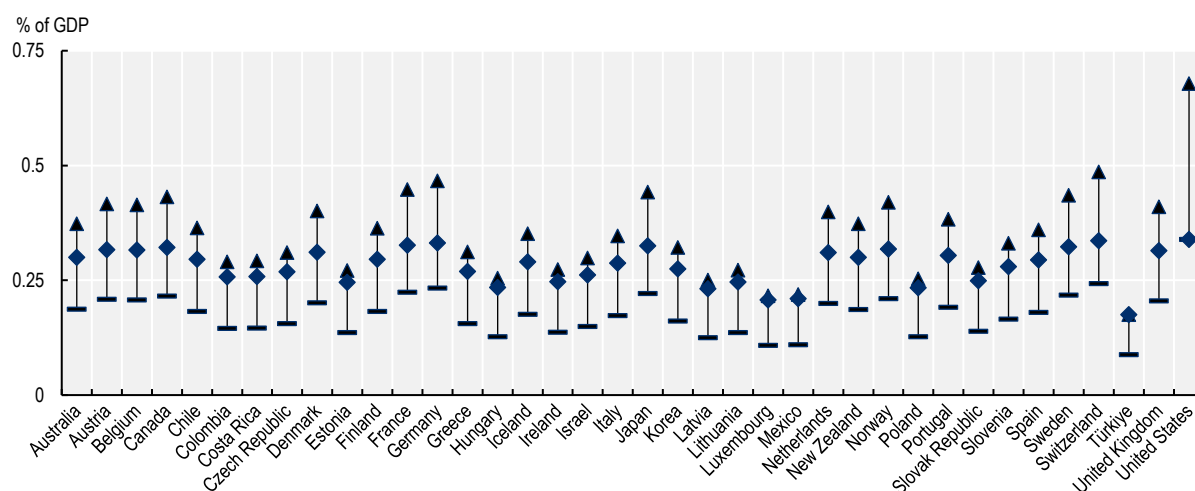
Judicious use of routine health data improves containment and mitigation efforts, including early warning systems, and ensures that patients receive the right care for their needs (including wider adaptation of

telemedicine) and are adequately followed up. To strengthen trust in digital health solutions, there is a need to ensure that use of such personal data is responsible and well informed. This includes enabling privacy, ensuring personal data protection and digital security, and promoting the interoperability and governance of health data.

The OECD report *Health in the 21st Century* concludes that health lags behind many other parts of the economy in harnessing the potential of data and digital technology, “missing the potential to save a significant number of lives and billions of dollars” (OECD, 2019^[23]). The report notes that a conservative doubling of current investment levels is needed to promote more intelligent use of data for information and knowledge, and that this could equate to a healthy return of approximately three to one.

Assuming that countries with overall higher spending are already more advanced in harnessing their health data and information, an inversely proportional additional investment range of 2-4% of health care expenditure is applied, in line with the OECD report. Thus, for the United States (the highest spender), an increase of 2% of health spending is needed, and for Türkiye (the lowest spender), an additional 4% is needed. Using health spending data across OECD countries in 2019, the level of additional investment would represent around 0.26% of GDP (Figure 14.8).

Figure 14.8. Additional spending to harness health information in OECD countries, as a share of GDP



Note: The arrow represents an additional 2-4% of 2019 health spending as a share of GDP, while the diamond indicates the estimated investment need, based on overall levels of health spending.

Source: Authors' calculations based on OECD Health Statistics 2021.

Pillar 3: Bolster health professionals working on the front line

Investment 5: Sufficient health and long-term care professionals

At the heart of health system resilience is a stronger front line (see the chapter on workforce). Concerns about retention of staff, and associated labour and skill shortages, have been accumulating over recent years. Increased pressure from demographic change, population demands, and added concerns about the upcoming retirement of an older generation of doctors and nurses are expected to exacerbate such shortages (OECD, 2016^[24]).

Securing sufficient numbers of skilled health and care professionals – in hospitals, across primary care and in LTC – is essential. A reinforced workforce strengthens service delivery, enabling effective case

management of individuals with COVID-19 (or those hospitalised due to other types of health shocks), while maintaining services at all levels of a health system for other health care needs.

The pandemic has heightened awareness among governments and citizens alike that nursing and care staff deserve greater recognition for the skill, responsibility and empathy they demonstrate on a daily basis. During the first and subsequent waves of the pandemic, health and care workers were at the front line, enduring long and difficult working conditions, with increased risk of infection, serious illness and death.

Costing the investment need is broken down into two major cost drivers: the cost of having an adequate number of health and LTC professionals; and the cost of improving the competitiveness of salaries of key cadres of health and LTC workers.

- Building an adequate health workforce

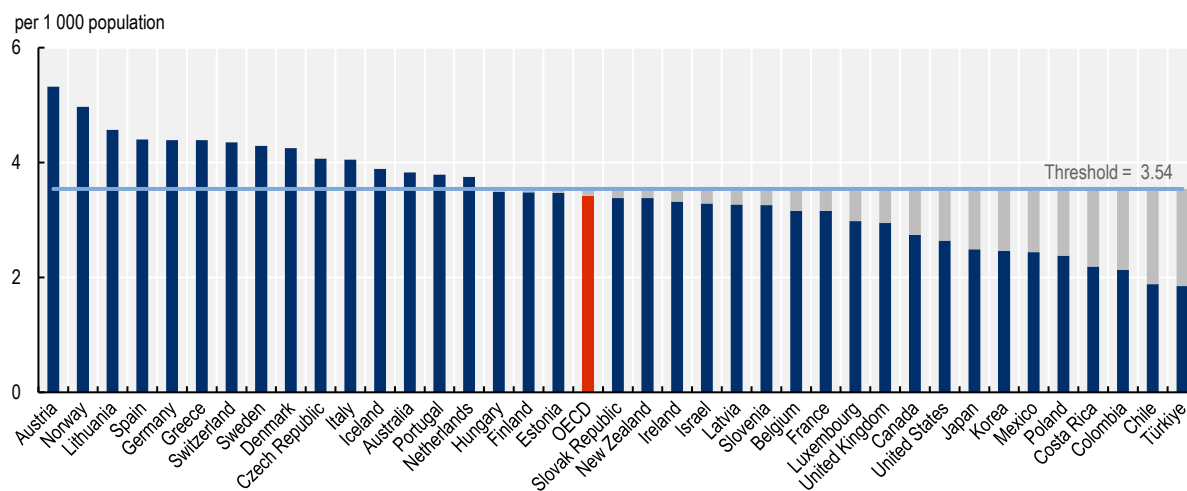
Notwithstanding the many factors determining the optimal density of medical professionals in any one country – such as demographic and disease patterns, geographical and rural/urban characteristics and organisation of care across providers – a simple international benchmarking exercise provides order-of-magnitude cost estimates for increases in staffing required for countries with relatively low numbers of health professionals.

Various thresholds for determining health worker densities have been put forward. The 2006 World Health Report identified a minimum density of 2.3 skilled health workers (physicians and nurses/midwives) per 1 000 population – a figure used to monitor progress towards meeting the Sustainable Development Goals (SDGs) (WHO, 2006^[25]). The Global strategy on human resources for health: Workforce 2030 report considered an updated threshold of 4.45 health workers per 1 000 population to reflect the broader range of services targeted by universal health coverage (UHC) and the SDGs, while acknowledging that OECD health systems go beyond provision of essential health services with a density of health workers above this threshold (WHO, 2016^[26]). More pertinently in the context of resilience, as part of a systematic analysis for the Global Burden of Disease Study 2019 to measure human resources for health in relation to UHC, the Institute for Health Metrics and Evaluation derived levels of health worker density required to achieve a performance target of 90 out of 100 on the UHC effective coverage index (GBD 2019 Human Resources for Health Collaborators, 2022^[27]). The thresholds of 3.54 physicians and 11.45 nurses/midwives per 1 000 population are, therefore, adopted in this chapter (Figure 14.9, Figure 14.10).

Bringing the density of physicians up to this threshold (and assuming current remuneration levels of physicians) for all OECD countries would require an average investment of 0.15% of GDP. The increase in the numbers of nurses and midwives across OECD countries to reach the threshold of 11.45 per 1 000 population would require an average investment of around 0.33% of GDP.

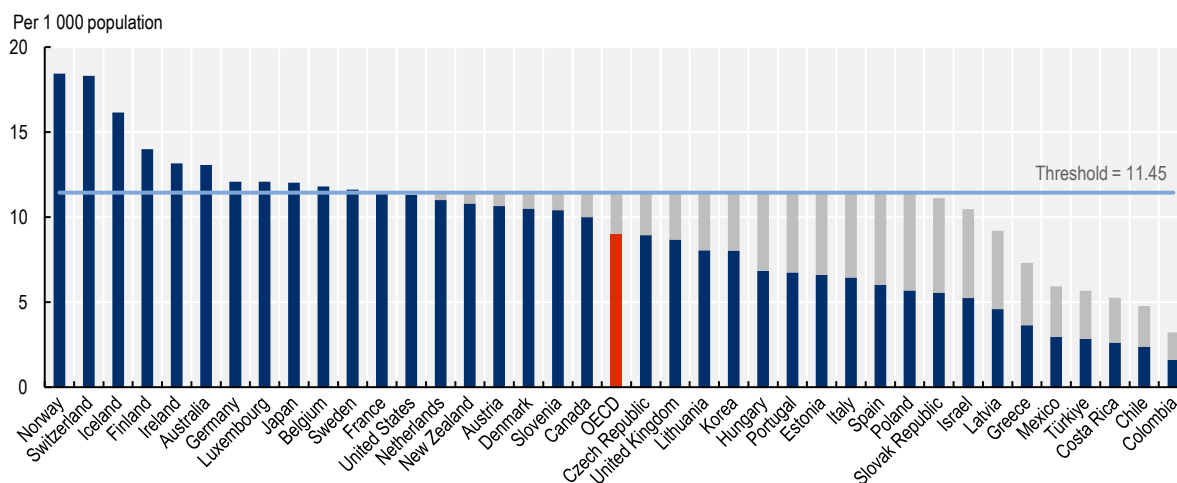
The number of workers in the LTC sector has also proved to be a key factor in mitigating the effects of the pandemic on the elderly population. Even some of the best-staffed high-income OECD countries do not rate the availability of LTC workers in their country as satisfactory (Colombo et al., 2011^[28]). A study by the International Labour Organization on coverage deficits in LTC sought to establish a minimum threshold for provision of care, based on the median population-weighted value of selected OECD countries (ILO, 2015^[29]). Meeting such a threshold, while recognising the very low levels in some countries, would equate to an average investment of 0.04% of GDP. Taken together with investment in physicians and nurses, this amounts to a net increase of more than 3.5 million health and care professionals across all OECD countries, or a 15% increase overall.

Figure 14.9. Practising physicians (headcount) per 1 000 population, 2019 (or latest year)



Note: Data for countries reporting active or registered physicians rather than practising physicians are adjusted using an OECD average ratio. The grey bar represents the additional physician numbers required to reach the threshold.
Source: OECD Health Statistics 2021.

Figure 14.10. Practising nurses/midwives (headcount) per 1 000 population, 2019 (or latest year)



Note: Data for countries reporting active or registered nurses rather than practising nurses are adjusted using an OECD average ratio. The grey bar represents the additional nurse/midwife numbers required to reach the threshold (with a maximum 100% increase).
Source: OECD Health Statistics 2021.

- Raising the competitiveness of salaries for nurses and care workers

Estimates of the costs of increasing salaries for nursing and personal care workers use OECD data on the current and additional number of health and care workers across various categories, along with reported levels of remuneration for 2019 available for hospital nurses in 35 OECD countries. This is combined with data on the relative salaries of different cadres of nurses and carers. The OECD publication *Who Cares?* provides salary comparisons between carers and broader groups of nurses and health workers (OECD, 2020_[30]).

Increasing the wages of nursing and care workers, using as a base the average OECD nurse salary level (relative to average national income), corresponds to an average increase of 0.14% of GDP.

Investment 6: Medical reserve

Boosting and optimising the capacity of health systems to respond to the surge in the demand for care associated with COVID-19 cases has been a major challenge faced by countries – particularly early in the pandemic. As doctors, nurses and other health professionals were mobilised to play the role of first responders, health systems sought ways to increase the number of staff available rapidly. Several countries mobilised inactive and retired health professionals. Other countries turned to military health professionals, to assist in testing, treatment and relocation of patients. Countries also mobilised students in medical, nursing and other health education programmes to provide services to patients or to help in responding to public concerns; for example, staffing telephone hotlines or taking on the non-clinical tasks of key clinical staff (see the chapter on workforce).

Creating a medical reserve can offer a flexible and cost-effective surge capacity that can be called on in times of high need. Costs relate primarily to recurrent training, so people enlisted in a country's medical reserve maintain the necessary skills to support full-time health professionals and can integrate to best effect during a peak in COVID-19 cases or other emerging health shock. Based on the annual budgets for this type of entity, the annualised cost to develop and maintain a medical reserve force are estimated to be in the range 0.02% to 0.04% of GDP. This excludes additional costs associated with deployment of surge capacity during a health shock (such as per diem payments and travel allowances).

14.4. Conclusions: Targeted investments will improve resilience

Targeted investments in health systems strengthen resilience to the ongoing pandemic and emerging future shocks. In doing so, they protect society and stimulate the economy. This chapter identifies six key investments under three overarching pillars that aim to protect people's underlying health; fortify the foundations of health systems; and bolster health and LTC professionals working on the front line.

Taken together, the six investments amount to an estimated 1.4% of GDP on average (compared with the 2019 pre-pandemic baseline), with a cross-country range of 0.6% to 2.5%, depending on how much a country is already spending on each of the targeted areas. These estimates are based on such increases in the ratio of health spending to GDP being reached and then spending in these areas being maintained over time. The numbers reflect broad order-of-magnitude estimates rather than results based on a precise cost-accounting analysis.

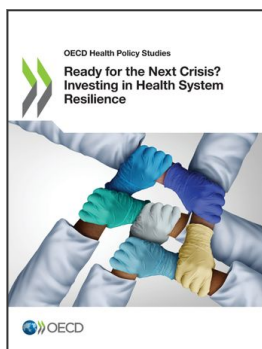
Funding such investments requires buy-in from ministries of finance as well as health ministries and social security institutions. In the current context of tight public finances in most OECD countries, a combination of targeted spending and measures to reduce wasteful spending could be used. Moving forward, the return from these targeted health system investments is likely to outweigh the costs substantially. For example, effective interventions in preventive care would eventually reduce the need for health care, with consequent cost savings.

Within the health sector, such investments stop the health system from being overwhelmed. In the medium term, they can also increase efficiency by reducing ineffective and wasteful spending. Beyond the health sector, such investments will boost the economy: a stronger, more resilient health system helps to reduce the stringency of containment and mitigation measures. It strengthens human capital both now, through a healthier and more productive workforce, and in the future, through less disrupted education.

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