Megatrend 2
Health & Care

It doesn't stop at pandemics: Together, policy makers and health experts have to find solutions for myriad health and caregiving challenges
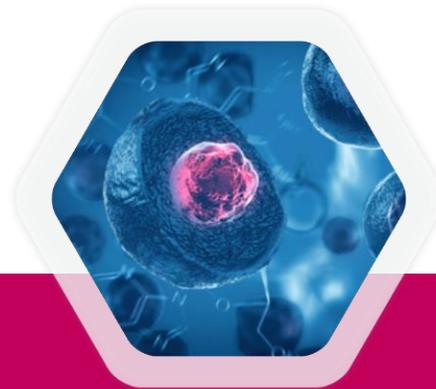
Subtrends of megatrend "Health & Care"

1

2

3

Pandemics &
Other Challenges

Diseases &
Treatments

Care-
giving

Roland
Berger

1 Pandemics & Other Challenges

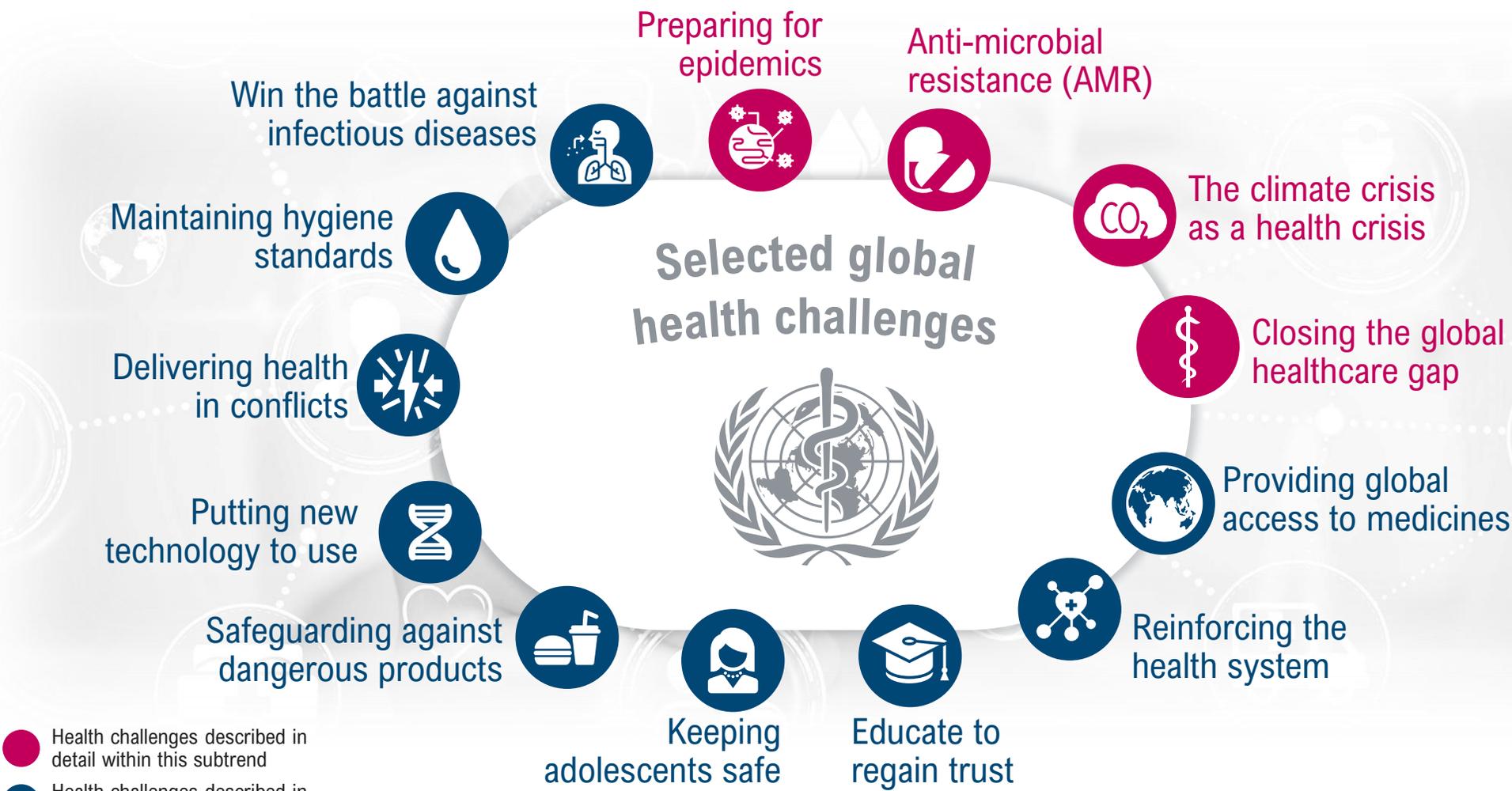**2** Diseases & Treatments

3 Care-giving

While the negative fallout from the coronavirus pandemic still looms over the healthcare system, further important challenges lie ahead

13 most important health challenges according to WHO

Selected global health challenges

Preparing for epidemics

Anti-microbial resistance (AMR)

Win the battle against infectious diseases

The climate crisis as a health crisis

Maintaining hygiene standards

Closing the global healthcare gap

Delivering health in conflicts

Putting new technology to use

Providing global access to medicines

Safeguarding against dangerous products

Reinforcing the health system

Keeping adolescents safe

Educate to regain trust

● Health challenges described in detail within this subtrend

● Health challenges described in an overview on the next page

Sources: WHO; Roland Berger

Roland Berger

From winning the battle against infectious diseases to providing global access to medicines – The scope of the challenges is tremendous …

Selected global health challenges (1/2)

Win the battle against infectious diseases
> **Infectious diseases** such as HIV, tuberculosis, malaria, and sexually transmitted infections **will cause an estimated 4 million deaths** in 2020
> The major causes are **inadequate funding and weakness of health systems** in endemic countries – most of which are developing countries

Maintaining hygiene standards
> Water, sanitation and hygiene services are crucial for a viable health system. Any **lack of such basic provisions** leads to poor quality of care and **an increased risk of infection**
> Around **1/4 of global health facilities do not have a basic water supply**

Delivering health in conflicts
> In recent years, **many outbreaks of dangerous diseases** occurred in countries with protracted conflict
> In addition, **conflicts** are forcing record numbers of **people to be displaced**, leaving them with little access to healthcare

Putting new technology to use
> Genome editing, synthetic biology, and **digital health technologies** such as artificial intelligence help to **prevent, diagnose, and treat diseases**
> Their **use should be encouraged** while being carefully monitored

Safeguarding against dangerous products
> **Dietary deficiencies and unhealthy diets** are responsible for **almost one third of today's global burden of disease**
> Simultaneously, **diet-related diseases are increasing due to the consumption of foods** that are high in sugar, saturated fats and salt

Keeping adolescents safe
> Every year, more than **1 million young people aged 10-19 die**
> **Leading causes** of death in this age group are **traffic accidents, HIV, suicide, lower respiratory tract infections, and interpersonal violence**

Educate to regain trust
> **Trust in public health is threatened** by the uncontrolled spread of misinformation on social media and an erosion of trust in institutions
> The **anti-vaccination movement** has been a major factor in the **surge in fatalities from preventable diseases**

Reinforcing the health system
> Chronic lack of investment in training and recruitment, paired with a failure to ensure adequate pay, has led to a **global shortage of health workers**
> By 2030, **18 million additional health workers** are needed

Providing global access to medicines
> **One third** of the global population **lacks access to medicines, vaccines, and diagnostic tools**
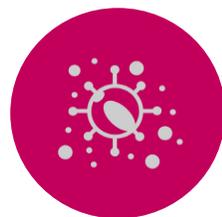> **Improving** access to medication while ensuring quality also **requires fighting sub-standard and rogue products**

Sources: WHO; Roland Berger

Roland Berger

… including four of the most pressing which will be explored further in the following section

Selected global health challenges (2/2)

Preparing for epidemics

> The coronavirus crisis is reinforcing the message, that it is **not a matter of 'if'** another epidemic will strike, **but 'when'**

> When it strikes it **will** most likely **spread fast**, potentially threatening millions of lives

> Governments need to **prepare for further outbreaks**

Anti-microbial resistance (AMR)

> Due to unregulated prescription practices and the overuse of antibiotics (among other factors), **AMR is rising**, jeopardizing modern medicine's many achievements

> A **more targeted use** of antibiotics and the development of **new antibiotics** are both key in combatting AMR

The climate crisis as a health crisis

> Climate change causes more extreme weather events exacerbating **malnutrition** and the **spread of infectious diseases**

> Many of today's **common diseases** can **be traced back to a changed climate**

> **Air pollution kills** approx. 7 million people every year

Closing the global healthcare gap

> People in wealthier countries on average live **18 years longer** than people in poorer countries

> It is paramount to **improve access to primary care** which addresses the majority of a patient's healthcare needs

Sources: WHO; Roland Berger

Roland Berger

The scale of human tragedy along with the deep economic downturn due to COVID-19 demonstrates the world's vulnerability to pandemics
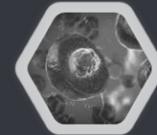
Global cases and death count, selected countries ['000 cases/fatalities, %]

		Cases	% of population	Fatalities	% of cases
	World	207,384	2.7%	4,363	2.1%
	US	36,889	11.1%	622	1.7%
	India	32,251	2.3%	432	1.3%
	Brazil	20,379	9.6%	569	2.8%
	France	6,479	10.0%	113	1.7%
	UK	6,326	9.3%	131	2.1%
	Italy	4,444	7.4%	128	2.9%
	Germany	3,832	4.6%	92	2.4%
	South Africa	2,614	4.4%	77	3.0%
	Japan	1,182	0.9%	15	1.3%
	China	106	0.0%	5	4.4%
	Australia	40	0.2%	1	2.4%

Annual growth of global GDP [%]

Average growth 1980–2020: **3.3%**

Global Financial Crisis

0%

COVID-19 Pandemic

-3.3%

1980 1985 1990 1995 2000 2005 2010 2015 2020

1) As of August 16, 2021
Sources: Johns Hopkins University; IMF; Roland Berger

Roland Berger

1 Pandemics & Other Challenges

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3 Care-giving
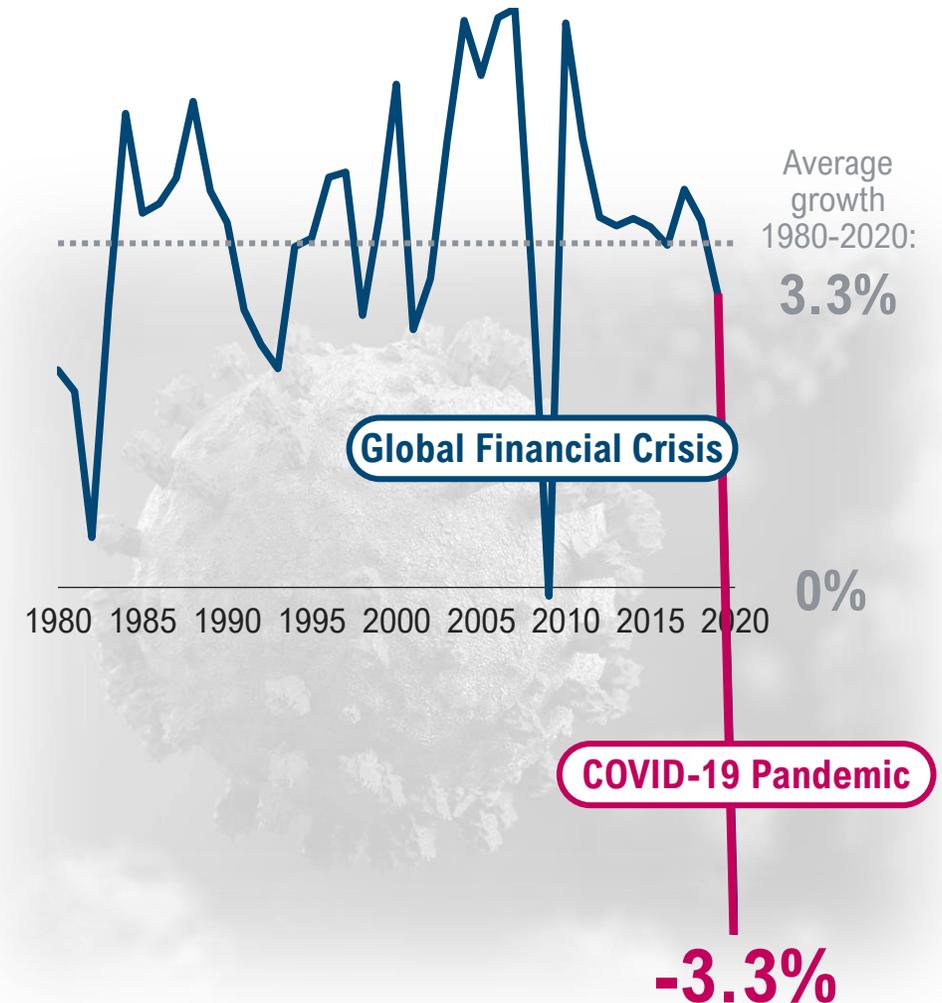
Throughout history, humanity has been accompanied by pandemics – Experts foresee worse pandemic events in the future

200 m
Black Death (Bubonic plague)
The worst pandemic to date wiped out almost a third of the world's population around 700 years ago

15 m
The Third Plague
The third plague pandemic (after the 6th century's Justinian Plague and the "Black Death"), began in China in the mid-19th century

20-50 m
Spanish Flu
The Spanish flu was an influenza pandemic that appeared towards the end of World War I. The Spanish flu resulted in the deaths of more people than World War I

4.4 m
COVID-19
The coronavirus pandemic is the worldwide outbreak of the respiratory disease COVID-19

| 1300 | 1347-1351 | 1520 | 1855 | 1918-1919 | 1981-present | 2000-2016 | 2020-present | ? | 2050 |

Smallpox
Smallpox killed approximately 90% of Native Americans. Indeed, the first ever vaccine was created to ward off this disease
56 m

HIV/Aids
AIDS refers to a specific combination of symptoms that occur in humans as a result of the destruction of the immune system triggered by HIV infection
25-35 m

MERS	850
SARS	770
Swine Flu	200K
Ebola	11.3K

> We are going to **get more pandemics** (…) I don't think there's any doubt about it. (…) We will get pandemics **with much higher mortality** than the one we just had.

– Professor Sir John Bell, Regius Professor of Medicine, Oxford University, and member of the UK Vaccine Taskforce
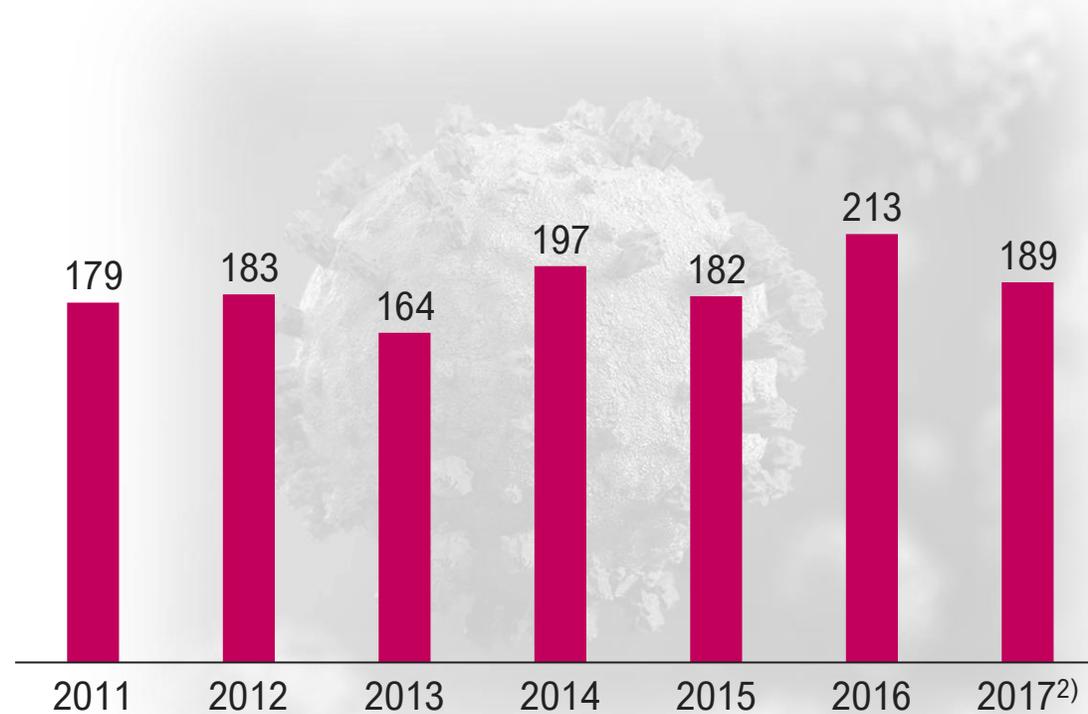
Roland Berger

The COVID-19 pandemic is a global health crisis, yet many more locally contained epidemic events are taking place every year

Number of epidemic events[1] by year

179 — 2011
183 — 2012
164 — 2013
197 — 2014
182 — 2015
213 — 2016
189 — 2017[2]

> While the Corona pandemic spread to almost all countries and regions of the world, thereby generating global awareness, **local epidemics** take place **every year in different parts of the world**

> An **epidemic** is the occurrence **in a community or region** of cases of an illness, specific health-related behavior, or other health-related events clearly in excess of normal expectancy

> A **pandemic** is an epidemic **occurring worldwide** or over a very wide area, crossing international boundaries, and usually affects a much larger number of people

> How quickly an **epidemic** can **turn into a pandemic** was demonstrated in the case of the coronavirus in 2020

> One reason for the **rapid spread** is to be found in **globalization** and its associated ease of travel of goods, animals and people, unconsciously spreading viruses potentially across greater distances

> In addition to the danger to life of these events, there are also considerable other **longer-term consequences** depending on the type of virus: Babies with birth defects such as malformation of the brain due to the Zika virus epidemic in parts of Latin America will require lifelong care; health implications of people suffering from "Long Covid" are not yet fully understood and will require adequate research, therapy and care

> The global community **must prepare** for future pandemics, starting with the containment of epidemics

1) Analysis excluded Poliomyelitis. The following epidemic and pandemic diseases were analyzed: Avian Influenza A(H5N1), A(H7N9), A(H7N6) A(H10N8), A(H3N2), A(H5N6), A(H9N2), Chikungunya, Cholera, Crimean-Congo hemorrhagic fever, Ebola virus disease, Lassa fever, Marburg virus disease, Meningitis, MERS-CoV, Monkeypox, Nodding syndrome, Nipah virus infection, Plague, Rift Valley fever, Shigellosis, Typhoid fever, Viral hemorrhagic fever, West Nile fever, Yellow fever, Zika virus disease. If a disease caused more than 1 epidemic event by year in a country, it was only counted once for the year it occurred in that country. Includes cases imported or locally transmitted
2) WHO data as of 12 January 2018 (note: 2017 data is not complete)
Sources: WHO; Dictionary of Epidemiology; Roland Berger

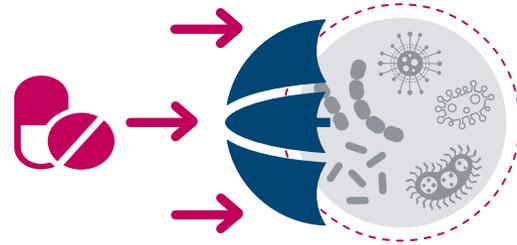Roland Berger

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Combating infectious diseases is one area to prevent further pandemics – Antimicrobial resistance is a key global concern requiring concerted action
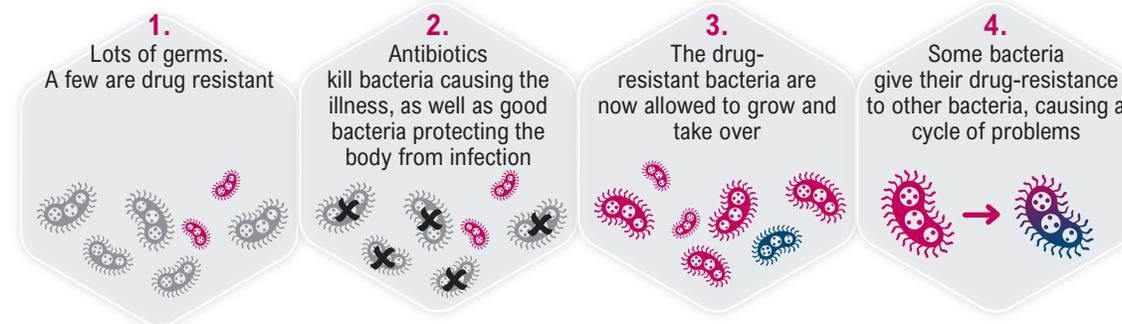
What are drug resistant infections?

Antimicrobial Resistance (AMR) is **resistance to drugs that treat infections** caused by microbes (parasites, viruses, bacteria or fungi)

This is a natural phenomenon: **microbes evolve to develop resistance to drugs as they are exposed to them**

How antimicrobial resistance occurs (example antibiotics)

1.
Lots of germs.
A few are drug resistant

2.
Antibiotics
kill bacteria causing the
illness, as well as good
bacteria protecting the
body from infection

3.
The drug-
resistant bacteria are
now allowed to grow and
take over

4.
Some bacteria
give their drug-resistance
to other bacteria, causing a
cycle of problems

Human action is making AMR even worse

Misuse or overuse of anti-
microbial drugs in and in
the breeding of healthcare
crops and animals

Poor sanitary
conditions

Inappropriate food
handling

Poor infection prevention
and control practices in
hospitals

> **Antimicrobial resistance (AMR)** occurs when germs such as bacteria, fungi and parasites acquire the ability to **resist the drug** that is designed to kill them – it is not the human body that is becoming resistant to antimicrobial drugs such as antibiotics, it is the microbe (causing the infection) that has become resistant

> AMR not only affects humans – (farm) **animals and plants** as well as **pets** are **also affected** by the overuse of antibiotics – resistant germs are transferred to humans when ingested, or on close contact

> **Farm animals** habitually receive **excessive amounts** of antimicrobial drugs, in particular **antibiotics**

> **Combating** AMR as a global effort has been **neglected for a long time** for many reasons: Novel antibiotics R&D, for example, is characterized by a very low success rate, while being lengthy and extremely costly – often authorization takes longer than the virus's journey to resistance. Therefore, the pharmaceutical industry has little commercial interest in the development of new antibiotics

> However, **AMR is now a global concern** – today 85% of all UN member states have incorporated the fight against AMR into their national plans or are intending to do so; without concerted action it will simply be increasingly difficult to prevent the accelerating impact AMR has on public health and national health systems

Sources: WorldBank; CDC; WHO; GARDP; AMR Action Fund; Roland Berger

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Combating AMR is challenging because resistant microbes spread in a variety of ways – Routes to antibiotic overuse are multi-layered/factorial

Transmission routes of antibiotic-resistant bacteria

Potential routes of transmission of antibiotic-resistant bacteria

> Humans, pets, livestock and fish farms rely on equivalent classes of antibiotics to treat infectious diseases. With exposure to these antibiotics, both pathogenic and non-pathogenic **bacteria develop the ability to survive**

> These bacteria can spread into the environment through a **variety of pathways**, such as **water supplies** and **water sanitation systems**: Sewage treatment plants do not completely remove antibiotic-resistant bacteria before releasing treated water into waterways

> **Spreading animal manure** containing resistant bacteria on crops, where bacteria can thrive on plants, is another common pathway

> **Ingestion** of resistant bacteria can then occur via the food chain and subsequent consumption of foods that harbor resistant bacteria - but it should be noted that **the amount of antibiotics ingested through food consumption is toxicologically negligible**

> **Wildlife, insects, and other vermin** are also **potential carriers** of antibiotic-resistant microbes

> Nevertheless, **tourism, migration, and import of food are reported as the most rapid pathways for the spread** of resistant bacterial strains across borders

> In **healthcare facilities** such as hospitals and nursing homes, resistant bacteria may spread through **interaction** between patients or with healthcare workers, or by contaminated medical equipment and surfaces

Sources: bioMérieux; BvL; Roland Berger

Roland Berger

The consequences of not addressing the problem of AMR would be tremendous – But the fight against AMR is gaining momentum

> **A post-antibiotic era means an end to modern medicine as we know it. Things as common as strep throat or a child's scratched knee could once again kill**

– Margaret Chan, former director-general of WHO, 2012

A failure to address the problem of AMR could result in

10 m deaths p.a. directly related to AMR by 2050, whereof in

Asia   47%

Africa   41%

~90 trillion USD of losses for the world GDP

Combating AMR activity is in full progress

138 research & development projects in the pipeline in 2020

Antifungal medicines

Antibacterial vaccines

| 10 | 101 | 27 |

Antibacterial medicines

87 Other

138 projects

51 In late-stage clinical development

51 projects

32 Antibiotics

7 Antifungals

12 Vaccines
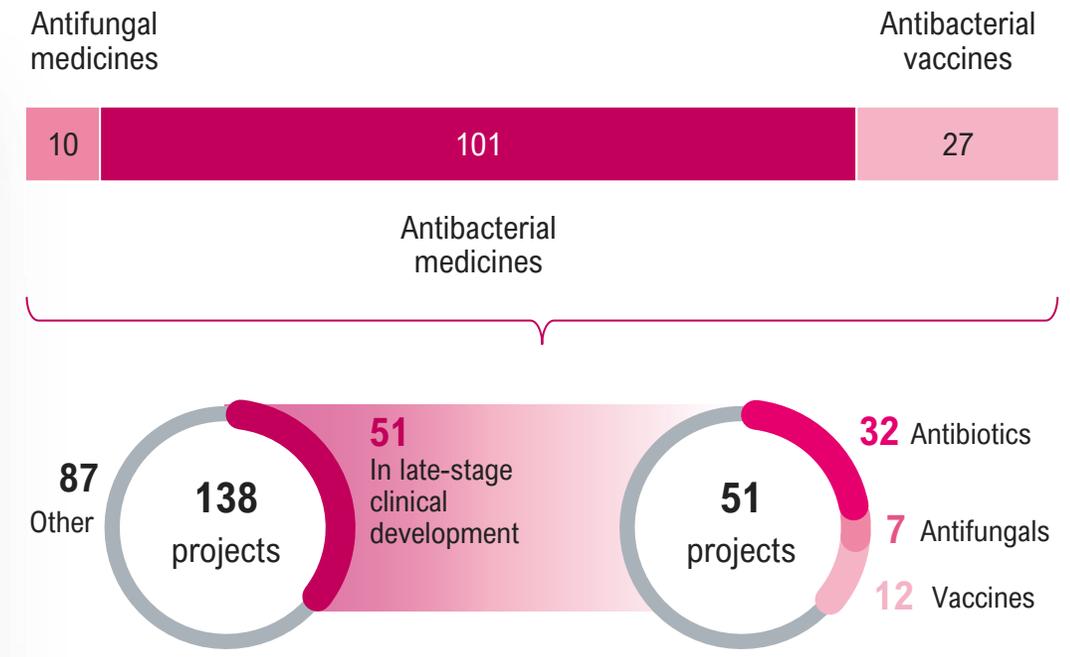
The fight against AMR is picking up on several fronts: Innovative ways of funding for the development of new drugs are being explored, for example through the international Global Antibiotic R&D Partnership (GARDP) and the industry's AMR Action Fund. In addition, new methods such as novel antibacterial agents are also being tested

Sources: WHO; Wellcome Trust; PHE; Roland Berger

Roland Berger

Climate change impacts human health in a multitude of ways and presents society with arguably the greatest challenge to master in future years

Effects of changing climate on human health

Rising temp-eratures

Extreme weather

Air quality impacts

Vector borne diseases

Environmental effects

More frequent heatwaves | Increased flooding & storms | More intense wildfires | Increased pollution & GHG emissions | Changes in precipitation | Increased duration of warm season / Changes in median temperature

Secondary effects

Urban heat island effect | Property loss / Infrastructure damage / Water contamination | Increased allergens | Expanded geographical range | Changes in vector behaviors

Health effects

Heat stroke / Dehydration | Aggravated cardiovascular illnesses | Aggravated respiratory illnesses | Injury & Death / Water borne illness | Increased allergy-related illnesses | Increased cases of vector-borne diseases such as, Lyme disease, Malaria, Zika Virus, and West Nile Virus

Sources: APHA; Roland Berger

Roland Berger
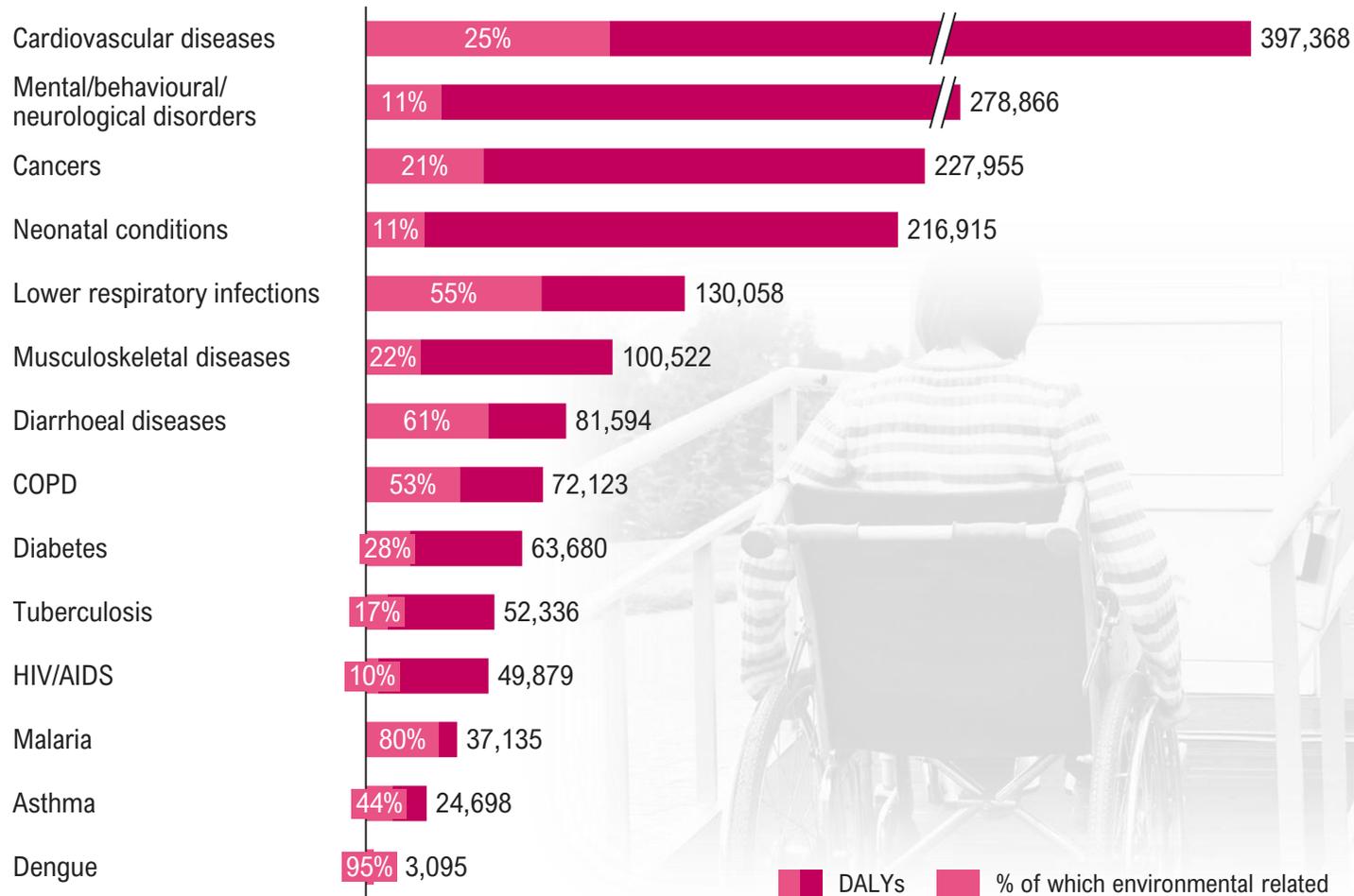
Many disability adjusted life years (DALYs) are attributable to external environmental conditions

Global burden of disease and share attributable to the environment, 2016 ['000 DALYs[1], %]

Disease	% environmental	DALYs
Cardiovascular diseases	25%	397,368
Mental/behavioural/neurological disorders	11%	278,866
Cancers	21%	227,955
Neonatal conditions	11%	216,915
Lower respiratory infections	55%	130,058
Musculoskeletal diseases	22%	100,522
Diarrhoeal diseases	61%	81,594
COPD	53%	72,123
Diabetes	28%	63,680
Tuberculosis	17%	52,336
HIV/AIDS	10%	49,879
Malaria	80%	37,135
Asthma	44%	24,698
Dengue	95%	3,095

■ DALYs   ■ % of which environmental related

> Compared to the average temperature in the period 1850-1900, the world has on average **warmed by approximately 1.1°C**. Of the last 3 decades, each has been successively warmer than any preceding decade since 1850

> **Climate change affects** the environmental and social determinants of **human health** – safe drinking water, clean air, sufficient food and secure shelter

> Many people are losing their lives in direct relation to the climate: In 2016, more than 13 million people died as a result of living or working in an unhealthy environment, representing **24% of all deaths**

> When accounting for both death and disability, more than **600 million DALYs** were lost due to environmental risks

> If environmental risks were removed, **up to 28% of all deaths in childr**en under five years could be prevented

> A significant proportion of some **"common diseases"** known today, such as cancer, **can be attributed to climate factors**, such as extreme weather events increasing the exposure to carcinogenic substances into the air
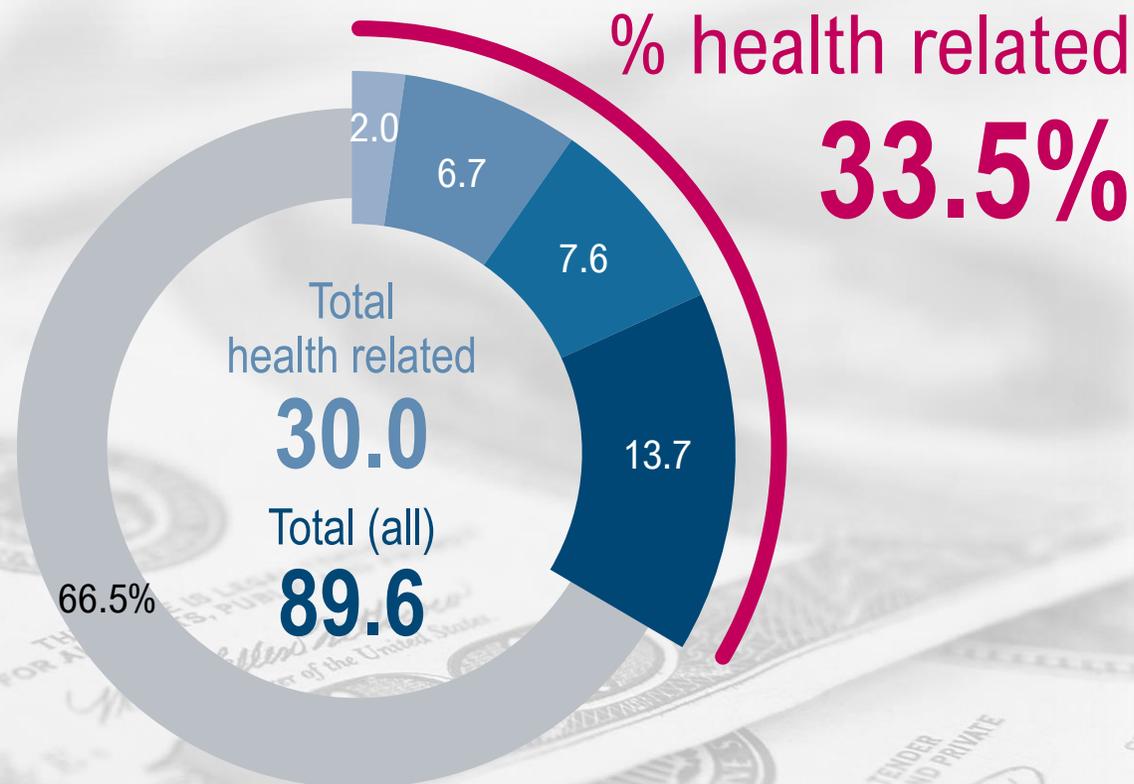
Sources: WHO; IPCC; Roland Berger

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Meeting all health-related costs accounts for a third of the total cost of addressing climate change

Estimated global annual cost[1] of climate change adaption, 2010-2050 [USD bn]

% health related

33.5%

Total health related
30.0

Total (all)
89.6

66.5%

2.0
6.7
7.6
13.7

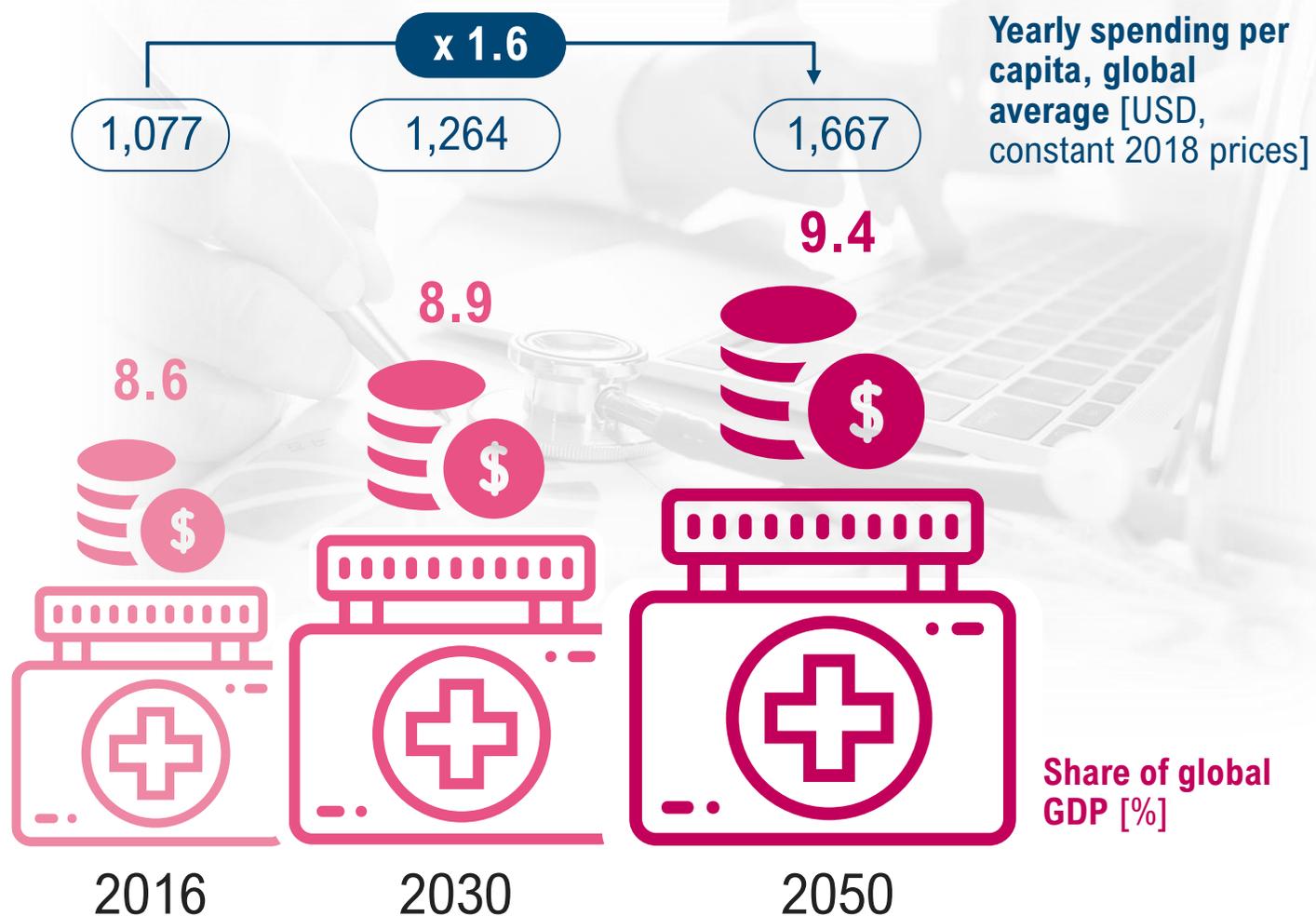Health sector · Extreme weather · Agriculture, forestry & fisheries · Water supply · Other

> The **wide range of health outcomes** potentially affected means accounting for

1) Costs associated with increased **healthcare and public health interventions** for morbidity and mortality from a long list of climate-sensitive health outcomes;

2) Costs associated with **lost workdays** and **lower productivity**; and

3) Costs associated with **well-being**

> Costs could also accrue from **repeated episodes** of malaria, diarrhea, or other infectious diseases that affect childhood development and health in later life

> Costs associated with actions taken in **other sectors** are also important for health, such as access to safe water and improved sanitation

> The **health-related costs of climate change** thus account for **around a third** of the total costs of addressing the impacts of climate change

1) All estimates are derived by applying unit costs to WHO estimates of health impacts of climate change
Sources: UNFCCC; NCBI; Roland Berger

Roland Berger

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To manage upcoming challenges, future global healthcare spending is set to increase but the rise is relatively modest
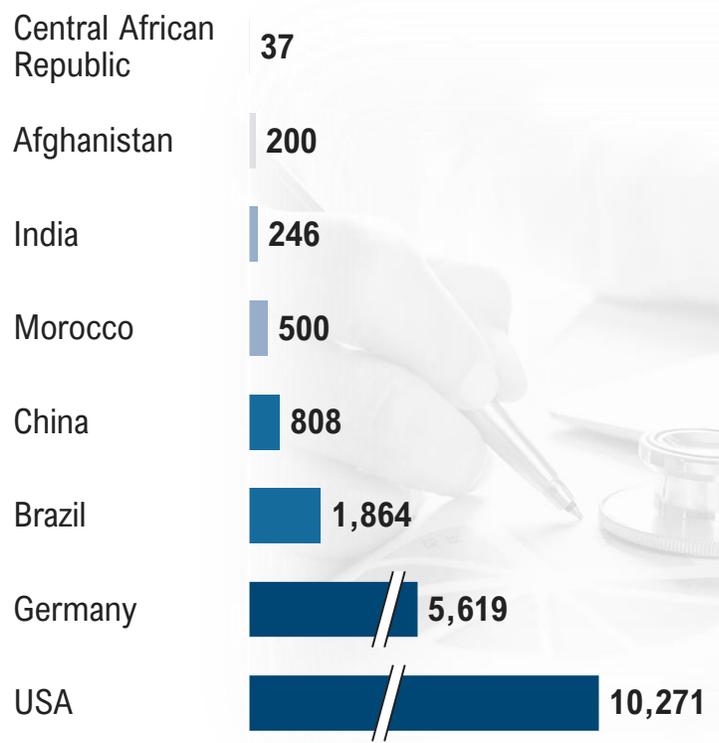
Development of global healthcare spending

x 1.6

| 1,077 | 1,264 | 1,667 |

Yearly spending per capita, global average [USD, constant 2018 prices]

8.6   8.9   9.4

2016   2030   2050

Share of global GDP [%]

> **Global health spending** is set to **increase**, both in absolute spending per capita as well as relative to economic output

> In 2016, **global healthcare spending** already accounted for **8.6% of global economic output** – the equivalent of about USD 8 trillion

> Absolute **healthcare spending** has been **growing** at a rate of about **4% p.a.** since 1995 – further growth is expected, but at a slower pace of 1.8% p.a. till 2050

> Healthcare spending in 2016 was also distributed very unevenly: **41.7%** of global health spending was in the US, which accounts for **4.3%** of the global population, while the poorest countries, home to approximately **10%** of the global population, only accounted for **0.4%** of global healthcare spending

> Besides total healthcare expenditures, future inequalities in spending are also set to increase: Low-income countries will comprise **15.7%** of the global population in **2050,** but still only see **0.6%** of spending on healthcare

Sources: Lancet; Roland Berger

Roland Berger

Health spending per capita is expected to rise in all country groups with middle income countries seeing the strongest growth to 2050

Health spending per capita [USD, real, PPP]

2016 – Selected countries

Country	Value
Central African Republic	37
Afghanistan	200
India	246
Morocco	500
China	808
Brazil	1,864
Germany	5,619
USA	10,271

2016 – Income groups[1]

2050 – Income groups[1]

2016	Factor	2050
125	x 1.7	207
274	x 2.5	675
1,009	x 2.8	2,858
5,621	x 1.6	8,812

Legend:
- Low income
- Lower-middle income
- Upper-middle income
- High income

1) Population-weighted averages
Sources: Lancet; Roland Berger

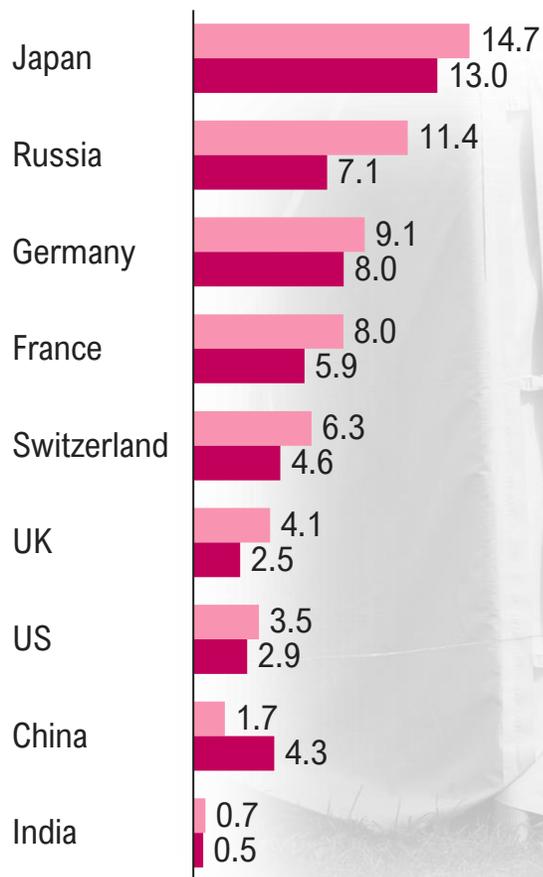Roland Berger

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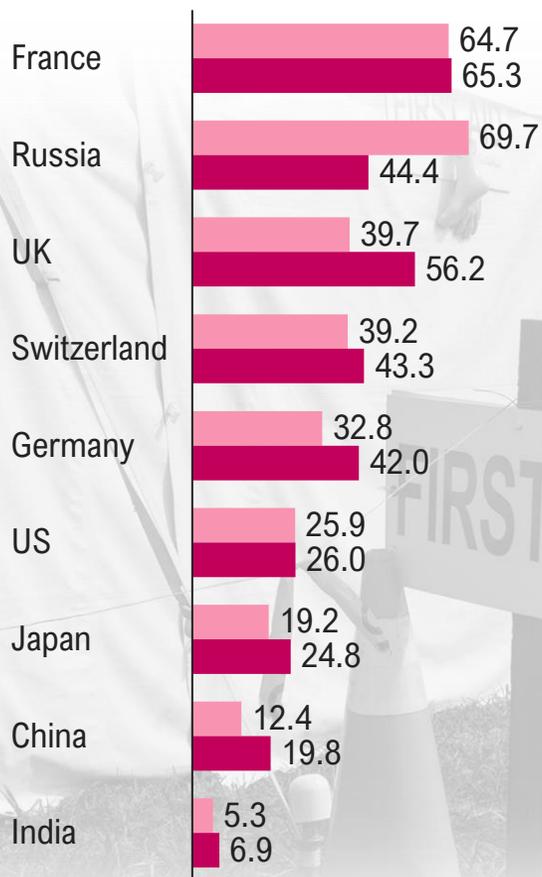Challenges

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Lower spending ultimately means fewer doctors and hospital beds particularly in low-income countries where quality of care is already low
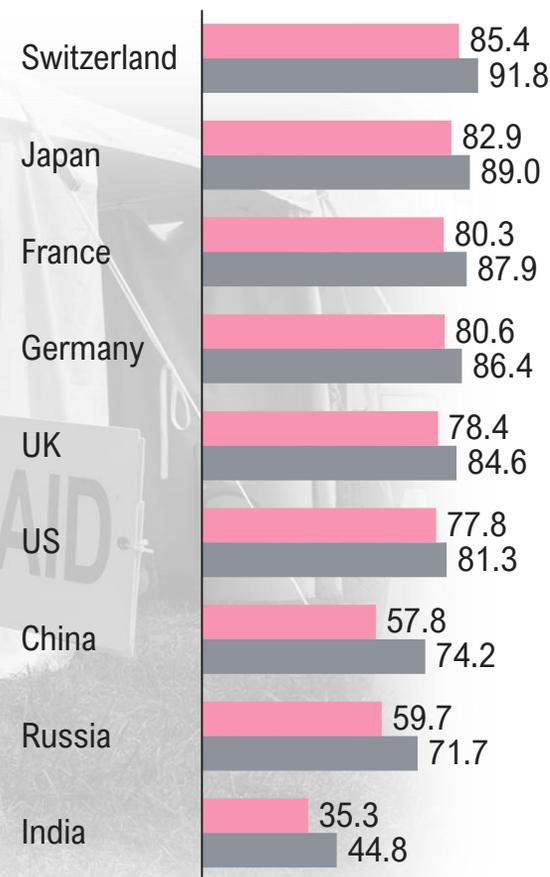
Hospital beds
per 1,000 inhabitants

Country	2000	2018
Japan	14.7	13.0
Russia	11.4	7.1
Germany	9.1	8.0
France	8.0	5.9
Switzerland	6.3	4.6
UK	4.1	2.5
US	3.5	2.9
China	1.7	4.3
India	0.7	0.5

Medical doctors
per 10,000 inhabitants

Country	2000	2018
France	64.7	65.3
Russia	69.7	44.4
UK	39.7	56.2
Switzerland	39.2	43.3
Germany	32.8	42.0
US	25.9	26.0
Japan	19.2	24.8
China	12.4	19.8
India	5.3	6.9

HAQ-Index[1]

Country	2000	2015
Switzerland	85.4	91.8
Japan	82.9	89.0
France	80.3	87.9
Germany	80.6	86.4
UK	78.4	84.6
US	77.8	81.3
China	57.8	74.2
Russia	59.7	71.7
India	35.3	44.8

Legend: ■ 2000 ■ 2015 ■ 2018 (or latest reported value)

> While the number of physicians and hospital beds are strongly correlated with healthcare spending, the above factors **do not** directly indicate **how good the access to** and **quality of healthcare services** are

> For example, **Japan** has **very few medical doctors** per 10,000 inhabitants, but still has a **very high score** in the HAQ index. The **UK**, on the other hand, has a **large number of physicians**, but **scores lower** on the **HAQ index**

1) The HAQ-Index is an abbreviation of Healthcare Access and Quality Index. The index is based on mortality from causes amenable to personal healthcare in 195 countries and territories
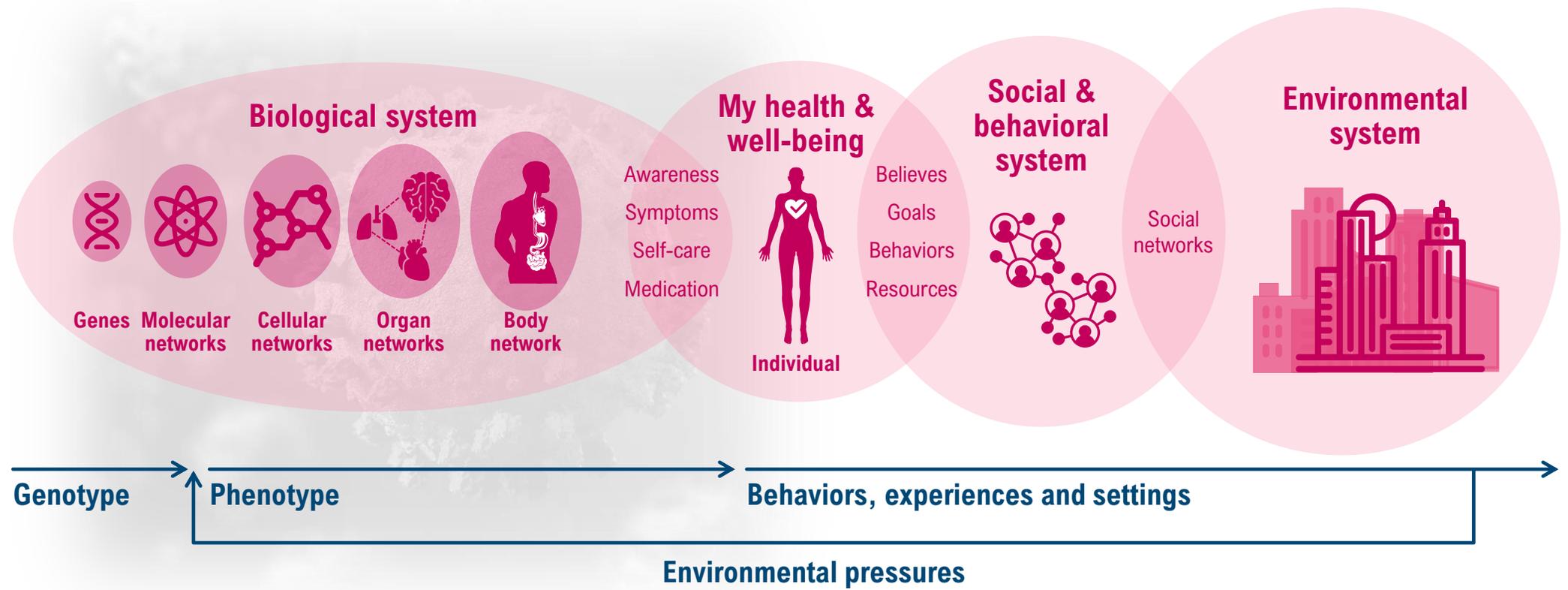Sources: OECD; Lancet; Roland Berger

Roland Berger
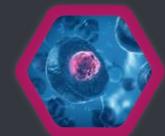
Understanding diseases and treatments is just one aspect of our concept of health – Our health is determined by numerous interconnected factors

From cells to systems – Holistic determinants/concept of health

Biological system

Genes | Molecular networks | Cellular networks | Organ networks | Body network

Awareness
Symptoms
Self-care
Medication

My health & well-being

Individual

Believes
Goals
Behaviors
Resources

Social & behavioral system

Social networks

Environmental system

Genotype → Phenotype → Behaviors, experiences and settings

Environmental pressures

> **Health** is a state of **complete physical, mental and social well-being** and not merely the absence of disease or infirmity
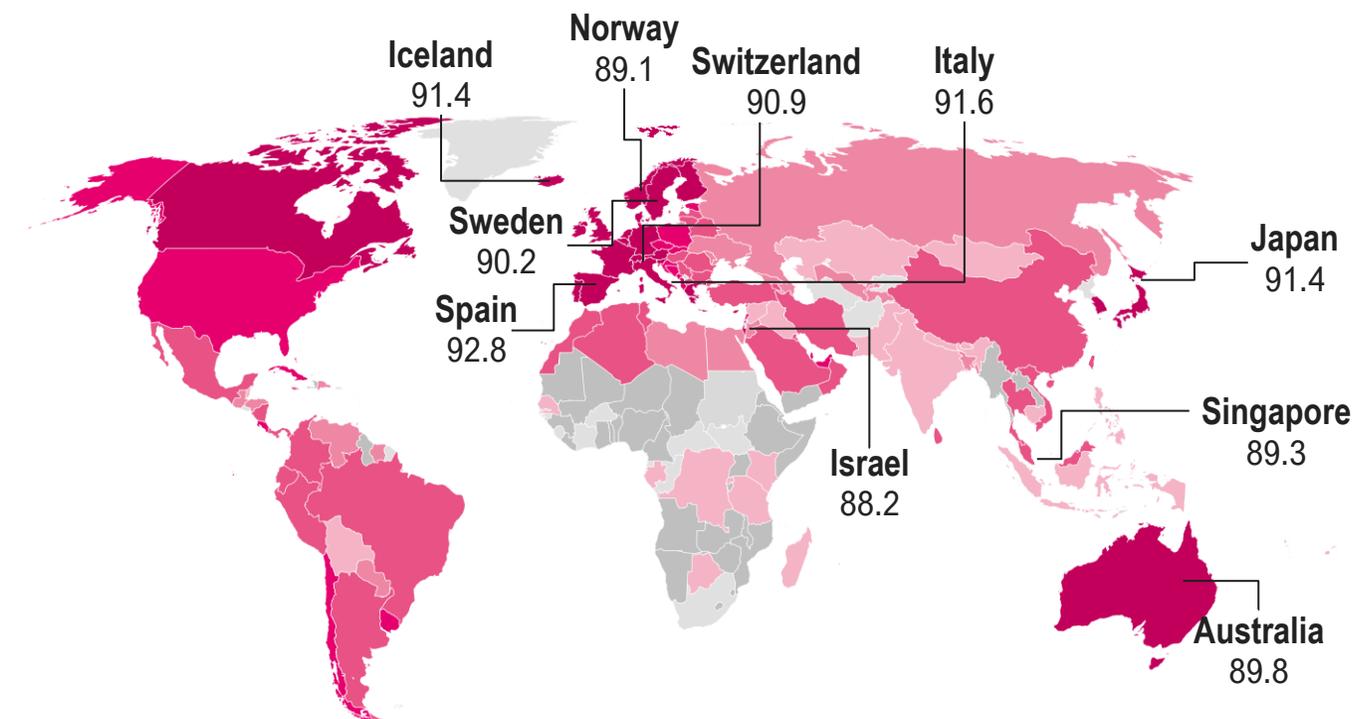>
> **– WHO Constitution, 1948**

Roland Berger

Europe does very well in a comparison of the healthiest countries worldwide – Spain offers the healthiest living conditions

Top 10 of the healthiest countries according to their Health Grade[1] 2019

Iceland 91.4
Norway 89.1
Switzerland 90.9
Italy 91.6
Sweden 90.2
Spain 92.8
Japan 91.4
Singapore 89.3
Israel 88.2
Australia 89.8

Legend: ■ >85 ■ 85 - 70 ■ 70 - 55 ■ 55 - 40 ■ 40 - 25 ■ <25 ■ no data

> According to the Bloomberg Health Index 2019, **Spain is the healthiest place to be**. Overall, European countries perform very well

> **Five other European nations** ranked among the **top 10** in 2019: Italy (2nd), Iceland (3rd), Switzerland (5th), Sweden (6th) and Norway (9th)

> The **healthiest Asian nation was Japan**, jumping three places to fourth compared to the 2017 survey, displacing Singapore, which fell to eighth

> **Australia** and **Israel** completed the top 10 in seventh and tenth place respectively

> Researchers from the University of Navarra claim that **eating habits** could provide **insights** to **health levels** in Spain and Italy, as "a **Mediterranean diet** supplemented with extra-virgin olive oil or nuts had a lower rate of major cardiovascular events than those assigned to a low-fat diet"

1) The Health Grade represents the difference between a health score and a negative health risk penalty. The health score, ranging in value from 0-100, considers variables such as mortality from communicable & non-communicable diseases, life expectancy, etc. The health risk penalty considers environmental factors such as Greenhouse Gas emissions and behavioral factors such as alcohol abuse or high blood pressure of a population
Sources: Bloomberg; Roland Berger

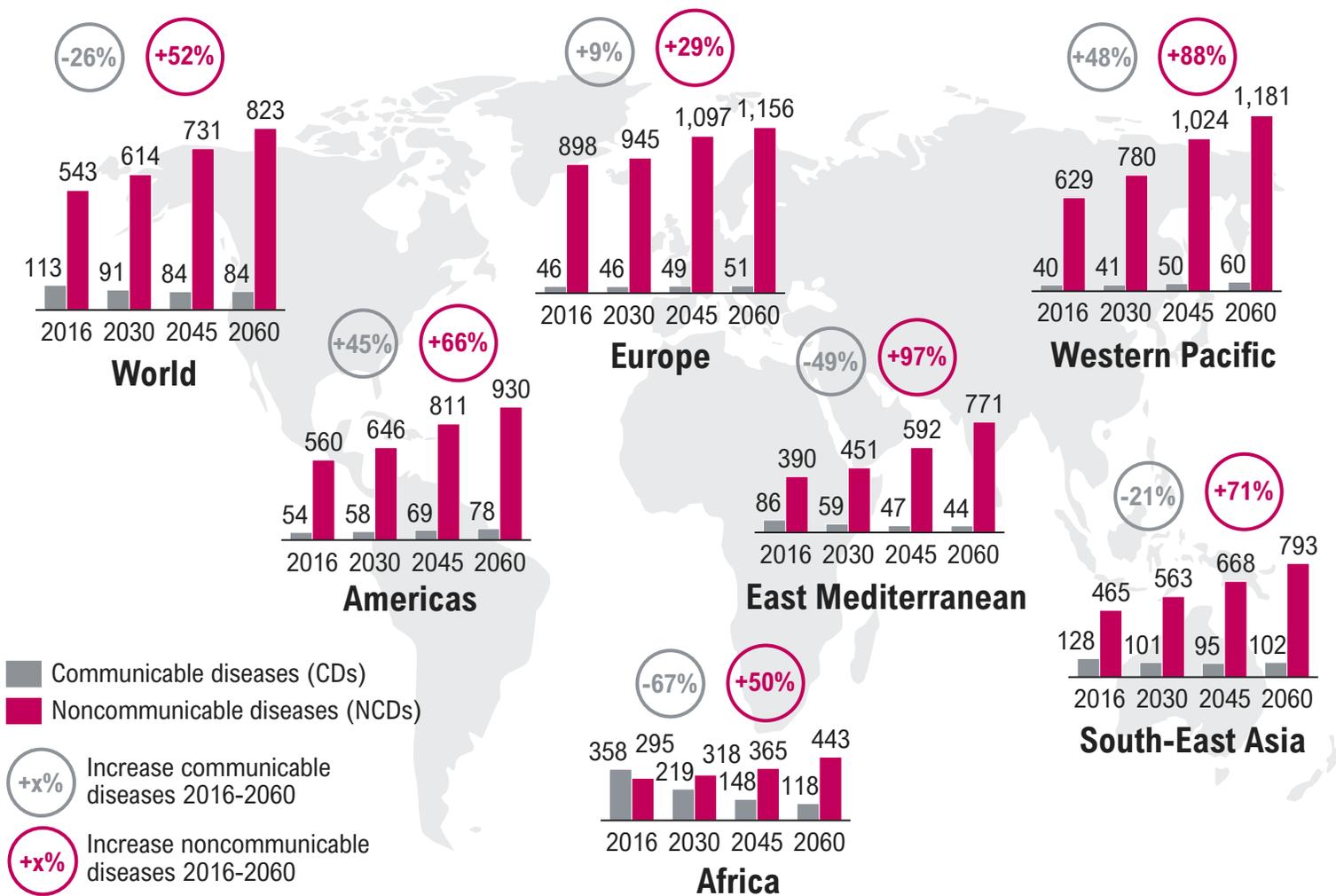Roland Berger

1
Pandemics
& Other
Challenges
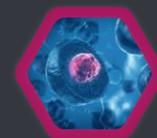
2
Diseases &
Treatments

3
Care-
giving

From health to diseases: Future noncommunicable disease burden will become an overall societal issue – Communicable diseases will decrease
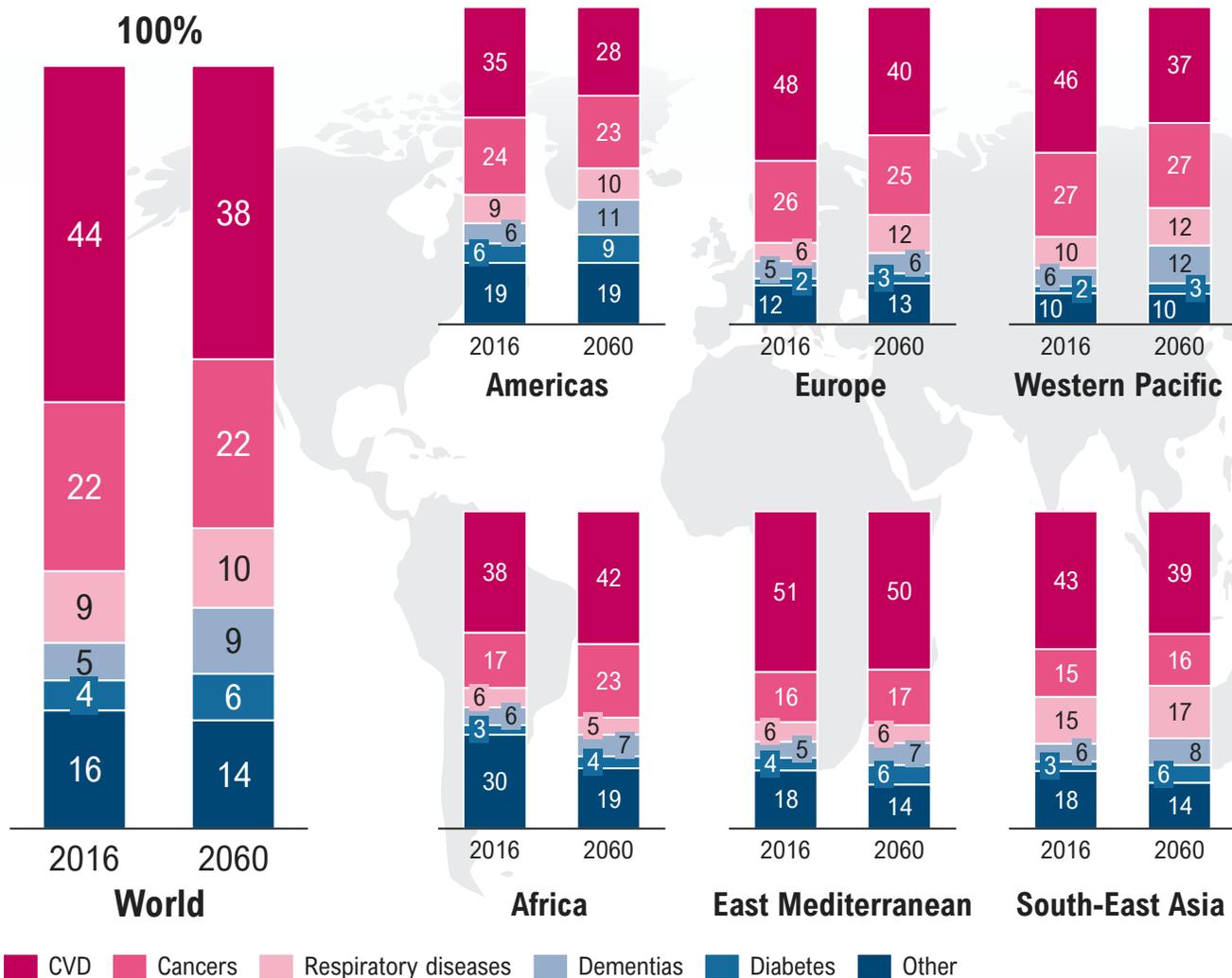
Deaths of communicable (CD) and noncommunicable diseases (NCD) per 100,000 capita

World
-26% +52%
113 / 543 (2016), 91 / 614 (2030), 84 / 731 (2045), 84 / 823 (2060)

Europe
+9% +29%
46 / 898 (2016), 46 / 945 (2030), 49 / 1,097 (2045), 51 / 1,156 (2060)

Western Pacific
+48% +88%
40 / 629 (2016), 41 / 780 (2030), 50 / 1,024 (2045), 60 / 1,181 (2060)

Americas
+45% +66%
54 / 560 (2016), 58 / 646 (2030), 69 / 811 (2045), 78 / 930 (2060)

East Mediterranean
-49% +97%
86 / 390 (2016), 59 / 451 (2030), 47 / 592 (2045), 44 / 771 (2060)

South-East Asia
-21% +71%
128 / 465 (2016), 101 / 563 (2030), 95 / 668 (2045), 102 / 793 (2060)

Africa
-67% +50%
358 / 295 (2016), 219 / 318 (2030), 148 / 365 (2045), 118 / 443 (2060)

Legend:
- Communicable diseases (CDs)
- Noncommunicable diseases (NCDs)
- +x% Increase communicable diseases 2016-2060
- +x% Increase noncommunicable diseases 2016-2060

> While the world population is set to increase by 36% from 2016 to 2060, there is an **over 50% increase of deaths due to NCDs** over the same period

> Three factors can explain this development: Firstly, a **growing world population** leads to increasing deaths; secondly, **society is aging** – a common risk factor for NCDs. Lastly, it is also likely that increased, **better monitoring** of diseases in **developing countries** may lead to rising numbers

> However, the general trend observed in **CDs** is equally remarkable, as such **deaths are decreasing** despite a growing world population; this is mainly due to **improved hygiene** and **better living standards** in developing countries, but also **new therapies** that make infectious or parasitic diseases less harmful

Sources: WHO; Roland Berger

Roland Berger

Globally, cardiovascular diseases and cancers remain significant chronic diseases to 2060 – Dementia and diabetes are becoming more prominent

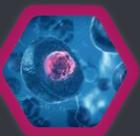Deaths of noncommunicable diseases by selected diseases and WHO regions [%]

World (100%)

	2016	2060
CVD	44	38
Cancers	22	22
Respiratory diseases	9	10
Dementias	5	9
Diabetes	4	6
Other	16	14

Americas

	2016	2060
CVD	35	28
Cancers	24	23
Respiratory diseases	9	10
Dementias	6	11
Diabetes	6	9
Other	19	19

Europe

	2016	2060
CVD	48	40
Cancers	26	25
Respiratory diseases	6	12
Dementias	5	6
Diabetes	2	3
Other	12	13

Western Pacific

	2016	2060
CVD	46	37
Cancers	27	27
Respiratory diseases	10	12
Dementias	6	12
Diabetes	2	3
Other	10	10

Africa

	2016	2060
CVD	38	42
Cancers	17	23
Respiratory diseases	6	6
Dementias	3	5
Diabetes	3	4
Other	30	19

East Mediterranean

	2016	2060
CVD	51	50
Cancers	16	17
Respiratory diseases	6	6
Dementias	5	7
Diabetes	4	6
Other	18	14

South-East Asia

	2016	2060
CVD	43	39
Cancers	15	16
Respiratory diseases	15	17
Dementias	3	8
Diabetes	6	6
Other	18	14

Legend: ■ CVD ■ Cancers ■ Respiratory diseases ■ Dementias ■ Diabetes ■ Other

> **Non-communicable diseases (NCDs)**, also known as chronic diseases, tend to be of long duration and are the result of a **combination of environmental, genetic, physiological and behavioral factors:** Tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets all increase the risk of dying from NCDs

> Regionally, the extent and future trends of **certain noncommunicable disease groups vary notably**, reflecting structural, economic and sociopolitical differences – Africa, for example, will see a distinct rise in cardiovascular diseases (CVD) and cancer related deaths, whereas all other regions will see a (near) doubling of dementia related deaths

> Overall, **CVD** can be identified **worldwide as the most common cause of death**, followed by cancer – in the future this will hold true worldwide, but dementias, diabetes and respiratory diseases are likely to catch up and play a bigger role in almost all regions

> NCDs not only entail a high physical burden for the affected individuals over the duration of the illness but carry a cost burden on healthcare systems as well as individuals – depending on the level (or absence) of health insurance. According to UNICEF, **the annual cost of not preventing NCDs** amounts to **USD 25 per capita** in low-income countries and to **USD 139** in high-income countries – such healthcare costs quickly drain households' resources and, if combined with a loss of income, lead to a vicious cycle of poverty
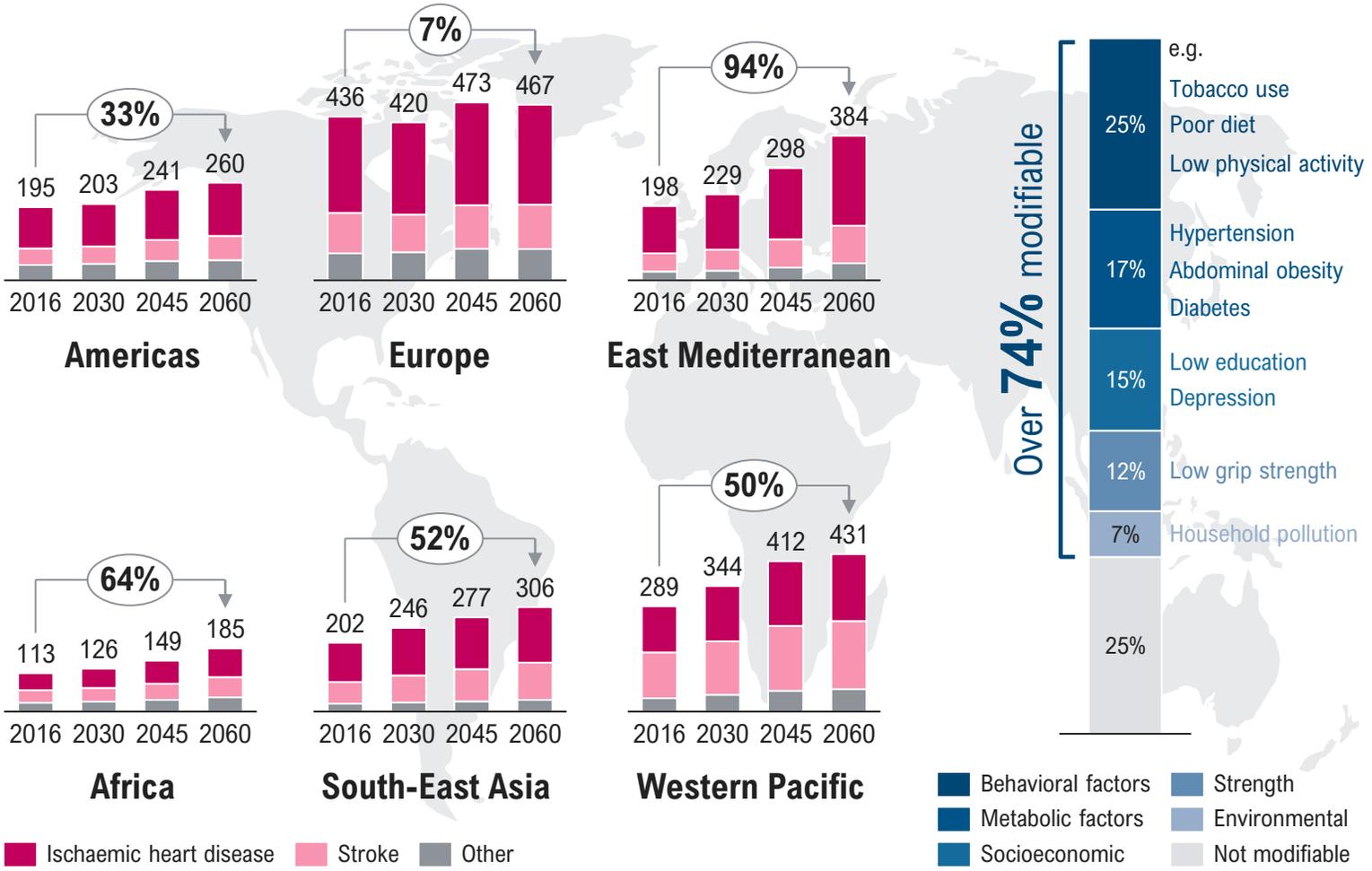
Sources: WHO; UNICEF; Roland Berger

Roland Berger

Cardiovascular diseases will cause most deaths amongst noncommunicable diseases – But three quarters are preventable

Number of deaths related to CVD [per 100,000 capita]

Americas — 33%
- 2016: 195
- 2030: 203
- 2045: 241
- 2060: 260

Europe — 7%
- 2016: 436
- 2030: 420
- 2045: 473
- 2060: 467

East Mediterranean — 94%
- 2016: 198
- 2030: 229
- 2045: 298
- 2060: 384

Africa — 64%
- 2016: 113
- 2030: 126
- 2045: 149
- 2060: 185

South-East Asia — 52%
- 2016: 202
- 2030: 246
- 2045: 277
- 2060: 306

Western Pacific — 50%
- 2016: 289
- 2030: 344
- 2045: 412
- 2060: 431

Legend: ■ Ischaemic heart disease ■ Stroke ■ Other

Preventable global CVD deaths related to selected risk factors, 2020 [%][1]

Over **74%** modifiable

%	e.g.	Category
25%	Tobacco use, Poor diet, Low physical activity	Behavioral factors
17%	Hypertension, Abdominal obesity, Diabetes	Metabolic factors
15%	Low education, Depression	Socioeconomic
12%	Low grip strength	Strength
7%	Household pollution	Environmental
25%		Not modifiable

Legend:
- ■ Behavioral factors
- ■ Metabolic factors
- ■ Socioeconomic
- ■ Strength
- ■ Environmental
- ■ Not modifiable

> **Cardiovascular diseases (CVD)** are the number one cause of death globally, taking an estimated **17.9 million lives each year**. CVDs are a group of disorders of the heart and blood; one third of CVD deaths occur prematurely in people under 70 years of age

> As a reflection of major forces driving social, economic and cultural change, Western regions – Europe, North America but also Western Pacific – display the highest number of deaths caused by cardiovascular diseases. For example, according to the American Heart Association, **deaths due to stroke in the U.S. occurred every 4 minutes** in 2017

> In 2020, 74% of all CVD related deaths would have been modifiable – and therefore preventable – by higher awareness and avoidance of **major risk factors** among the population

> **Due to** global **aging** and **urbanization** trends and in line with future economic developments, CVDs – particularly ischemic heart disease and strokes – are expected to **increase the number of deaths globally**
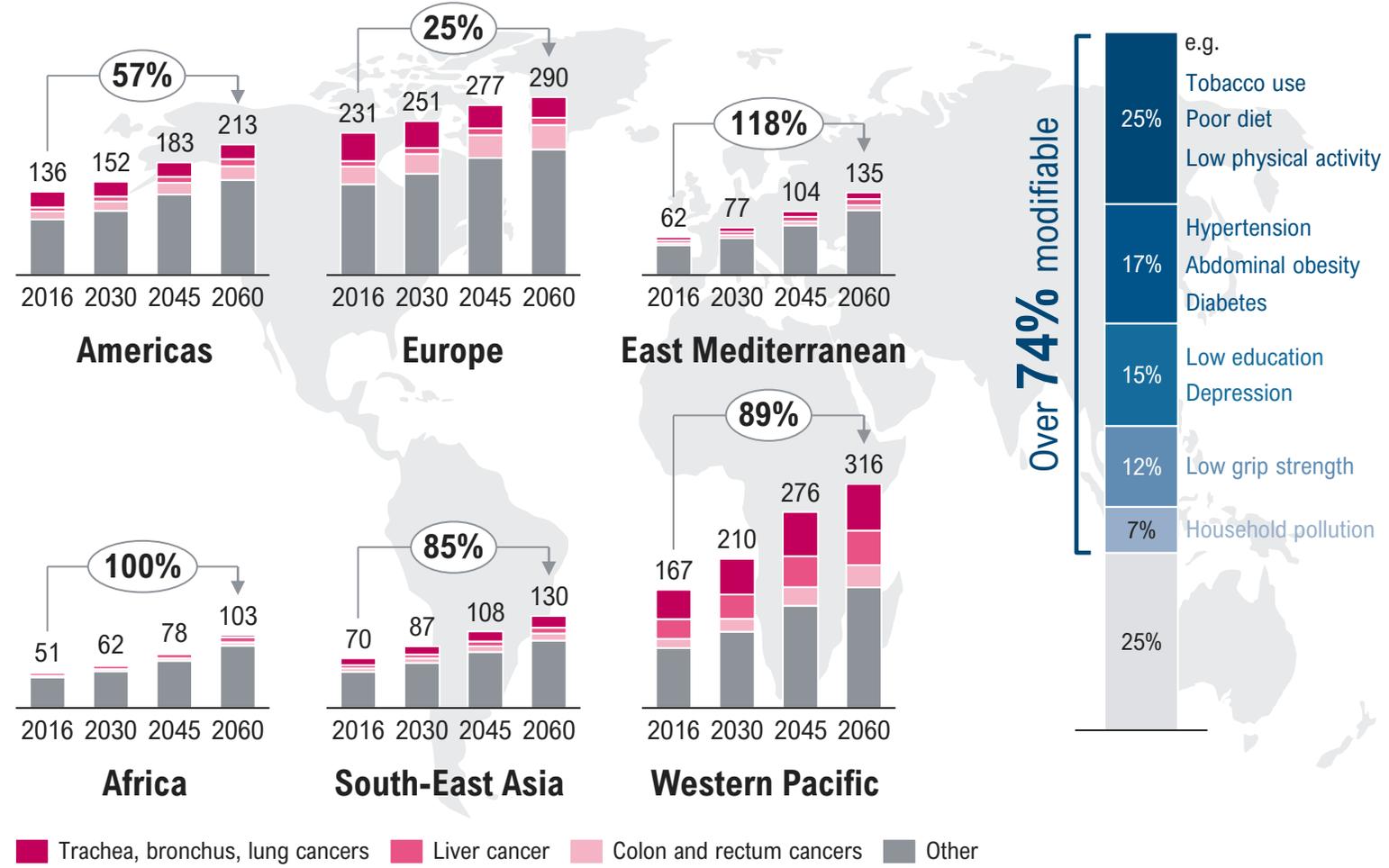
Sources: WHO; The Lancet; Roland Berger

Roland Berger

Deaths due to cancer will increase significantly – Two out of five cases are a resulting from unhealthy lifestyles and are therefore preventable

Number of deaths related to cancer [per 100,000 capita]

**Share of preventable cancer deaths related to selected risk factors [%]**[1]

Americas — 57%
2016: 136, 2030: 152, 2045: 183, 2060: 213

Europe — 25%
2016: 231, 2030: 251, 2045: 277, 2060: 290

East Mediterranean — 118%
2016: 62, 2030: 77, 2045: 104, 2060: 135

Africa — 100%
2016: 51, 2030: 62, 2045: 78, 2060: 103

South-East Asia — 85%
2016: 70, 2030: 87, 2045: 108, 2060: 130

Western Pacific — 89%
2016: 167, 2030: 210, 2045: 276, 2060: 316

Over **74%** modifiable

Share	Risk factors
25%	e.g. Tobacco use, Poor diet, Low physical activity
17%	Hypertension, Abdominal obesity, Diabetes
15%	Low education, Depression
12%	Low grip strength
7%	Household pollution
25%	

> Cancer is a broad term, including various diseases affecting different parts of the body; **all types of cancer include an abnormal growth of cells** that can spread to other parts of the body, ultimately leading to death

> The **highest death rates** related to cancer can be found in **regions of relatively high development or economic activity**. In line with other noncommunicable diseases, a considerable share of cancer deaths **is preventable**. Smoking, obesity and alcohol consumption are all modifiable risk factors

> In line with globalization and associated patterns of socio-economic activity, **regions with relatively low rates of cancer deaths** will experience the **highest relative increase** to 2060

> According to the American Cancer Society, **smoking tobacco is by far the leading cause of lung cancer**. In 2018, countries in the Americas (Chile 45%), in Europe (Greece 39%), South-East Asia (Bangladesh 39%), and Western Pacific countries (China 25%) had the highest share of (adult) smokers, whereas East Mediterranean (Iran 14%) and African countries (Ethiopia 5%) have relatively low shares of smokers

■ Trachea, bronchus, lung cancers   ■ Liver cancer   ■ Colon and rectum cancers   ■ Other

1) Three globally most common types of cancer
Sources: WHO; The American Cancer Association; Roland Berger

Roland Berger
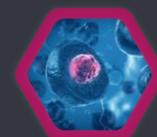
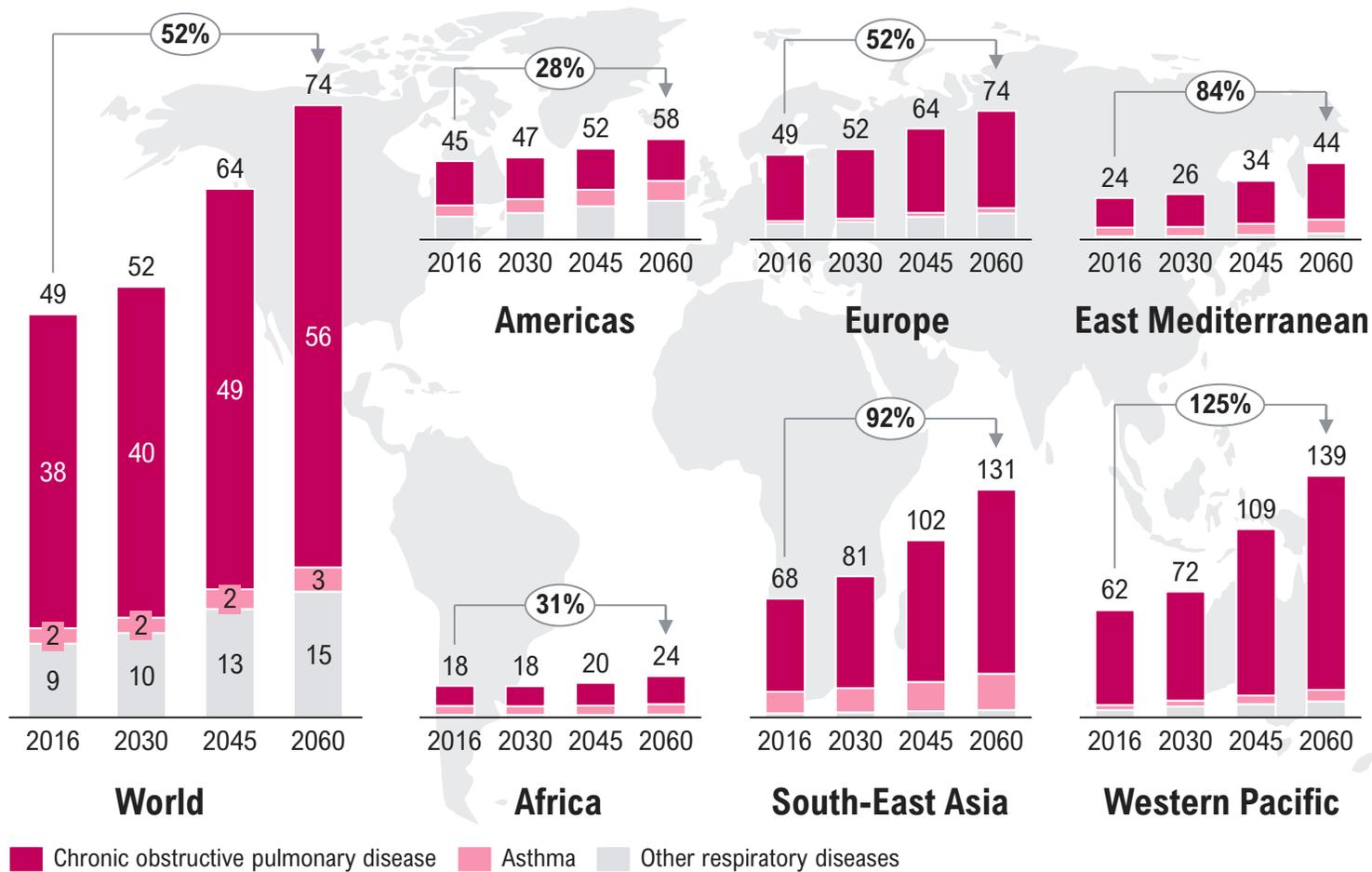# Respiratory diseases increasingly cause death – Numbers are expected to double in South-East Asia and Western Pacific

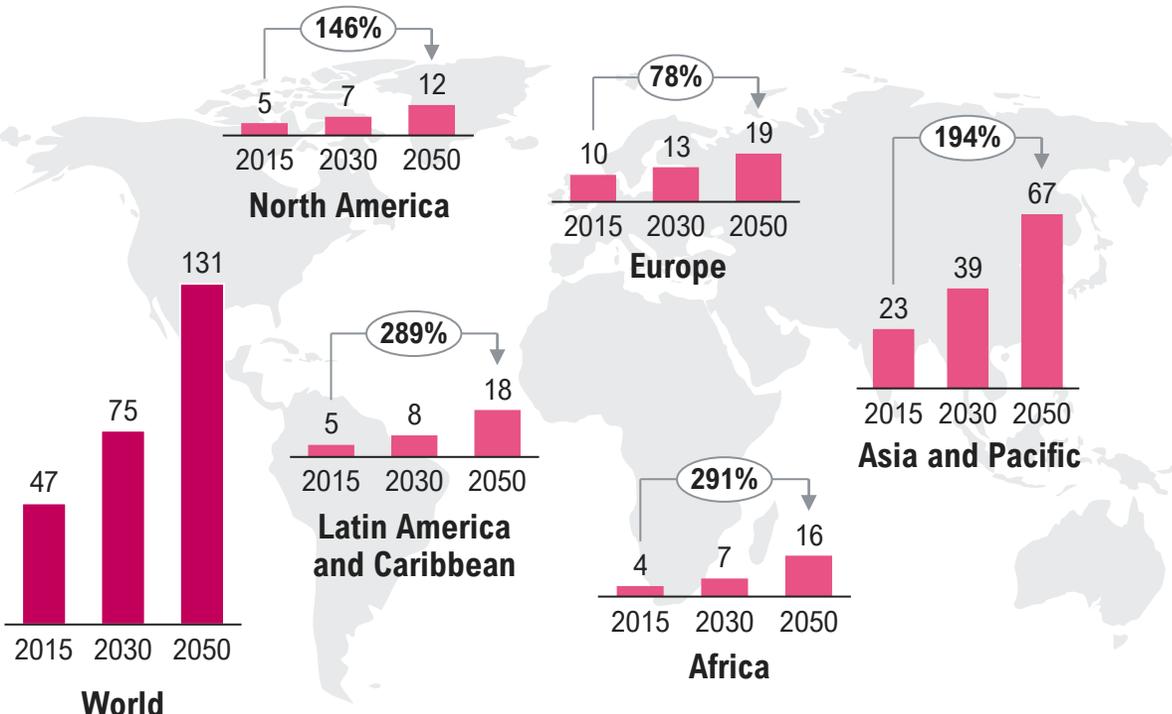## Number of deaths related to noncommunicable respiratory diseases [per 100,000 capita]
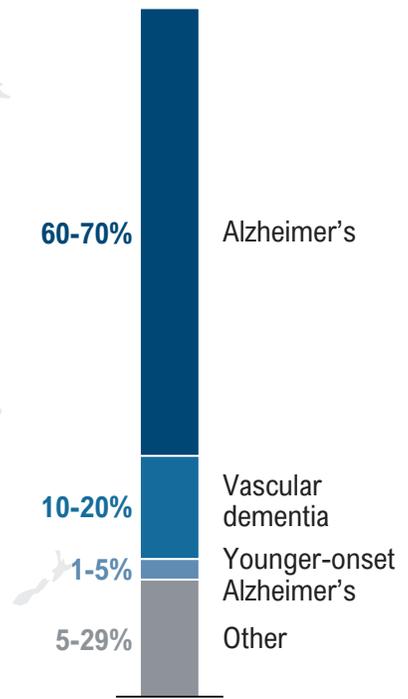

World
	2016	2030	2045	2060
Chronic obstructive pulmonary disease	38	40	49	56
Asthma	2	2	2	3
Other respiratory diseases	9	10	13	15
Total	49	52	64	74

(52%)

Americas (28%)
2016	2030	2045	2060
45	47	52	58

Europe (52%)
2016	2030	2045	2060
49	52	64	74

East Mediterranean (84%)
2016	2030	2045	2060
24	26	34	44

Africa (31%)
2016	2030	2045	2060
18	18	20	24

South-East Asia (92%)
2016	2030	2045	2060
68	81	102	131

Western Pacific (125%)
2016	2030	2045	2060
62	72	109	139

Legend:
- ■ Chronic obstructive pulmonary disease
- ■ Asthma
- ■ Other respiratory diseases

> **Noncommunicable respiratory diseases** are a result of both **external and genetic influences** and can **weaken the ability to breathe** to such an extend that it may lead to death. For instance, the main risk factors of chronic obstructive pulmonary disease (COPD) are tobacco smoke, air pollution and occupational dusts and chemicals

> According to the WHO, more **than 90% of COPD related deaths occur in low- and middle-income countries**, where effective strategies for prevention and control are not always implemented or accessible, nor do such strategies have an immediate influence on the global death rates of respiratory diseases, since (active or passive) tobacco smoking damages the lungs long-term

> Worldwide, a trend **to more chronic respiratory diseases** such as asthma is also evident. The cause of most asthma is unknown and there is no effective strategy for primary prevention

> In addition to COPD and asthma, there are several other respiratory disorders whose burden is great but less well quantified: More than **100 million people** suffer from sleep-disordered breathing (apnea) and more than **50 million people** struggle with occupational lung diseases

Sources: WHO; Roland Berger

Roland Berger

By 2050, dementia cases are expected to near-triple globally – Future increases are most pronounced in less developed regions

Number of people with dementia [m]

North America
146%
2015	2030	2050
5	7	12

Europe
78%
2015	2030	2050
10	13	19

Asia and Pacific
194%
2015	2030	2050
23	39	67

Latin America and Caribbean
289%
2015	2030	2050
5	8	18

Africa
291%
2015	2030	2050
4	7	16

World
2015	2030	2050
47	75	131

Dementia types, share of [%]

- 60-70% Alzheimer's
- 10-20% Vascular dementia
- 1-5% Younger-onset Alzheimer's
- 5-29% Other

> **Dementia** (a progressive cognitive impairment disease spectrum) **is a growing global phenomenon**; global aging accounts for some of the increases but the biggest rises to 2050 will be seen in less developed regions (Latin America and Africa) with a comparatively younger population

> There is currently **no cure for dementia**, but its social and economic **costs are high** due to more frequent hospitalizations and the need for intensive long-term care

> Dementia does **not just affect the very old**. About 3% of people between the ages of 65–74 have dementia, 19% between 75 and 84, and nearly half of those over 85 years of age

> **Alzheimer's is the most common form of dementia**; up to 5% of Alzheimer's cases are classified as younger-onset, which typically affects people of working age, and even some as young as 30. This form has a strong genetic basis, such as inherited gene mutations

> "Nearly **10 million people develop dementia each year**, 6 million of them in low- and middle-income countries"

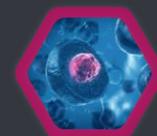**– Dr. Tedros Adhanom Ghebreyesus, Director-General of WHO**

Note: World data based on higher WHO estimate, other absolute numbers from Alzheimer's Diseases International
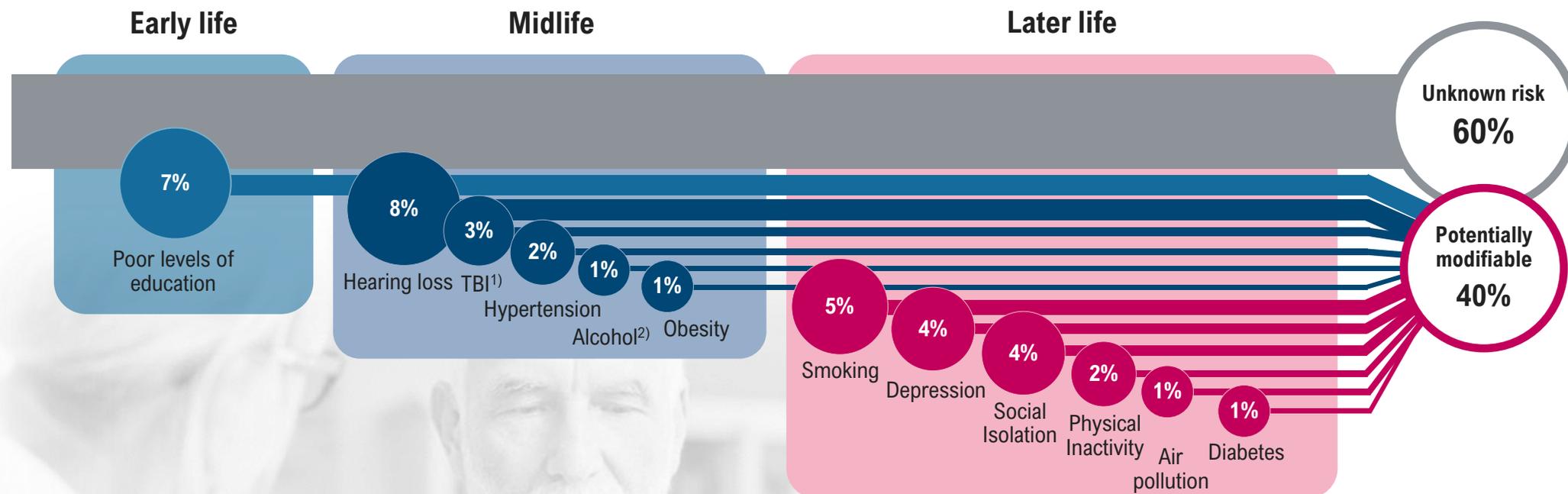Sources: WHO; Alzheimer´s Disease International; University of Queensland; Roland Berger

A significant part of dementia's likely risk factors can be influenced from early on – A life-course model maps 12 potentially modifiable risk factors
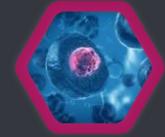
Life-course model of dementia risk factors

Early life

7% — Poor levels of education

Midlife

8% — Hearing loss
3% — TBI[1]
2% — Hypertension
1% — Alcohol[2]
1% — Obesity

Later life

5% — Smoking
4% — Depression
4% — Social Isolation
2% — Physical Inactivity
1% — Air pollution
1% — Diabetes

Unknown risk 60%

Potentially modifiable 40%

> A large proportion of dementia risk factors cannot be influenced by lifestyle changes, but **up to 40% of risk factors** can be influenced through **prevention and intervention**; a life-course model maps 12 dementia risk factors that are potentially modifiable throughout an individual's life

> **Two basic prevention measures** are understood: A reduction of neuropathological damages caused by head injuries (such as sports injuries or accidents) but also hypertension, diabetes, alcohol and depression. Also, an increased and maintained cognitive reserve is essential

> **Early-life factors**, such as less education and cognitive stimulation, affect the resulting cognitive reserve. From mid-life onwards, hearing loss and unhealthy lifestyle choices (smoking, alcohol abuse, inactivity) play a significant role impacting cognitive function and performance

1) Traumatic brain injury; 2) More then 21 units per week
Sources: Alzheimer's Association; The Lancet; Roland Berger

Roland Berger

Diabetes cases are increasing worldwide – African and Middle Eastern regions are leading in the rise of diabetes to 2045

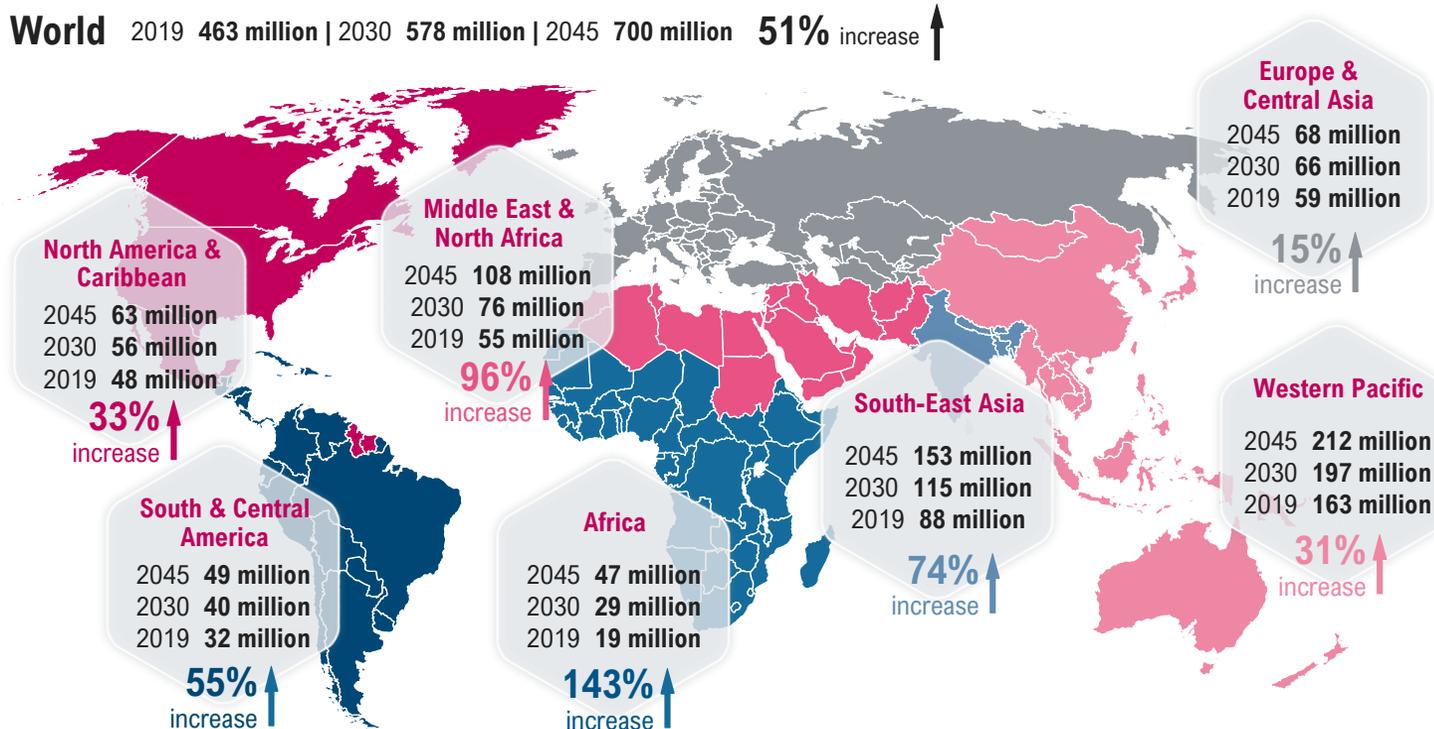Where diabetes burdens are rising – People with diabetes by region, 20-79 years [m]

World 2019 **463 million** | 2030 **578 million** | 2045 **700 million** **51%** increase ↑

Europe & Central Asia
2045 **68 million**
2030 **66 million**
2019 **59 million**
15% increase ↑

North America & Caribbean
2045 **63 million**
2030 **56 million**
2019 **48 million**
33% increase ↑

Middle East & North Africa
2045 **108 million**
2030 **76 million**
2019 **55 million**
96% increase ↑

South-East Asia
2045 **153 million**
2030 **115 million**
2019 **88 million**
74% increase ↑

Western Pacific
2045 **212 million**
2030 **197 million**
2019 **163 million**
31% increase ↑

South & Central America
2045 **49 million**
2030 **40 million**
2019 **32 million**
55% increase ↑

Africa
2045 **47 million**
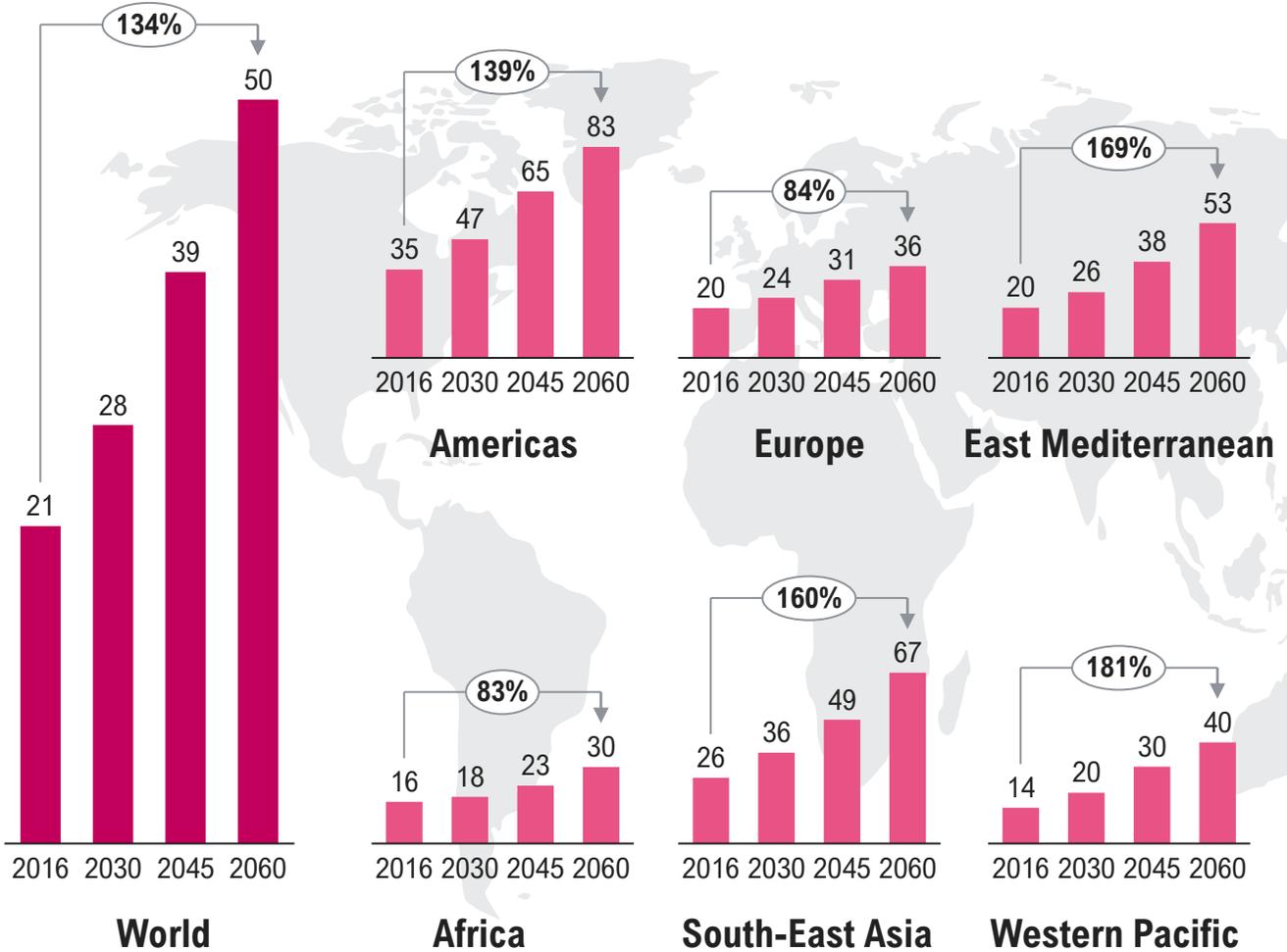2030 **29 million**
2019 **19 million**
143% increase ↑

> The number of **people with diabetes has quadrupled in the last 40 years**. It is the only major noncommunicable disease for which the **risk of dying early is going up**, rather than down.
> — **Dr. Tedros Adhanom Ghebreyesus, Director-General of WHO**

> **Diabetes** is a chronic disease that occurs either when the **pancreas does not produce enough insulin** (blood sugar regulating hormone) or when the body **cannot effectively use the insulin** it produces. Over time, **raised blood sugar levels** lead to serious damage of the nerves and blood vessels

> Type 1 diabetes – about **5-10% of all cases** – is characterized by deficient insulin production and requires daily insulin injections. The cause of Type 1 diabetes is not known

> Type 2 diabetes results from the **body's ineffective use of insulin**. This type of diabetes is largely the result of a combination of bad lifestyle choices such as physical inactivity and poor diet leading to excess body weight

> According to the WHO, around **1.5 million people** worldwide died due to diabetes in 2019

Sources: IDF Atlas 2019; WEF; WHO; Roland Berger

Roland Berger

The risk of Type 2 diabetes increases with several factors, some of which highly correlate with the trend of an ageing society and Western lifestyles

Number of deaths related to diabetes [per 100,000 capita]

World
- 2016: 21
- 2030: 28
- 2045: 39
- 2060: 50
- 134%

Americas
- 2016: 35
- 2030: 47
- 2045: 65
- 2060: 83
- 139%

Europe
- 2016: 20
- 2030: 24
- 2045: 31
- 2060: 36
- 84%

East Mediterranean
- 2016: 20
- 2030: 26
- 2045: 38
- 2060: 53
- 169%

Africa
- 2016: 16
- 2030: 18
- 2045: 23
- 2060: 30
- 83%

South-East Asia
- 2016: 26
- 2030: 36
- 2045: 49
- 2060: 67
- 160%

Western Pacific
- 2016: 14
- 2030: 20
- 2045: 30
- 2060: 40
- 181%

Selected risk factors for Type 2 diabetes and its multipliers

Risk factor	Relative risk
+45 years old	x5-6
Obesity	x4-5
Overweight	x2-3
Hypertension	x2-3
Hyperlipidemia	x4
One first-degree relative	x2-3
Two first-degree relatives	x5-6

Sources: WHO; Roland Berger

Roland Berger
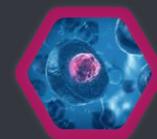
Globally, lower respiratory infections lead to the highest number of deaths of communicable diseases – and their share is rising across all regions

Deaths of communicable diseases by selected diseases and WHO regions [%]

100%

World

	2016	2060
Lower respiratory infections	35	54
Tuberculosis	15	11
Diarrhoeal diseases	16	17
HIV/AIDS	12	2
Malaria	5	4
Other	16	11

Americas

	2016	2060
Lower respiratory infections	58	76
Diarrhoeal diseases	10	6
HIV/AIDS	7	1
Malaria	3	1
Other	0	0
	22	17

Europe

	2016	2060
	58	65
	14	6
	6	0
	5	8
	0	
	18	20

Western Pacific

	2016	2060
	38	53
	20	18
	14	14
	1	1
	3	1
	23	13

Africa

	2016	2060
	25	34
	20	10
	18	21
	11	20
	11	6
	15	10

East Mediterranean

	2016	2060
	31	54
	26	9
	21	26
	1	0
	5	1
	15	11

South-East Asia

	2016	2060
	62	84
	14	3
	5	0
	4	3
	0	0
	14	10

Legend: ■ Lower respiratory infections ■ Tuberculosis ■ Diarrhoeal diseases ■ HIV/AIDS ■ Malaria ■ Other

> Communicable diseases are infectious diseases **that spread from one person to anothe**r, or from **animals** to humans, as in the case of malaria. **Caused by pathogens** such as viruses, bacteria or fungi, **treatment is pathogen-dependent.** For bacterial infections, antibiotics are a common treatment; for viral infections there are either preventative treatments such as vaccinations and antiviral drugs – or none or yet to be discovered treatments, as was the case in the novel coronavirus in 2020

> In general, transmission of communicable diseases can be **prevented** by practicing good **hygiene**, like washing hands and disinfection

> **Lower respiratory infections** such as pneumonia or bronchitis are the **most frequent cause for death** in the group of communicable diseases, followed by diarrheal diseases and tuberculosis (TB)

> Due to better health infrastructure in regions such as Europe and the Americas, **TB is almost eradicated** there. Overall, apart from Africa, there is a clear **downward trend** of fewer TB **cases** worldwide

> In the future, **diarrheal diseases but also lower respiratory infections** – both transmitted more easily – **will play an even bigger role** than at present

Sources: WHO; Roland Berger

Roland Berger
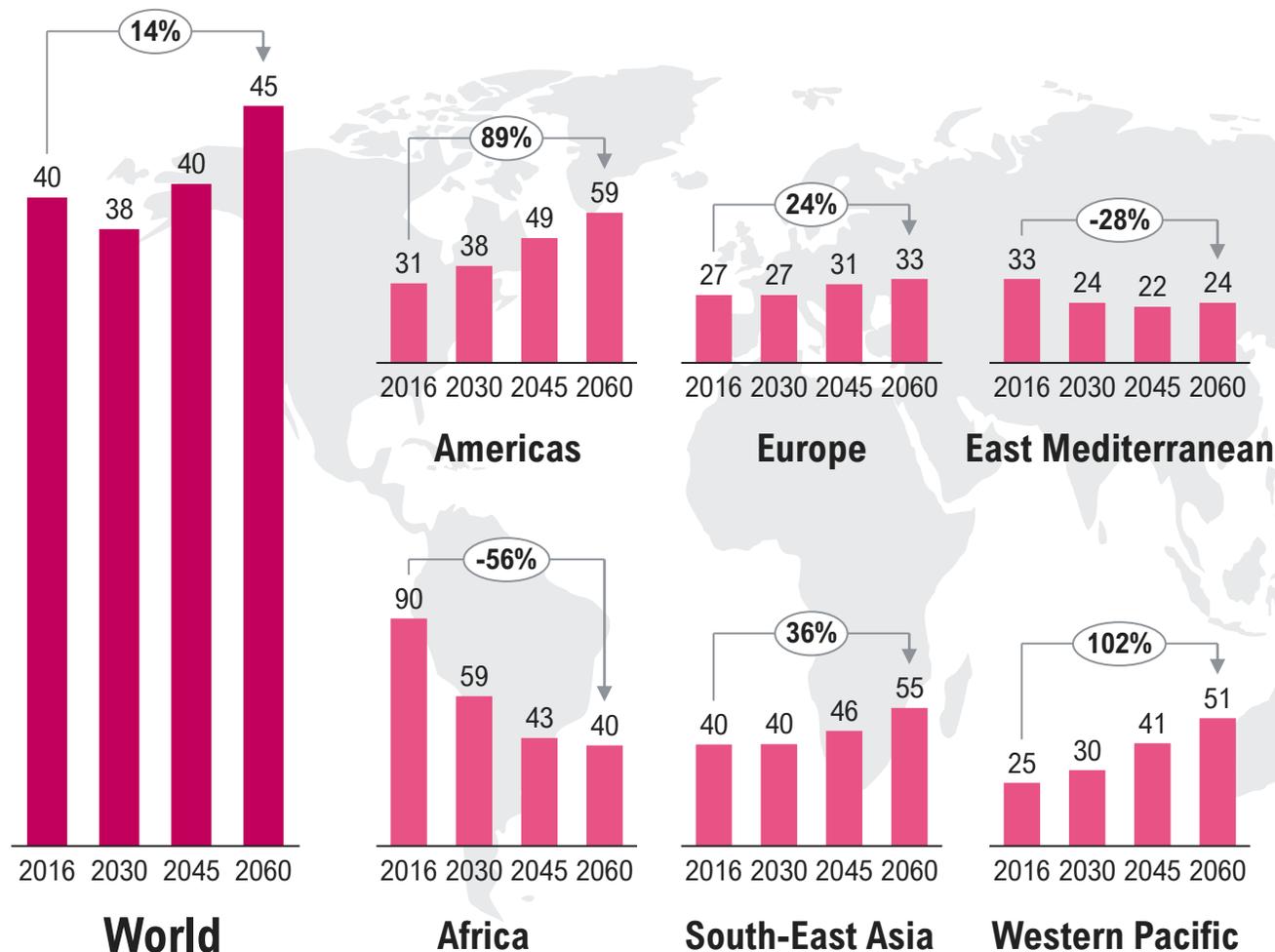
In the future, lower respiratory infections will cause fewer deaths in Africa and East Mediterranean, elsewhere such infections are on the rise

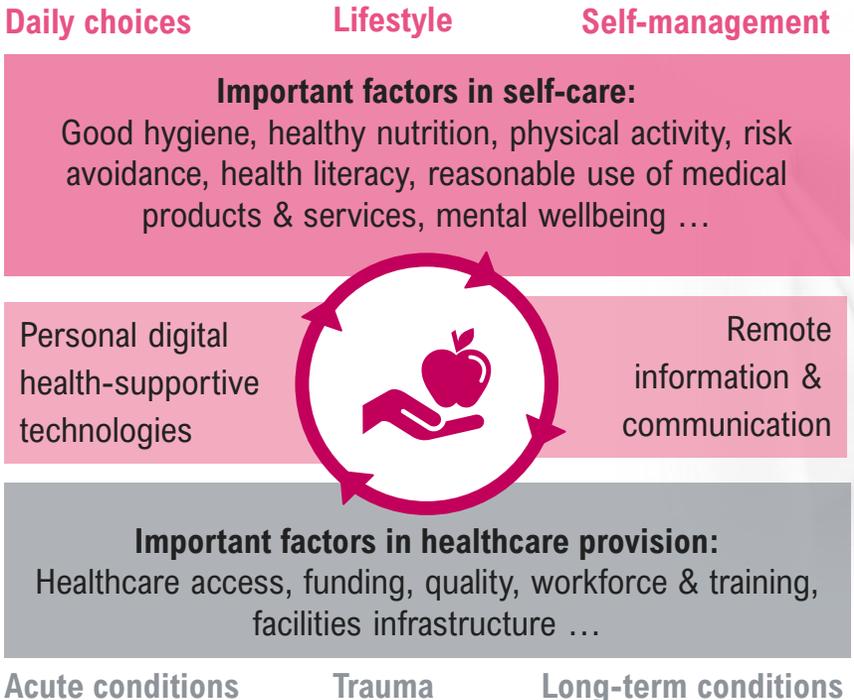## Number of deaths related to LRI [per 100,000 capita]

World — 2016: 40, 2030: 38, 2045: 40, 2060: 45 (14%)

Americas — 2016: 31, 2030: 38, 2045: 49, 2060: 59 (89%)

Europe — 2016: 27, 2030: 27, 2045: 31, 2060: 33 (24%)

East Mediterranean — 2016: 33, 2030: 24, 2045: 22, 2060: 24 (-28%)

Africa — 2016: 90, 2030: 59, 2045: 43, 2060: 40 (-56%)

South-East Asia — 2016: 40, 2030: 40, 2045: 46, 2060: 55 (36%)

Western Pacific — 2016: 25, 2030: 30, 2045: 41, 2060: 51 (102%)

> Lower respiratory infections (LRI) are almost always pneumonias, which are caused by bacteria, such as streptococcus, but also by viruses (for e.g. SARS-CoV-2) and fungi. LRIs are a **leading cause of death among children under 5 years** old but also in the **very old**

> As countries transition from the low-middle to the high-middle socio-demographic index, **LRI mortality rates in the very young decrease**, but a parallel improvement in such rates among the elderly is generally not observed: Africa is a case in point where targeted intervention programs for the very young plus a much lower median age in the general population bring about a steady LRI decrease; in other regions, the aging of societies has a much stronger, adverse effect, or the development is due to a mix of factors

> **LRI diseases can be prevented** with simple interventions and treated with low-cost, low-tech medication and care, but death rates are high and rising especially in Americas and Western Pacific regions. In the latter for example, only one third of all children with pneumonia receive the antibiotics they need

Sources: WHO; The Lancet; BMJ Journals; Roland Berger

Roland Berger

Getting ahead of treatments: Self-care principles are beneficial for all – Interest in better informed, tech-supported self-monitoring is rising

Self-care is based on healthy habits, informed decisions, responsible medical care supported by tech

Daily choices   **Lifestyle**   **Self-management**

Important factors in self-care:
Good hygiene, healthy nutrition, physical activity, risk avoidance, health literacy, reasonable use of medical products & services, mental wellbeing …

Personal digital health-supportive technologies

Remote information & communication

Important factors in healthcare provision:
Healthcare access, funding, quality, workforce & training, facilities infrastructure …

Acute conditions   **Trauma**   **Long-term conditions**

Global wearables healthcare devices market [USD bn]

2020	2025
18.4	46.6

> **Self-care** is the ability of individuals, families and communities to **promote health, prevent disease, maintain health, and to cope with illness and disability** with or without the support of a healthcare provider.
>
> **– World Health Organization**
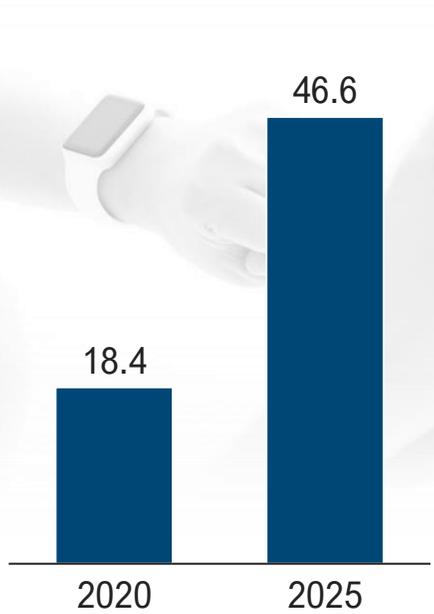
> Self-care is an important tool from a personal as well as a public healthcare perspective: Health systems can promote **self-care** as a wider **approach** – especially in disease types where the potential **prevention** rate is high. For **individuals**, the ability and capacity to make **informed decision on daily self-care choices** – including the use of all available health resources – is an important contributor to the successful management of an existing health condition, but also for general wellbeing and prevention of age-related diseases – thus achieving a longer **'healthspan'** with **optimal longevity**

> Increasingly sophisticated personal health measurement tools, such as smartphone health apps, and other digital health-supportive devices – **wearables, activity monitors, behavior trackers and sleep sensors** – are becoming more and more common as part of a wider self-care regime including self-monitoring of vitals: The global **wearable healthcare devices market** is projected to reach **USD 46.6 billion** by 2025, up from USD 18.4 billion in 2020

> Additionally, according to the OECD, between 2007 and 2018, the percentage of individuals **seeking health information on the internet has doubled**. Combined, this growing affinity for self-tracking as well as gaining health information remotely bodes well for the uptake and acceptance of **telemedicine** and **telecare** in the future
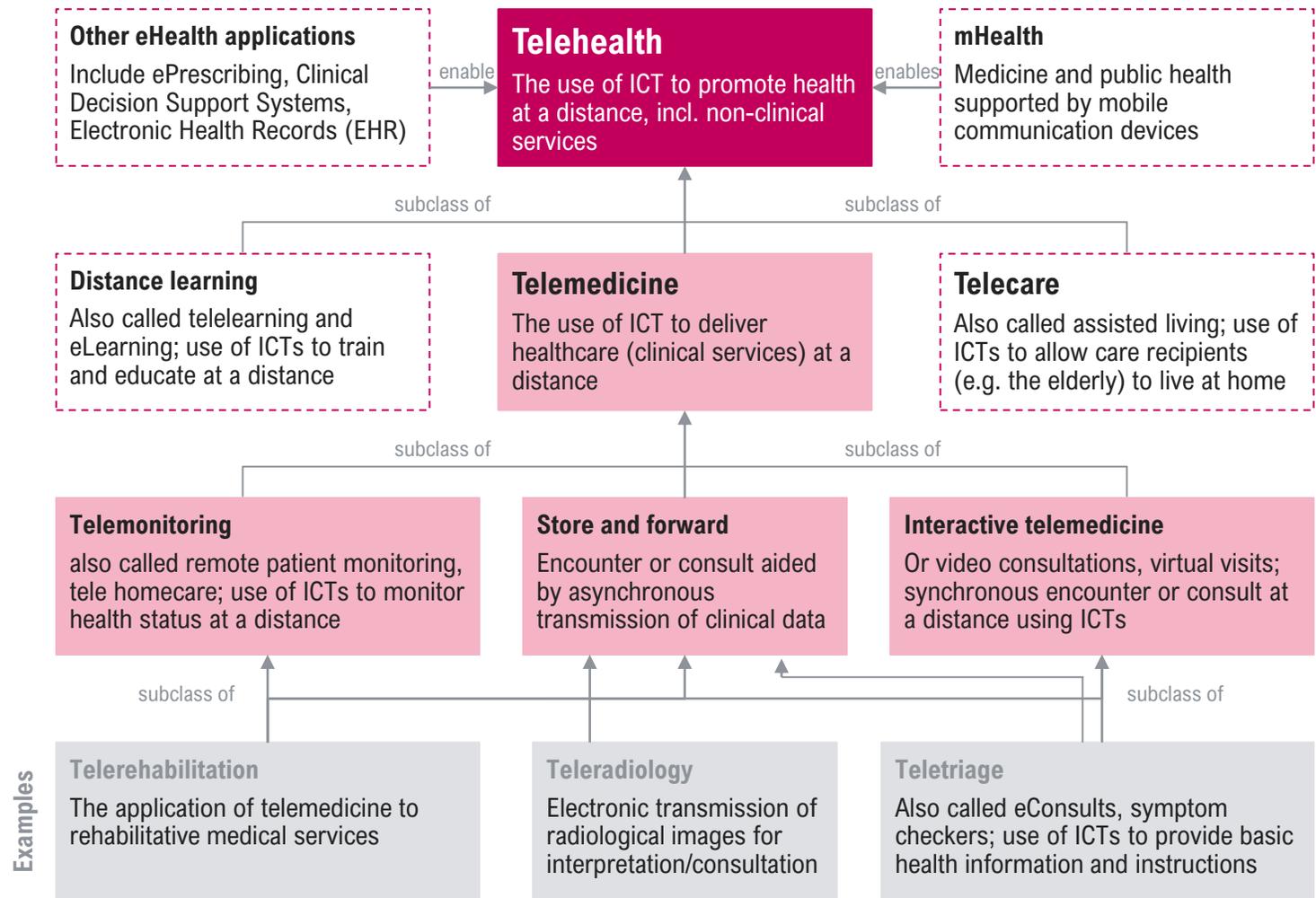
Roland Berger

The use of telehealth options – such as telemedicine – has gained traction due to the pandemic but eHealth ecosystems are already enabling far more

Telehealth and the wider eHealth ecosystem

Other eHealth applications
Include ePrescribing, Clinical Decision Support Systems, Electronic Health Records (EHR)

→ enable →

Telehealth
The use of ICT to promote health at a distance, incl. non-clinical services

← enables ←

mHealth
Medicine and public health supported by mobile communication devices

subclass of — subclass of

Distance learning
Also called telelearning and eLearning; use of ICTs to train and educate at a distance

Telemedicine
The use of ICT to deliver healthcare (clinical services) at a distance

Telecare
Also called assisted living; use of ICTs to allow care recipients (e.g. the elderly) to live at home

subclass of — subclass of

Telemonitoring
also called remote patient monitoring, tele homecare; use of ICTs to monitor health status at a distance

Store and forward
Encounter or consult aided by asynchronous transmission of clinical data

Interactive telemedicine
Or video consultations, virtual visits; synchronous encounter or consult at a distance using ICTs

subclass of — subclass of

Examples

Telerehabilitation
The application of telemedicine to rehabilitative medical services

Teleradiology
Electronic transmission of radiological images for interpretation/consultation

Teletriage
Also called eConsults, symptom checkers; use of ICTs to provide basic health information and instructions

> Telehealth is the distribution of **health-related information and services** via electronic information and telecommunication technologies (ICT)

> It enables **long-distance patient-physician contact**, consultation, care, monitoring, intervention and referrals, as well as remote training

> **Telehealth** can **bridge the gap**, especially in rural areas, but also where lack of transport or mobility is an issue, and where lower funding or lack of staff limit access to healthcare

> Telehealth saves time and money for patients as well as heath care professionals: According to AmWell, an **in-person doctor visit** in the United States **takes 121 minutes** (including travel, waiting and admin) or an equivalent USD 43 worth of time on average, while a telehealth **consultation lasts for about 15 minutes,** equating to USD 5 worth of (patient's) time

Sources: OECD; AmWell; Roland Berger

Roland Berger
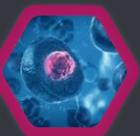
Many countries are undertaking a variety of Telemedicine programs – Teleradiology and teledermatology dominate at the national level

Countries reporting use of telehealth, by level of health system and type of program

Established
An ongoing program that has been conducted for a minimum of 2 years and is planned to continue

Pilot
Testing and evaluating a program

Informal
Use of ICT for health purposes in the absence of formal processes and policies

Local level
Health posts, health centers providing basic level of care

Intermediate level
District provincial facilities; public and private hospitals/health centers

National level
Referral hospitals, laboratories and health institutes

Regional level
Health entities in countries in the same geographic region

international level
Health entities in different geographic regions

Legend:
- Telemonitoring
- Teleradiology
- Teledermatology
- Telepsychiatry

> Based on an OECD survey, the use and level of telemedicine programs paints a **fragmented picture nationally and internationally**: In countries where reports on the use of telemedicine at district and national levels are available, programs in teleradiology and teledermatology have been established across many countries – with a similar mix of pilot projects across other disciplines more locally under way – while at regional and international levels, telemedicine endeavors are far more fragmented and mainly evident in Scandinavian countries and Spain, for example

> Although telemedicine services still represent a very small proportion of the total volume of services provided by health systems in OECD countries – even in countries where telemedicine is most widely used – **significant** pre-pandemic **growth rates had been observed**

> COVID-19 has had a positive, accelerating impact on the global telemedicine market: Telemedicine is an **invaluable tool**, when it comes to **connecting with a physician** under exceptional circumstances. The outlook for the industry has changed significantly, with the demand for telemedicine solutions predicted to increase across the globe

Note: For countries that report more than one level and type of program per specialty, the most advanced level and type are shown. Size of bubbles is proportional to the number of countries
Sources: OECD; Roland Berger

Cell and gene therapies belong to the most promising innovations enabling restoration of biological function and treatment of incurable diseases

Cell and gene therapies are the subject of **intense research and investment** by many pharmaceutical companies. The aim is to deliver **cures for rare diseases** and to enable **new therapeutic approaches** for more widespread diseases e.g., oncology or heart failure. Such therapies work **by employing engineered cells as therapeutics** or by **replacing defective or missing genes** in patients' cells

Cell & Gene[1] Therapy sales, 2019-2024e [EUR bn]

Legend:
- Gene Therapy
- Cell Therapy

Year	Total	Gene Therapy	Cell Therapy
2019	1.3	0.4	1.0
2020	2.9	1.1	1.9
2021	6.0	2.5	3.4
2022	10.6	5.0	5.6
2023	17.7	8.8	8.9
2024	26.0	13.2	12.8
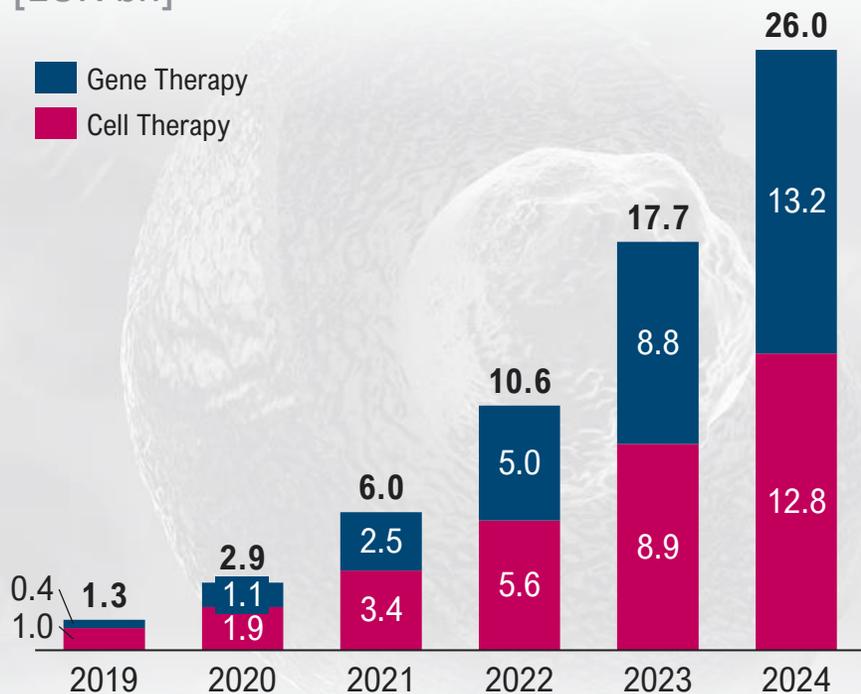
Cell & Gene Therapy opportunities

- Enables treatment of previously incurable diseases
- Precision medicine and ability for individualized customization
- Long lasting effect, requiring mostly one-off treatments
- In the future, possibility of novel curative mechanisms through the further enhancement of cells, for example via local payload (cytokines) secretion

1) Including combination Advanced Therapies and Medicinal Products (ATMPs)
Sources: EvaluatePharma; Roland Berger

Roland Berger
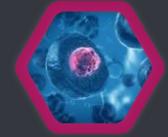
The resounding success of RNA vaccines in the COVID-19 pandemic attests to the future potential of RNA vaccines for cancer and other treatments

RNA vaccine technologies: mRNA / saRNA

RNA platform characteristic

An mRNA vaccine consists of a (non-replicating) **messenger RNA strand that codes for a disease-specific antigen**. Once vaccinated, the cells produce the antigen. This antigen is then displayed on the cell surface, where it is recognized by the immune system

Lipid coat

RNA

Antigen coding sequence

Replicase genes

under research
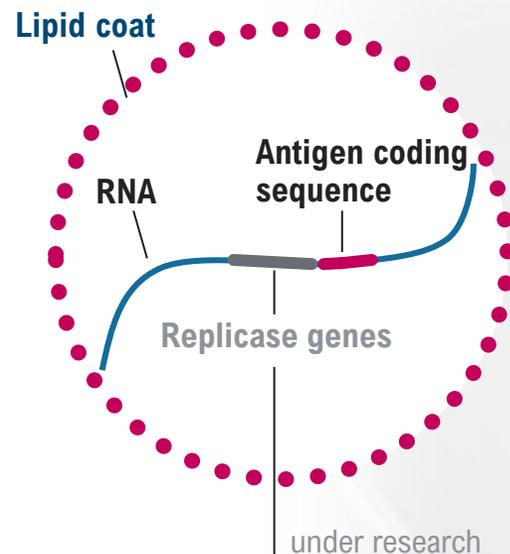
Built for speed

The **first mRNA-based vaccine** for the Corona virus **was developed within 4 days**. This speed leads to new possibilities for vaccine makers who could more quickly pivot to an effective selection of antigens

Plug and play functionality

The RNA platform makes it possible to develop **new vaccines rapidly** while easily testing hypotheses, thus advancing science

Self-amplifying functionality (saRNA)

Self-amplifying RNA (saRNA) replicates itself in the body, which helps **overcome** some of **mRNAs vaccination** volume and distribution **challenges**, potentially making it easier to scale in countries with weaker healthcare infrastructures, and for diseases that are difficult to inoculate against long term such as malaria

Potential RNA opportunities

Oncology

Based on a tumor sample, **an individually tailored mRNA vaccine** leads to an immune response attacking cancer cells in a specific tumor

Infectious diseases and prophy-lactic usage

Since mRNA vaccines are easy to adapt to infectious diseases at speed**, their potential to fight seasonal infectious respiratory diseases** such as influenza is **high**. Also, (future) self-amplifying RNA technology has the potential to help fight other complex infectious diseases such as HIV, tuberculosis or malaria, as well as scale RNA vaccinations more easily. There is also some early research into the potential of RNA vaccines for allergies

Rare diseases

Mostly caused by genetic defects, individuals suffering from rare diseases lack **specific intracellular proteins which they cannot produce themselves**. RNA therapy can **restore or replace** missing proteins to a satisfactory scale
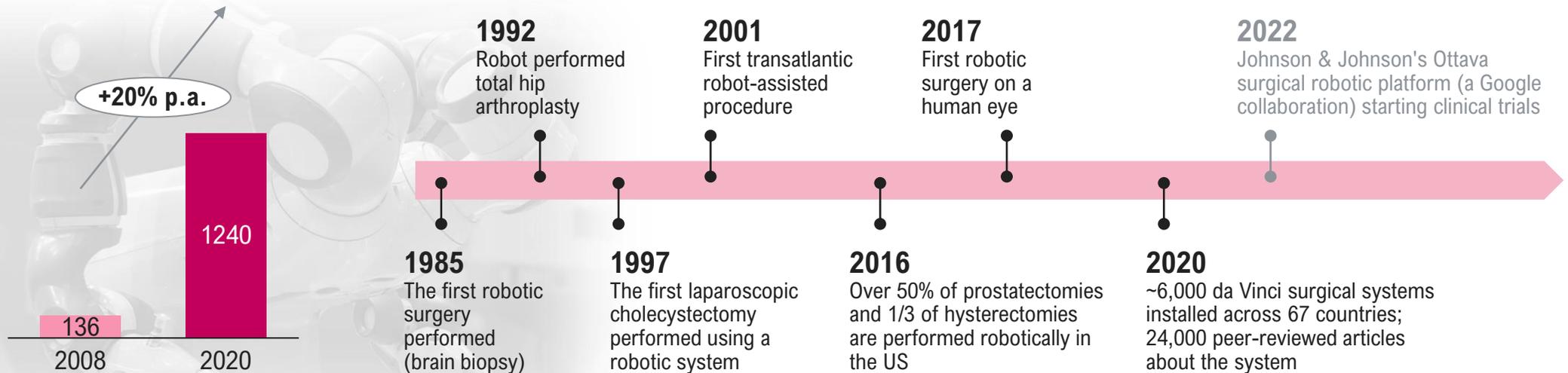
Roland Berger
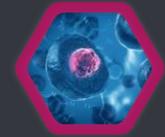
Surgical robotic systems procedures are becoming increasingly ubiquitous in medtech – AI is advancing surgical robots to next generation platforms

## Estimated yearly number of da Vinci surgical procedures ['000]

+20% p.a.

1240

136

2008   2020

1992
Robot performed total hip arthroplasty

2001
First transatlantic robot-assisted procedure

2017
First robotic surgery on a human eye

2022
Johnson & Johnson's Ottava surgical robotic platform (a Google collaboration) starting clinical trials

1985
The first robotic surgery performed (brain biopsy)

1997
The first laparoscopic cholecystectomy performed using a robotic system

2016
Over 50% of prostatectomies and 1/3 of hysterectomies are performed robotically in the US

2020
~6,000 da Vinci surgical systems installed across 67 countries; 24,000 peer-reviewed articles about the system

> **Robotic surgery** is usually associated with less invasive, minimal access surgery, reducing recovery time, helping both patients and hospitals; for surgeons, this technology augments dexterity and maneuverability, enhances precision, control, and sensory feedback

> The global market leader's pioneering da Vinci robotic system has performed over 8.5 million procedures to date, but several of its patents have expired in recent years, leading to intense **medtech** competition including new market entrants; at the same time, technological progress **in machine learning** and **artificial intelligence (AI)** is able to advance more and more components of robotic surgical platforms to be fully automated, such as sensing, image guidance, and decision and control capabilities

> **Next-generation surgical robots** are integral in advancing surgical skills to achieve highest level precision during complex procedures in areas not previously possible by the human hand, for example in ophthalmic surgery. AI can also help pool the surgical experience to standardize decision-making and provide post-surgical analytics, thus creating a global consensus in operating theaters worldwide; in the future, AI-powered surgical robots will be able to transmit and share their experiences with each other to more rapidly increase the expertise and ability of each robot and to ultimately achieve surgical goals efficiently without being dependent on human control

> So far, an even more widespread adoption **of AI-powered surgical robots has been limited** by the high cost of installation, regulatory frameworks, concerns regarding the safety, and the need for technically skilled professionals

Roland Berger

Machine and deep learning insights in the biomedical sciences have grown exponentially in recent years – Oncology leads the deep learning field

Total amount of machine & deep learning studies released on PubMed, 2005-2019

7,871[1]

4,651

2,508

1,172

203 359 522 758

2005 2007 2009 2011 2013 2015 2017 2019
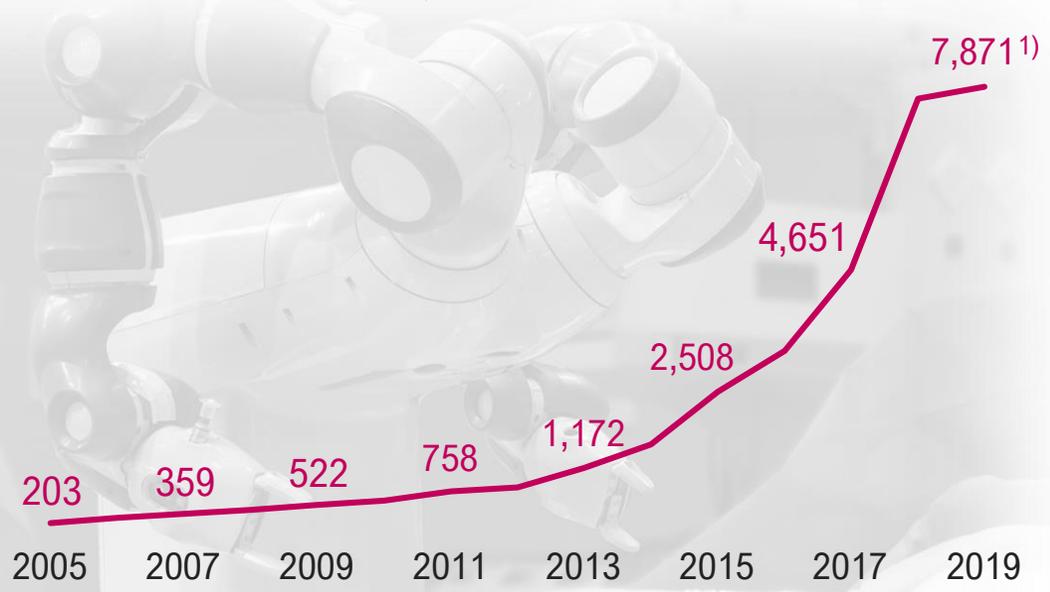
> " Lots of diseases are preventable, but they happen so slowly that people get worse without realizing it. If we can use deep learning as a powerful tool to give patients a wake-up call, we'd be able to prevent diseases when there's still time.
>
> **– Professor Narges Razavian, New York University** "

Number of machine & deep learning studies per field released on PubMed[1]
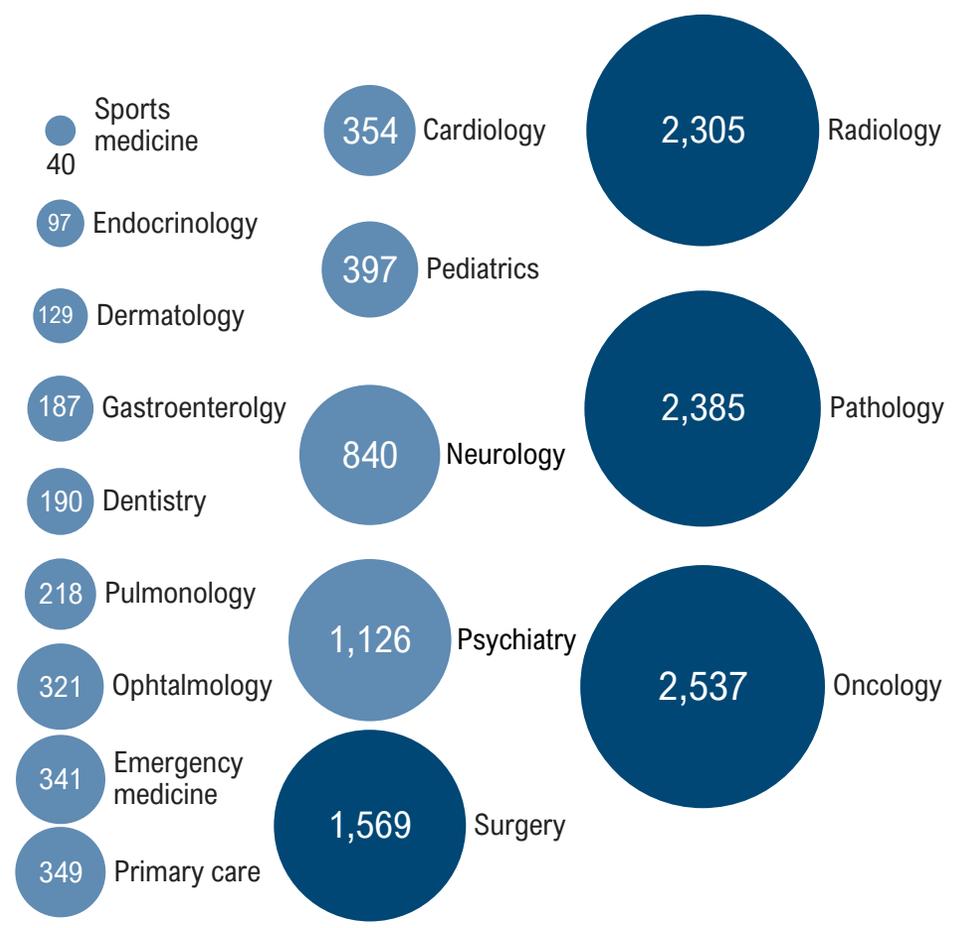
- 40 Sports medicine
- 97 Endocrinology
- 129 Dermatology
- 187 Gastroenterolgy
- 190 Dentistry
- 218 Pulmonology
- 321 Ophtalmology
- 341 Emergency medicine
- 349 Primary care

- 354 Cardiology
- 397 Pediatrics
- 840 Neurology
- 1,126 Psychiatry
- 1,569 Surgery

- 2,305 Radiology
- 2,385 Pathology
- 2,537 Oncology

Roland Berger

AI-based devices assist an ever-wider range of medical fields supporting diagnoses, reducing workflow and waiting times, and customizing dosages

Selected FDA approvals for artificial intelligence (AI) and machine learning (ML)-based devices in medicine, 2017 onwards

- Diagnosis of sleep disorders
- Detection of diabetic retinopathy
- Stroke detection on CT
- Predicting blood glucose changes
- Breast density via mammography
- ECG analysis support
- Radiology image processing software
- Measure liver iron concentration
- Mammogram workflow
- Chest x-ray assessment pneumothorax
- Quantification and reporting of results of cardiovascular function
- Radiological software for lesions suspicious for cancer
- Cardiac monitor

> A 2020 analysis of over 60 recently FDA approved artificial intelligence- and machine learning-based medical devices and algorithms indicates that they are predominantly geared at fields of radiology (46.9%), cardiology (25.0%), and internal/general medical practice (15.6%) but **many have cross-disciplinary functionalities**

> **AI/ML technologies** have the **potential** to diagnose, manage and treat a wide range of medical conditions; they can help assess and interpret X-ray and magnetic resonance images, improve workflow and thus reduce waiting times, support medication adherence, customize insulin dosages, and more

> Although highly promising, there are **many obstacles to the implementation of AI/ML** particularly in regulatory areas as well as everyday clinical practice. Issues include software transparency, data bias and safety

Medical fields

Cardiology   Neurology   Endocrinology   Internal medicine   Radiology   Ophtalmology   Emergency medicine   Oncology

Sources: Nature; FDA; Johner Institute; Roland Berger

Roland Berger

Between fiction and prediction: Advances in healthcare are subject to many expectations – But not all will materialize by 2050

Likelihood and impact of selected health predictions toward 2050 according to a 2020 UCSF[1] survey

Impact: Game-changing

Likelihood: Fiction

Likelihood: Prediction

- The end of cancer
- Bionic eyes banish blindness
- Universal Health Coverage in the US
- AIDS eradication
- Global pandemic wipes out millions
- E-health records interoperability solved
- Mental health drugs are as precise and effective as antibiotics
- Lab-grown organs make human donors obsolete
- Cell and Gene Therapies affordable
- Superbugs proliferate
- Gene editing
- Mental illness without stigma
- A pill to effectively treat obesity
- Fully cybernetic limbs
- Male contraceptives go mainstream
- Humans and AI merge
- Dentistry integrated into primary care
- Injectable "nanobots" for therapies
- Cure for common cold
- Ability to regrow lost teeth
- Implanted electronic health records
- Medical residents work 40-hours week
- AI doctors deliver primary care
- Amazon runs world's largest Health Maintenance Organization
- Instant disease diagnosis via smartwatch
- Microbiome therapies make billions
- The rich stay forever young with antiaging therapies

Impact: Overhyped

> Healthcare is one of the sectors with **highest levels of investment** in new technologies, new treatment options, and new drugs
> High level investments increase the **probability** for innovations to succeed, but many promising ideas nevertheless fail further down the line: **Predicting** future feasibility or game-changers is highly difficult and **uncertain**
> The University of California San Francisco (UCSF), a leading university in health science, tried to **evaluate selected future health predictions**
> The UCSF survey distinguishes between the **importance** of a healthcare outcome (on a scale ranging from Overhyped to Game-changing) as well as the **probability** of the outcome coming into effect (on a scale from Fiction to Prediction)

1) In 2020, University of California San Francisco (UCSF) faculty and alumni scored the above predictions for likelihood and impact. In the matrix we show all predictions except for two that are specific to the US. UCSF is a leading and highly ranked public research university dedicated exclusively to the health sciences. Five UCSF scientists have received the Nobel Prize in Medicine
Sources: UCSF; Roland Berger

Roland Berger

Changing disease patterns, lifestyles and tech advances entail future changes toward a more tailored person-centric healthcare relationship

From reactive sickness-based concepts towards a future of person-centered, integrative health

	Current system	Future system
System focus	**Sickness** System resources are demand-led and focus on disease management	**Prevention** Resources organized dynamically around minimizing disease and demand though preventative interaction, early diagnosis, wellness
Point of care	**Hospitals, clinics and labs** By appointment in physical healthcare locations (diagnostics, therapies, treatment management)	**Personal setting** Diagnostics, therapies and self-care support takes place predominantly in a personal location
Scope of care	**Medical & reactive** Clinical focus on medically recognized symptoms	**Holistic and predictive** Pro-active consideration of all internal and external factors that influence health & wellbeing
Delivery of care	**Standardized transactional care** Patients matched to standard treatments at system convenient times and settings, compliance and adherence focused	**Personalized "always on" care** Ongoing, integrated, co-created and tailored support relationship balancing needs, expert advice and genomic risk factors
Knowledge base	**Scientifically determined** Professional bodies and experts determine knowledge via evidence-based research and peer review	**Revealed and emergent** Ongoing experimentation augmented by advanced machine learning to real time individual and population data/Big Data
Data & Ownership	**Provider owned** Personal data records held at health providers, dispersed across settings, to varied standards, with accessibility obstacles	**Person owned** Data from all providers, systems and devices is held in personal data clouds, under personal control and accessibility permissions

Sources: Royal Free Charity; Roland Berger

Roland Berger

Caregiving can take on many forms – Assistance and support with activities of daily living are at the heart of informal and formal care provisions

Caregiving spectrum

Informal care	Formal care			
At-home: Informal Support	At-home: Formal Support	Day care centers	Assisted living	Institutio-nal/nursing home care

Short-term care:
for example, due to
> Hip fractures
> Knee replacements
> Stroke
> Cardiac diseases

Long-term care (LTC):
for example, due to
> Alzheimer's Disease
> Advanced dementia
> Advanced diabetes
> Neurological illnesses (e.g. MS)
> Congestive heart failure
> Multiple illnesses
> Hospice (palliative) care

Cost of care

> **Caregivers** are individuals providing care and assistance to family members and friends in need of support due to physical, cognitive or mental health conditions. Often called **at-home, family** or **informal caregiving**, it is fundamentally **non-medical care**, untrained and often unpaid care – and therefore a form of low-cost care

> This **informal caregiving** forms the cornerstone of support worldwide, providing the bulk of care provision to care recipients of all ages in need of assistance with **activities of daily living** (**ADL**)

> There are six **basic ADLs**: Eating, dressing, bathing, toileting, continence and mobility. The ease with which individuals can perform these ADLs helps determine what type of care they may need and for how long – temporarily (following an operation) or longer term (chronic illness) – and if formal public care provisions are available

> Informal at-home caregiving can also be **supplemented with** or **substituted by trained professional home healthcare workers,** such as nurses, therapists, social carers, dietitians and other trained homecare assistants who are paid for their services, and whose care is in accordance with an official and medically supervised care plan with regards to ADL

> An individual may need long-term help with many other types of activities, too, such as meal preparation, bill payments, and household chores – these are referred to as **instrumental activities of daily living** (**IADL**); while these types of services are strictly not considered healthcare services, family caregivers and home healthcare workers often assist with these activities as well

> **Formal caregiving** can be organized into **three different categories**: (1) in-home based care provided by direct home healthcare workers, (2) community-based care (such as day care centers and respite centers), and (3) residential care, in the form of assisted living facilities or institutional nursing care homes; here, residential care workers supported by other healthcare professionals provide mostly eldercare, including hospice care

Sources: OECD; ILO; MECF; Roland Berger

Roland Berger

Care funding and support systems vary considerably – From fully tax-funded or care insurance based LTC systems to means-tested safety nets

Differences in care funding and care support structures

Care funding systems	Tax-funded, comprehensive and universal system	Universal compulsory LTC insurance (more comprehensive/ with co-payments)	Mixed systems (general tax revenue /health insurance/ social contributions, etc.)	Central taxation/State or federal funds but highly means-tested ("safety-net") systems	Fewer public funds, some means-tested but limited availability of LTC funds	No public funds available for LTC services
Informal care (IC)	IC is one component of the system (low IC use, high IC support)	IC is one component of the system (high IC use, high IC support)	IC is an important part of the system (high IC use, high IC support)	IC is a critical component (high IC use and reliance, mixed IC support)	Very heavy reliance on informal (family) care	Exclusive reliance on informal care
Formal care (FC):						
At-home services & community care	Widely available	Widely available	Widely available	Commonly available	Limited availability	Not available
Institutional care (Nursing home care)	Widely available	Widely available	Widely available	Widely available	Somewhat available	Rarely available
Cash payments for LTC	Available	Often available	Generally available for LTC	Available on a limited or means-tested basis	Not available	Not available
Countries (sel.)	Sweden, Norway, Denmark	Netherlands, Japan / Germany, South Korea	Switzerland, Spain, Ireland, France, Italy Finland, Australia	USA, UK	South Africa, China, India, Mexico, Thailand, Brazil	Kenya, Ghana, Bangladesh
Notes	Public provision of LTC financed from general revenue; allocation usually devolved to local authorities	NL: LTC Part of health insurance as care is not separated from illness D, K, J: Care insurance	Highly mixed funding systems; levels of support, payments differ strongly CH: LTC part of health insurance; E, F, AUS: tax-funded care insurance (part.)	UK: LTC dependent on financial assessment and asset thresholds; individual must deplete their assets to qualify USA: Medicaid finances some LTC but individuals must exhaust their funds to qualify; US is largest private LTC market	Long-term care funding, coverage or care insurance (private or public) is close to non-existent in most African, Latin American and Asian countries (except South Korea, Japan); reliance on family caregiving is the norm and informal carer status is not formalized	

Roland Berger
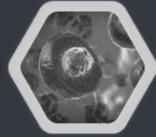
Informal caregiving is highly important – The stronger the care system, the smaller the burden on informal caregivers to give intensive long-term care

Generosity of LTC systems lessens the uptake of intensive informal care

Informal caregivers [%]
(<11h per week)

Intensive informal caregivers [%]
(>11h per week)

Generosity of LTC provisions[1]

Generosity of LTC provisions[1]
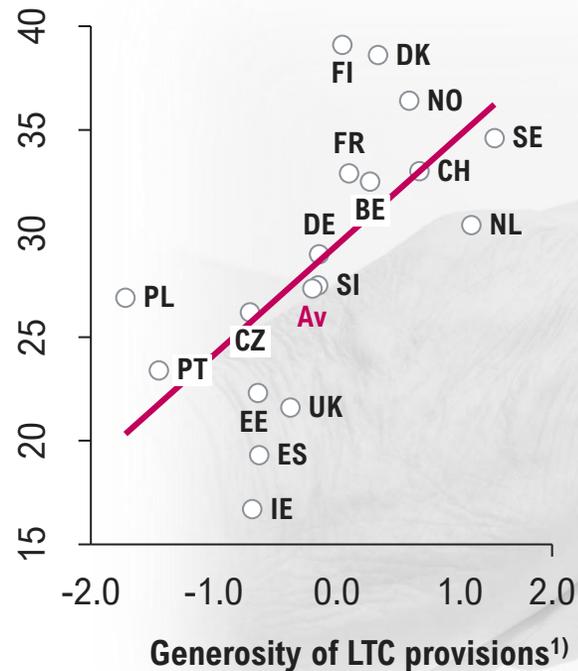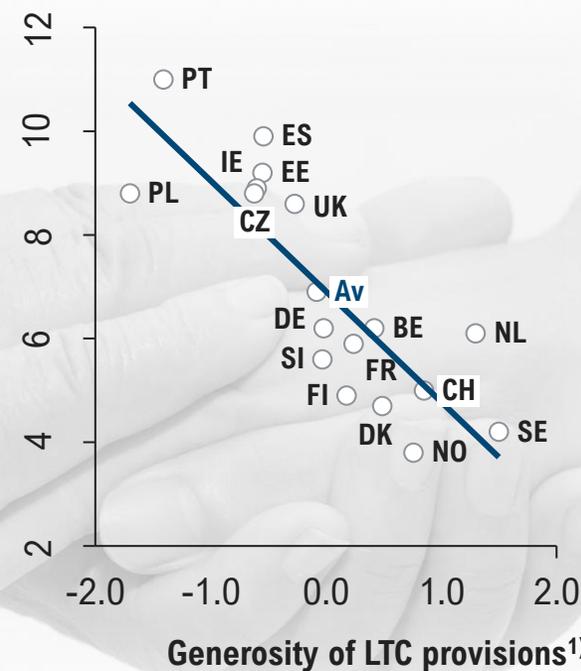
> Based on data from the European Social Survey (2014), **around one third** of the population give **some form of informal care** to a person in need (a family member, friend or neighbor because of health reasons including eldercare)

> Yet, **intensive informal caregiving**, on average, is much lower – **6.85%** of the population in Europe give care informally for more than 11 hours per week; **variations are considerable, from just under 4% in Norway to over 11% in Portugal**

> Countries that have a high prevalence of low intensity informal caregiving have a lower share of intensive informal caregivers and vice versa; this suggests that **generous welfare states,** where aspects of long-term care are well formalized and funded, stimulate taking up a caring role (to some degree), while at the same time such states **take away the burden of more intensive caregiving from informal (family) caregivers**

> A deeper analysis reveals that informal carers in Southern and Eastern European countries need to provide support with (more physically demanding) activities of daily living (ADL), while in Nordic countries, support is centered more around 'instrumental activities' (IADL), complementing formal care services provided. These different roles stem from **different cultures of care** and the **division of care responsibilities between the state and the family** in different LTC regimes developed over time

> Informal caregiving substitutes publicly funded LTC systems but there are considerable **opportunity costs** derived from informal care – impacts on labor market and productivity, as well as on caregivers' health status are considerable

1) Measured by a four-factor index combining long-term care beds in institutions and hospitals per 1000 population aged 65+, long-term care workers per 100 people aged 65+, long-term care public expenditure (health component) as share of GDP, and proportion of population receiving long-term care

Sources: Verbakel/Scandinavian Journal of Public Health; European Social Survey; OECD; Roland Berger

Roland Berger
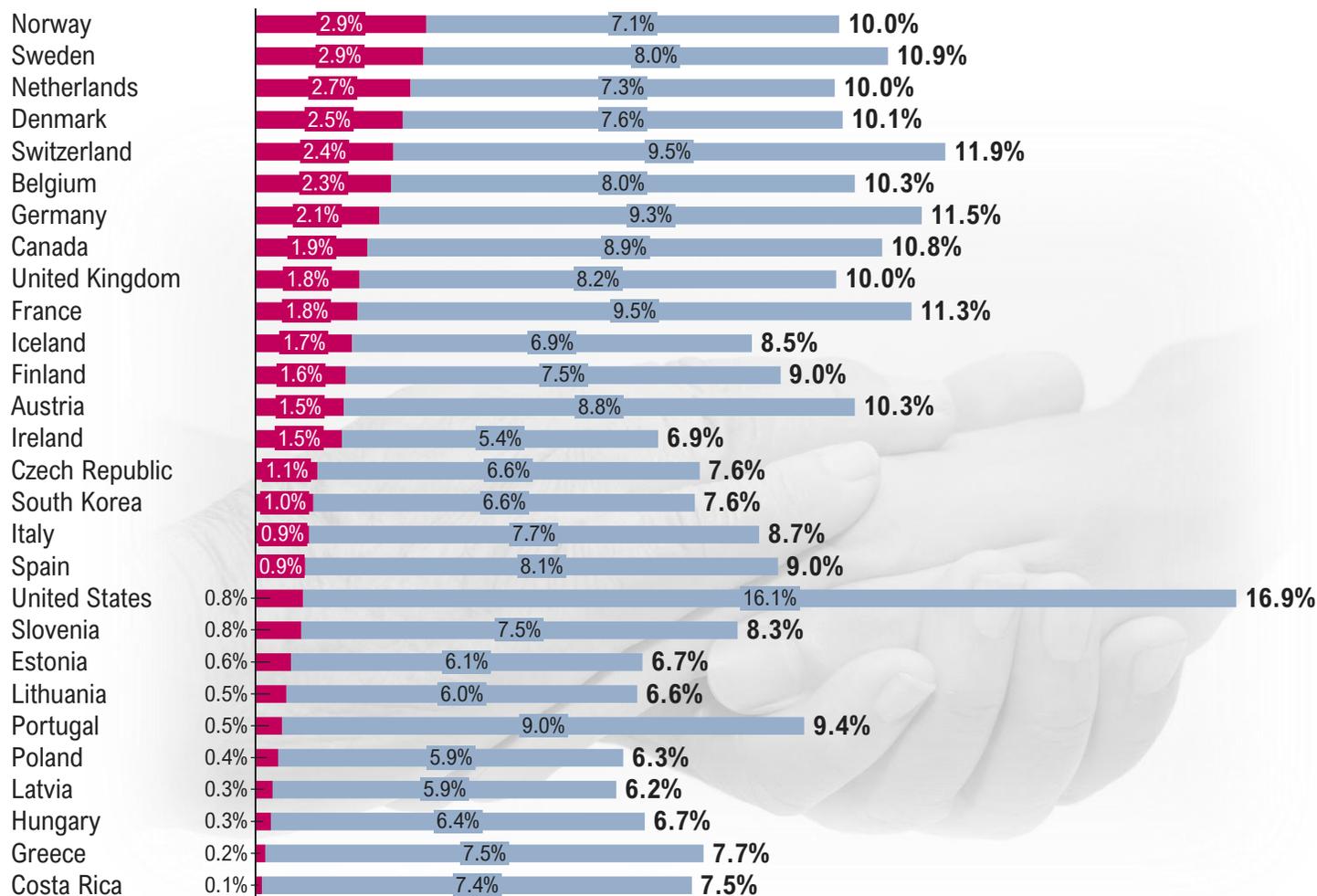
Care resource allocation: Long-term care expenditures as a share of GDP vary widely – LTC share is highest in Nordic countries and the Netherlands

Total healthcare expenditure and long-term care expenditure as a share of GDP, 2018 [%]

Country	LTC	Health excl. LTC	Total
Norway	2.9%	7.1%	10.0%
Sweden	2.9%	8.0%	10.9%
Netherlands	2.7%	7.3%	10.0%
Denmark	2.5%	7.6%	10.1%
Switzerland	2.4%	9.5%	11.9%
Belgium	2.3%	8.0%	10.3%
Germany	2.1%	9.3%	11.5%
Canada	1.9%	8.9%	10.8%
United Kingdom	1.8%	8.2%	10.0%
France	1.8%	9.5%	11.3%
Iceland	1.7%	6.9%	8.5%
Finland	1.6%	7.5%	9.0%
Austria	1.5%	8.8%	10.3%
Ireland	1.5%	5.4%	6.9%
Czech Republic	1.1%	6.6%	7.6%
South Korea	1.0%	6.6%	7.6%
Italy	0.9%	7.7%	8.7%
Spain	0.9%	8.1%	9.0%
United States	0.8%	16.1%	16.9%
Slovenia	0.8%	7.5%	8.3%
Estonia	0.6%	6.1%	6.7%
Lithuania	0.5%	6.0%	6.6%
Portugal	0.5%	9.0%	9.4%
Poland	0.4%	5.9%	6.3%
Latvia	0.3%	5.9%	6.2%
Hungary	0.3%	6.4%	6.7%
Greece	0.2%	7.5%	7.7%
Costa Rica	0.1%	7.4%	7.5%

■ LTC expenditure as a share of GDP   ■ Health expenditure excl. LTC as a share of GDP

> The share of total (public and private) health expenditure and long-term care (LTC) **expenditure of GDP differs greatly** from country to country; LTC can be broadly defined as paid care for people needing (non-medical) support in many facets of living over a prolonged period; overall, this mostly refers to eldercare

> While the **United States are a global leader in overall health expenditure as a share of GDP**, their LTC share (0.8%) is notably only a third of the world's #2 in relative expenditure to GDP, namely Switzerland (2.4%)

> **Nordic countries and the Netherlands are leading when it comes to** share of GDP spent on **LTC** (>2.5%), followed by countries where a mixture of LTC funding systems is established, accessible and supportive, and thus a **pillar of healthcare** generally; for example, the formalization of the Dutch LTC approach dates back to the 1960s

> Recently, more **countries have begun to tackle future LTC funding challenges** that an aging population entail, for example, Japan introduced an LTC insurance in 2000. In 2008, South Korea has adopted an LTC policy comparable to Germany's national care insurance made mandatory in the late 1990s, while other countries are either reforming existing or testing potential LTC policies: China has been piloting public LTC insurance in 15 cities since 2016

Sources: OECD; BMC; Roland Berger

Roland Berger
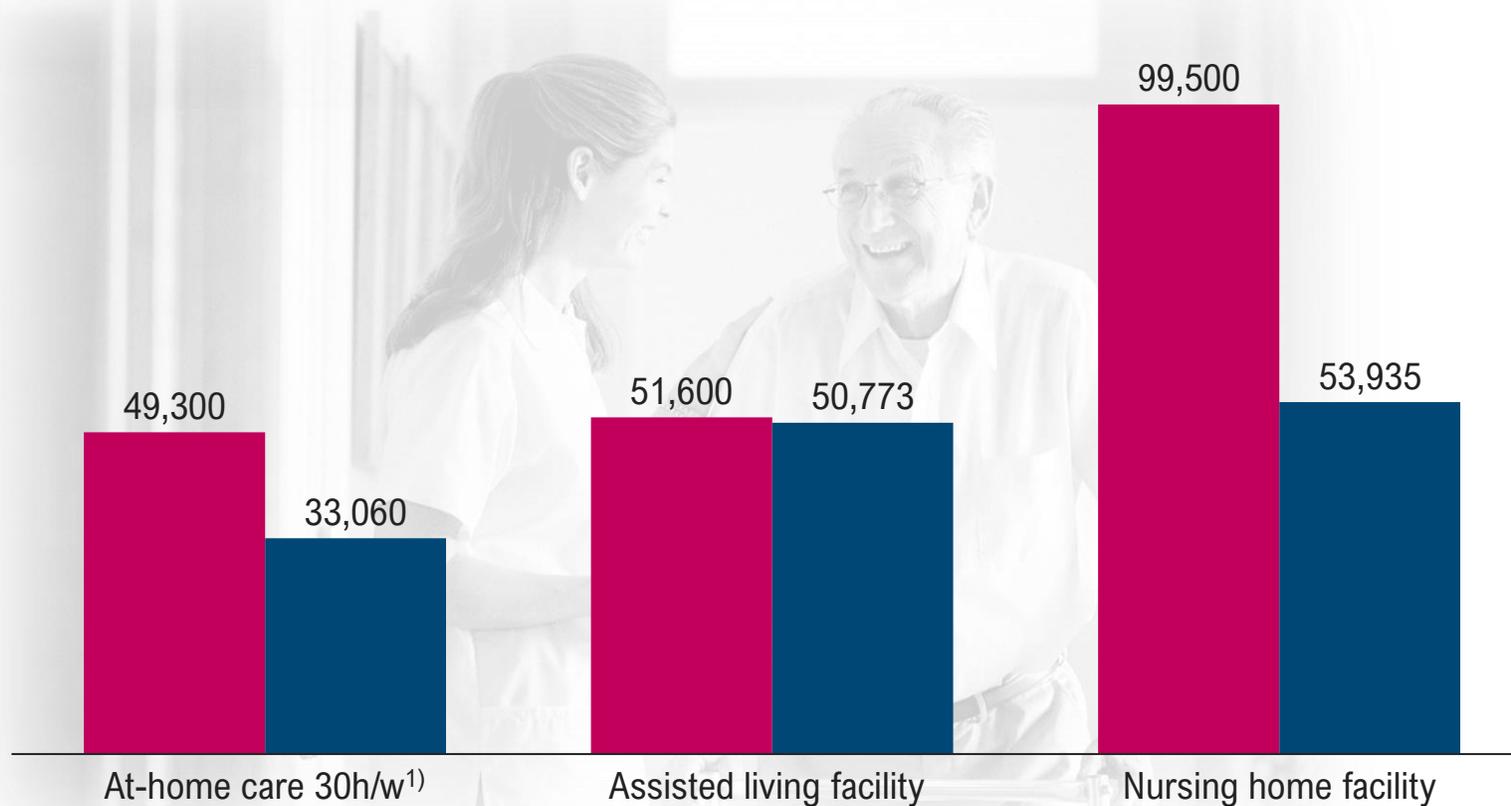
For the individual, formal care costs vary greatly across care settings – In the US, nursing home care is twice as expensive as at-home care

Annual average cost of LTC, selected care settings, per care recipient, 2020 [USD]
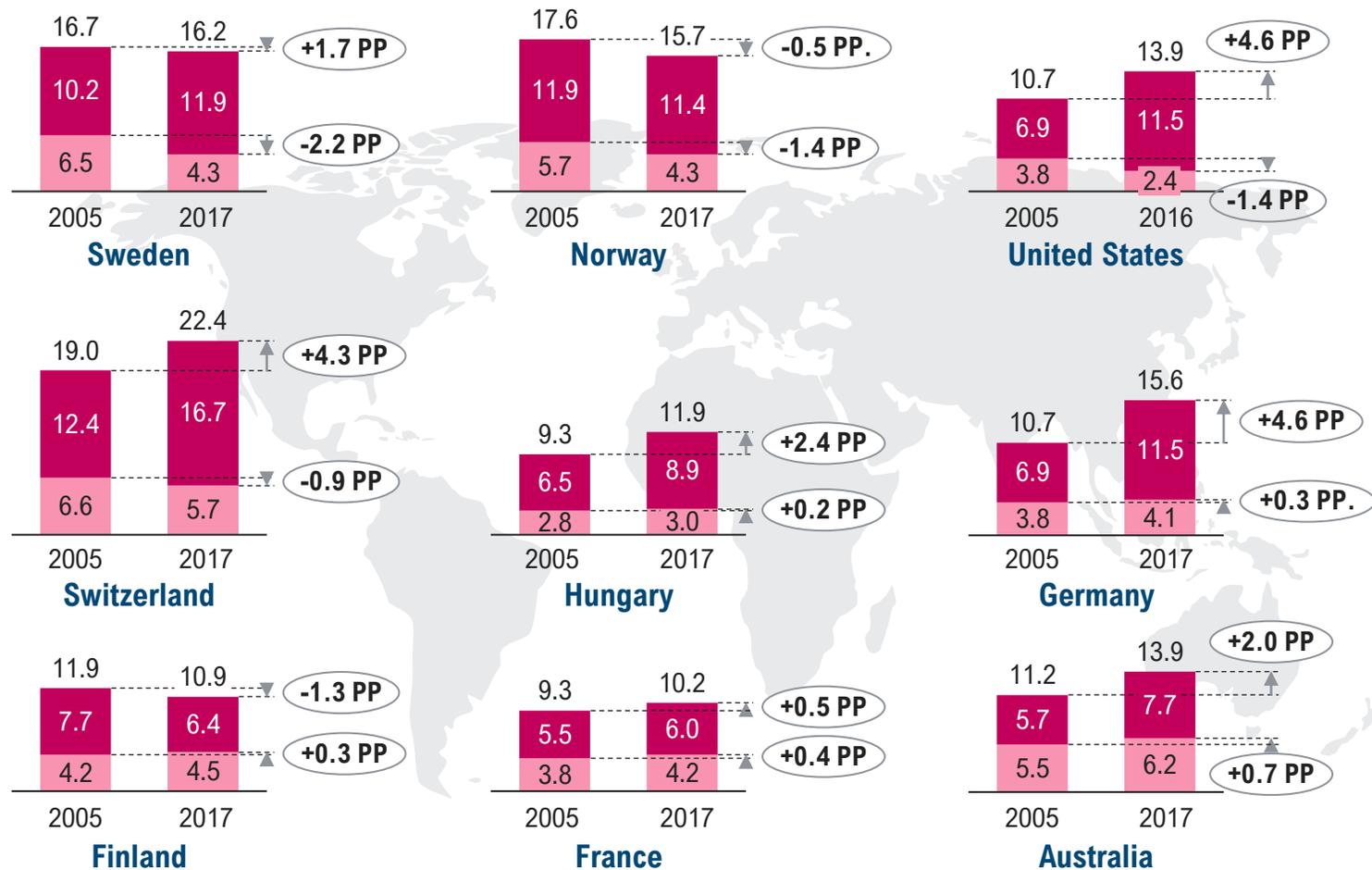
Examples: USA – Germany

- 49,300 (At-home care 30h/w[1])
- 33,060
- 51,600 (Assisted living facility)
- 50,773
- 99,500 (Nursing home facility)
- 53,935

USA   **Germany**

> While institutional care costs in the US and Germany can vary from state to state, the **difference in the average cost of care is substantial**

> Notably, for the care recipient in the US, **the more institutional the care setting, the more sharply expensive care becomes:** Nursing home care is far more expensive compared to at-home care but also nearly twice as costly as similar nursing care settings in Germany

> Such facilities-based LTC settings appear to be the **care option of last resort** in the US for the over 65s – the average length of stay is **14 months**. In **Germany**, the average duration of being a care recipient in a nursing home facility is nearly **30 months** – over twice as long

Note: For at-home care in Germany, assumption approx. equal to level 3 (Pflegegrad 3); ECB reference rate 2020: EUR 1 = USD 1.1422
Sources: Genworth; Allianz; Alters-Institut; AGS; Roland Berger

Roland Berger

From care in homes to care at home: In most countries, LTC for the elderly is moving away from institutional care to more at-home based care

Share of LTC recipients aged 65+ at-home and in institutions of total population aged 65+ [%]

Sweden
- 2005: 16.7 (10.2 at home, 6.5 in institutions)
- 2017: 16.2 (11.9 at home, 4.3 in institutions)
- +1.7 PP
- -2.2 PP

Norway
- 2005: 17.6 (11.9 at home, 5.7 in institutions)
- 2017: 15.7 (11.4 at home, 4.3 in institutions)
- -0.5 PP.
- -1.4 PP

United States
- 2005: 10.7 (6.9 at home, 3.8 in institutions)
- 2016: 13.9 (11.5 at home, 2.4 in institutions)
- +4.6 PP
- -1.4 PP

Switzerland
- 2005: 19.0 (12.4 at home, 6.6 in institutions)
- 2017: 22.4 (16.7 at home, 5.7 in institutions)
- +4.3 PP
- -0.9 PP

Hungary
- 2005: 9.3 (6.5 at home, 2.8 in institutions)
- 2017: 11.9 (8.9 at home, 3.0 in institutions)
- +2.4 PP
- +0.2 PP

Germany
- 2005: 10.7 (6.9 at home, 3.8 in institutions)
- 2017: 15.6 (11.5 at home, 4.1 in institutions)
- +4.6 PP
- +0.3 PP.

Finland
- 2005: 11.9 (7.7 at home, 4.2 in institutions)
- 2017: 10.9 (6.4 at home, 4.5 in institutions)
- -1.3 PP
- +0.3 PP

France
- 2005: 9.3 (5.5 at home, 3.8 in institutions)
- 2017: 10.2 (6.0 at home, 4.2 in institutions)
- +0.5 PP
- +0.4 PP

Australia
- 2005: 11.2 (5.7 at home, 5.5 in institutions)
- 2017: 13.9 (7.7 at home, 6.2 in institutions)
- +2.0 PP
- +0.7 PP

- LTC recipients at home
- LTC recipients in institutions

> In recent decades, many countries have instigated a strategy of long-term care **deinstitutionalization** to replace traditional models of care towards more LTC in the home

> The ambition is two-fold: To meet older people's **preference for staying in their known environment**, but also to contain cost-intensive institutional LTC expenditure in the face of an increasing aging population

> **Deinstitutionalization** is thus a means to achieve higher quality of life for the elderly and **care system sustainability** – but different national approaches have led to diverse results due to large disparities in regulatory, financial (care incentives), contextual (age structure), and cultural care backgrounds (expectations towards informal care), rendering this path a complex, country-specific process where data comparison is fraught with **caveats**

> Overall, **most countries have increased the level of at-home LTC** but not all have simultaneously managed to decrease their share of LTC recipients in institutions over the same time period

Sources: OECD; European Centre for Social Welfare Policy; ILO; Roland Berger

Roland Berger

Across Europe, the proportion of LTC workers of the total workforce differs widely – Part-time non-residential care work is most prevalent

LTC workers as a share of total workforce for selected European countries, 2019 [%]

Country	Non-residential	Residential	Total
Sweden	2.8%	4.3%	7.1%
Netherlands	1.6%	4.8%	6.4%
Belgium	1.9%	3.6%	5.5%
Finland	1.3%	4.0%	5.3%
France	1.7%	2.7%	4.4%
Germany	1.1%	3.1%	4.2%
Malta	0.5%	3.0%	3.5%
Luxembourg	1.2%	2.2%	3.4%
Portugal	0.7%	2.7%	3.4%
EU27	0.9%	2.2%	3.1%
Slovakia	1.5%	1.5%	3.0%
Spain	0.6%	1.6%	2.2%
Austria	0.4%	1.8%	2.2%
Czech Republic	0.5%	1.4%	1.9%
Hungary	0.4%	1.4%	1.8%
Italy	0.4%	1.4%	1.8%
Croatia	0.7%	1.0%	1.7%
Lithuania	0.3%	1.2%	1.5%
Estonia	0.2%	1.1%	1.3%
Bulgaria	0.7%	0.5%	1.2%
Poland	0.3%	0.8%	1.1%
Romania	0.3%	0.5%	0.8%
Cyprus	0.2%	0.4%	0.6%
Greece	0.1%	0.2%	0.3%

Legend: Residential | Non-residential | Part-time | Full-time

LTC workers employed full or part time, Europe [%], 2019

	Entire Workforce	Healthcare	LTC	Residential LTC	Non-residential LTC
Full-time	81%	74%	58%	63%	48%
Part-time	19%	26%	42%	37%	52%
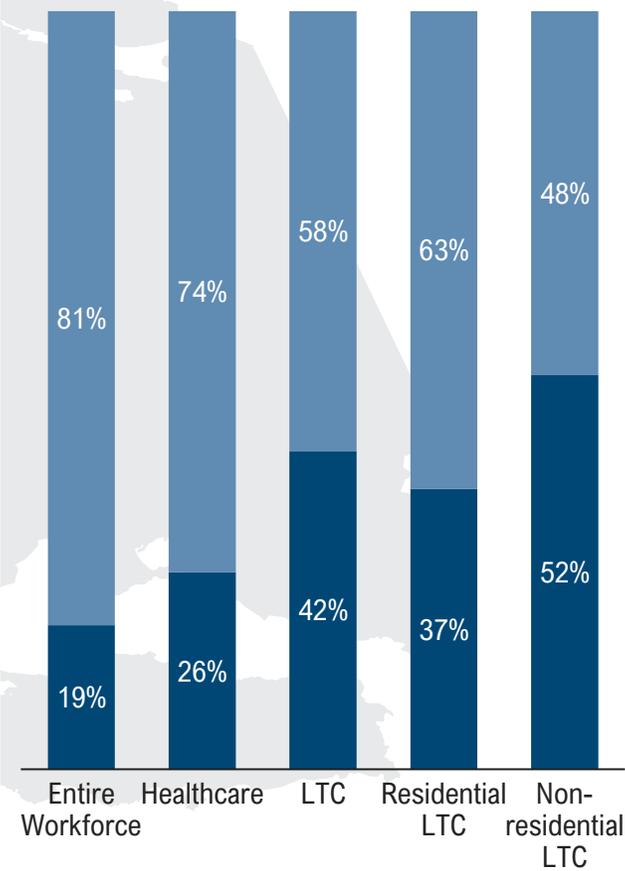
> Across Europe, the LTC workforce as a share of the entire workforce ranges **from 7.1% in Sweden to 0.3% in Greece** – such differences cannot be explained by LTC needs but are likely to stem from funding and differences in access to formal LTC (barriers include high cost, waiting lists, entitlements, etc.)

> **Part-time work** is much more prevalent in **LTC (42%)** than in **other professions (19%)**

> As a proportion of the overall workforce, the **formal LTC workforce in Europe has expanded** steadily from 2009 to 2019, by one-third **to over 6.3 million** – growth in employment in non-residential LTC has been larger than that in residential LTC

> The LTC workforce is **mainly female (81%)** – this gender split has barely changed over the past decade

> The proportion of workers aged 50+ is **higher** than in other sectors, and **is increasing** at a faster pace, **from 28% (2009) to 38% (2019)**

Sources: Eurofound/European Commission; Roland Berger

Roland Berger

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Pandemics
& Other
Challenges

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Treatments

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giving

A low number of care workers relative to the population aged 65+ persists in most countries – Key employment features vary

LTC workers per 100 people aged 65+, 2016

Country	Value
Poland	0.5
Portugal	0.8
Slovak Republic	1.5
Italy	1.9
Hungary	2.2
Slovenia	2.3
Czech Republic	2.3
France	2.3
United Kingdom	3.3
South Korea	3.5
Canada	3.6
Ireland	4.0
Austria	4.1
Spain	4.5
Belgium	4.8
OECD28	4.9
Germany	5.1
Estonia	5.3
United States	5.7
Japan	5.9
Australia	6.2
Finland	7.6
Luxembourg	7.9
Netherlands	8.0
Denmark	8.1
Sweden	12.4
Norway	12.7
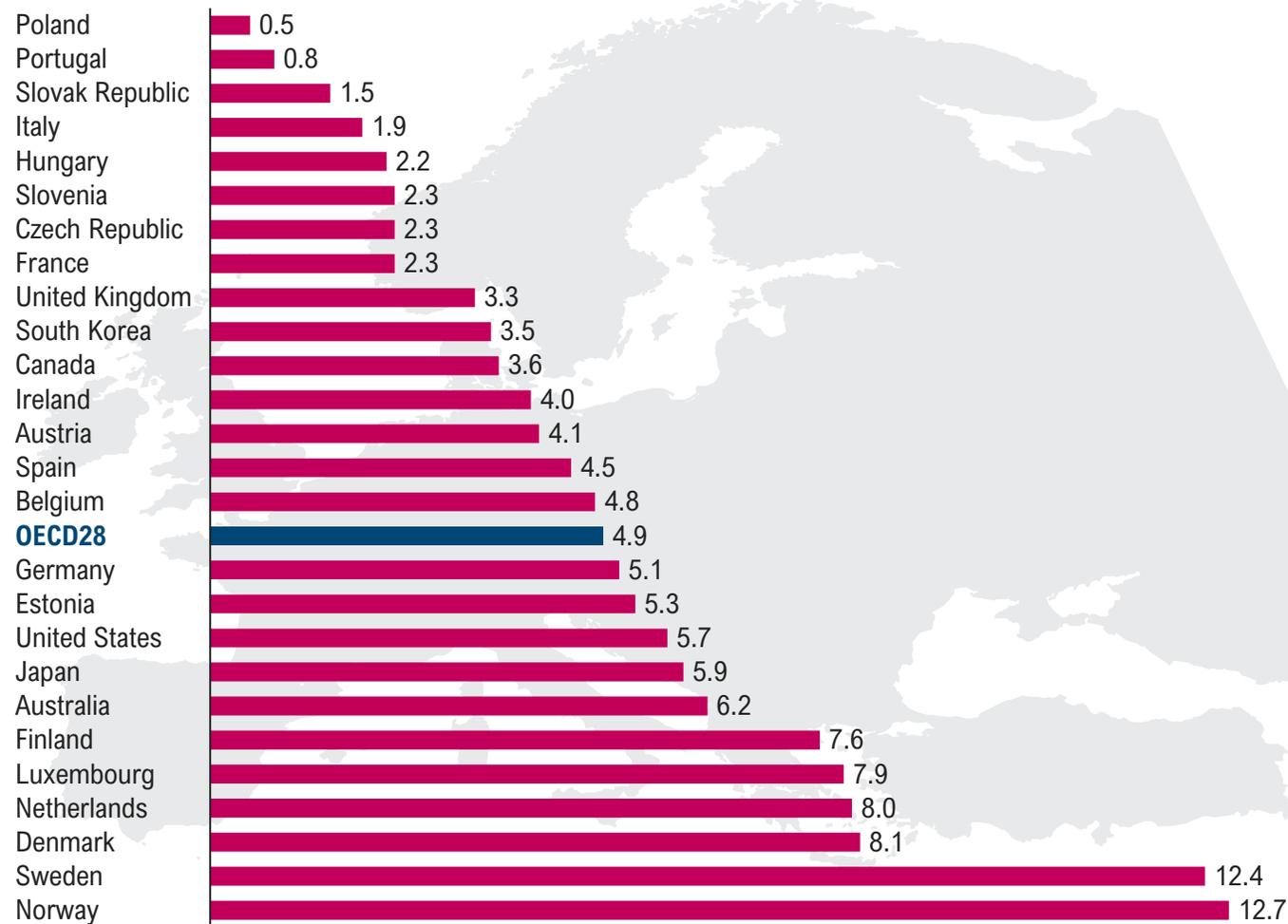
> There are now, on average, around **five LTC workers per 100 people aged 65+** across OECD and EU countries, with only a few countries having notably more, such as the Nordic countries, the Netherlands, Japan, USA – but this number has been slow to shift everywhere

> Some countries have **exceptionally low care worker numbers** – for example, in countries where a traditional reliance on informal (family) carers is particularly high, even for more intensive long-term care (Italy, Portugal), or where the LTC system is less robust (for example, in Eastern Europe), or evolving due to more recent reforms (South Korea)

> The number, competency and type of professionals providing LTC services varies greatly across countries, and so do their employment policies. **Low pay, high turnover and part-time work remain key features** of many LTC labor markets, and working in this sector is still not attractive enough in most countries for longer periods of time

> Furthermore, care workers competencies developed through education and training do not always match LTC tasks, which raises questions around **productivity**. Many countries do not yet have comprehensive strategies for the professionalization of LTC workers; often career paths are also limited

> Despite considerable **higher demand for LTC expected** for the coming decades, barriers to recruiting and retaining suitable skilled staff prevail

Roland Berger

LTC worker recruitment and retention are key concerns across many countries – For some these issues are a two-fold challenge

Median tenure rates and LTC workers per 100 people aged 65+, selected countries, 2016 [years]

Median tenure [years]

Chart: scatter plot with x-axis "Headcount of LTC workers per 100 individuals aged 65 and over" (0 to 14) and y-axis Median tenure [years] (2 to 9).

- Recruitment challenge (top-left region)
- Recruitment & Retention challenge (bottom-left region)
- Retention challenge (bottom-right region)

Data points: GRC (~8), NLD (~8), POL, SVN, FRA (~7), BEL (~7), LUX (~7), ROU, BGR, SVK, HUN, CZE (~6), MLT (~6), OECD (~5.5), PRT, CYP (~5), AUT (~5), AUS (~5), SWE, NOR (~5), ITA (~4), IRL, ESP, DEU, EST (~4), GBR (~3), FIN, DNK (~3)

> Addressing future LTC needs of the ageing population will not be possible unless two key issues are addressed within the sector: **retention** and **recruitment of LTC workers**

> Across all OECD countries, the **median tenure of LTC workers is just above five years** – which is around two years below that of the overall workforce

> In some countries, such as Germany or Finland, for example, the supply of LTC workers (per 100 people aged 65+) is larger than or close to OECD average but their median tenure is lower – such countries are faced with a **retention challenge**

> In other countries, such as France, Poland and Hungary, LTC workers stay comparatively longer in their jobs but the workforce per 100 people aged 65+ is much lower – such countries face a **recruitment challenge**

> Some countries, such as the UK and Italy face an above average **combined challenge** of recruitment and retention issues

> High rates of **staff turnover** generate not only a poorer quality of care but also higher costs in recruitment and subsequent training

Notes: Certain data limitations persist; the tenure rates presented here aggregate nurses and personal care workers, who often have different tenure rates; e.g., in Norway, the tenure rate of nurses is lower than that of personal care workers; in Belgium and Austria it is the other way around. The OECD data point is the unweighted average of the 23 OECD countries shown in the chart. EU-LFS data are based on ISCO 4-digit and NACE 2-digit codes
Sources: OECD; Roland Berger

Roland Berger

By 2040 an additional 60% of LTC workers are needed – With technological and work improvements the required increase could be cut in half

Additional LTC workers needed by 2040 [% of 2016 workforce][1]

1/3
of care work
is spent on
administrative
reporting

Chart countries (top to bottom): South Korea, France, Israel, Canada, Australia, Norway, Spain, United States, OECD, United Kingdom, Germany, Italy, Sweden, Finland

X-axis: 0% 20% 40% 60% 80% 100% 120% 140%

Legend:
- Without productivity increases
- With productivity increases

> In the coming decades, countries will need **additional** skilled **long-term care workers** to respond effectively to the growing care needs of an increasingly older population

> The number of LTC **workers** will **need** to **increase by 60%** by **2040** or **13.5 million workers across the OECD** to keep the current ratio of **carers** to elderly people; if productivity improvements, such as **changing work arrangements** and **technological improvements,** were factored in, the increase required is cut in half to 30%

> Measures geared at attracting more workers (including more men, in particular) into the care sector, for example through better **quality training** and **remuneration**, desirable **career pathways,** and increased **flexibility** will help to improve retention rates and aid recruitment efforts while enhancing the care sector's image overall

> LTC is a labor-intensive sector, but **greater use of technology could help increase productivity**. New technologies hold enormous potential to support LTC workers, particularly when it comes to improvements in **communication** and **monitoring** of care recipients, for example through smart **assistive technology**

> As around 1/3 of care work involves some form of administrative reporting tasks, the greatest potential lies in **easier information gathering, records administration,** and **sharing** of patient data for **efficient and critical care coordination** across home, institutional and hospital care settings i.e., multiple care providers through shared care planning tools

> Many **more work processes can be enhanced**: Cloud-based communications can enable real-time **dynamic scheduling** systems, which facilitates care professionals to organize home visits, plot most efficient at-home care visit journeys based on travel conditions and care locations while having access to files, care history and essential contact information remotely

1) Based on technological improvements and changing work arrangements
Sources: OECD; Roland Berger

Roland Berger

Dementia points at a strong increase in the need for cost-intensive, long-term care

Global population aged 65+ years [m]

1,500

678

2018   2050

+121%
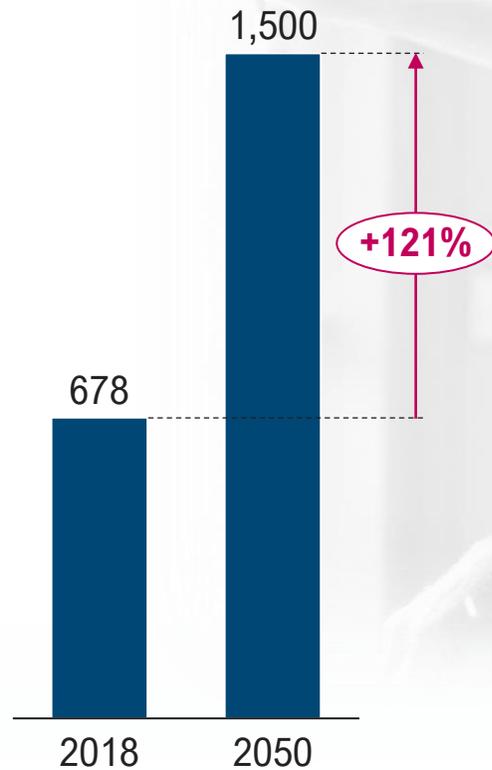
Global number of people living with dementia [m]

50   82   152

2018   2030   2050
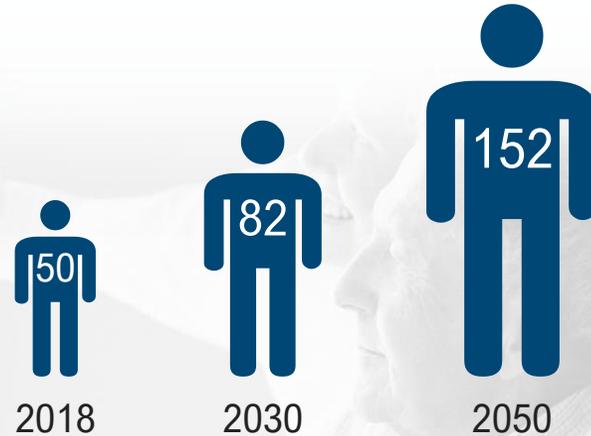
Worldwide cost of dementia [USD tr]

$ 1 tr $ 2 tr

2018   2030
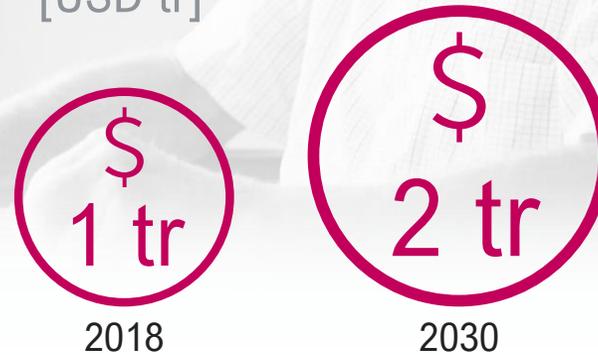
> In the future, many older people will be in good shape **– but many won't**

> The world's **older population continues to grow**. Globally, the number of people aged 65+ will more than double to 1.5 billion people to 2050

> The share of older people in need of **specific, more intensive care** is growing: **Someone turning age 65 today has** almost a **75% chance** of needing some type of **LTC service** in later years

> An important example of such an old-age care-intensive disease is **dementia**. The incidence rate increases **exponentially between the ages of 65 and 90** years, and doubles approximately every 5 years (1 in 14 over 65+, 1 in 6 over 80); noticeably more women are affected than men

> Early clinical symptoms comprise the difficulty of recalling conversations, names or events as well as apathy and depression. **Later symptoms** include impaired communication, disorientation and confusion, behavioral changes and, **ultimately, difficulty speaking, swallowing, and walking**

> Dementia has a physical, psychological, social, and economic **impact on patients but also on their care systems**: Doctors, caregivers, families, and society at large; the higher the caregiver burden, the more likely is the institutionalization

> Currently around **50 million people are living with dementia globally**. This number is expected to **triple to 152 million by 2050,** of which 71% will live in low- and middle-income countries – up from 60% today

> The next decade will 'only' see an increase of around 30 million people, but this will lead to **a doubling of the current global cost of USD 1 trillion to USD 2 trillion**

Roland Berger

Caregiving provides opportunities for more innovative tech solutions – Technology can aid the caregiver as much as the care recipient

Technological opportunities in caregiving for care workers/providers and care recipients

For care providers & care professionals

Assistive technologies

Assistive devices (e.g. tablets) that allow a care worker to perform, monitor and record **a range of care tasks**, remotely and in situ

Remote care and disease management technologies

Telecare and cloud-based clinical solutions providing **remote treatment management** and the **flexibility** to be used across different care settings spanning patient records, bookings, consultations, etc. **Sensors** to monitor diseases remotely or to help with in-home adjustment following hospital stays as well as **software** that aids carer visit scheduling or in-time medication deliveries

For care recipients & care professionals

Social technologies

A variety of devices and apps can help create a **social circle** and easy access to **interactive support**, helping to connect next of kin, friends and community, also acting as a social and **companionship** facilitator

Self-management technologies

Technological solutions and services that allow for more self-directed (cognitive or physical) living and enhanced daily activities (elearning); solutions can also enable the elderly to take control of personal health and care management plans more interactively, including **telehealth services from doctors and pharmacies**

> Existing and emerging innovative technologies have a vital role to play in improving the **standards** for those in need of care, while providing **savings** in the healthcare and caregiving sectors

> Many **care providers** already use or are looking for ways to implement simple technologies such as smartphones, **alarm systems**, **sensors** and **GPS** monitors in nursing homes or for home care delivery. More complex technological devices – such as companionship robots or self-sufficient smart homes, although not widespread – are showing positive results in labs and making their way into care settings in Japan and northern European countries

> **Care organizations** can achieve **multiple goals**: A more **efficient**, **cost-effective** and **collaborative** service by combining **remote**, **mobile** and/or **cloud-based** technologies; they help improve work processes and reduce LTC workload – for instance, by helping to share care plans and reducing the amount of repetitive tasks

> With **older generations (as well as their families) being increasingly digital-savvy** – and the coronavirus pandemic helping to accelerate the use of telehealth technologies – it is encouraging that in a recent US survey seniors increased their use of telemedicine services by 300% and **nearly half (43%) say they are happy to continue in this way post-pandemic**. Furthermore, 28% of respondents **already monitor their vitals via a wearable device**, and 34% order their prescriptions from an online pharmacy
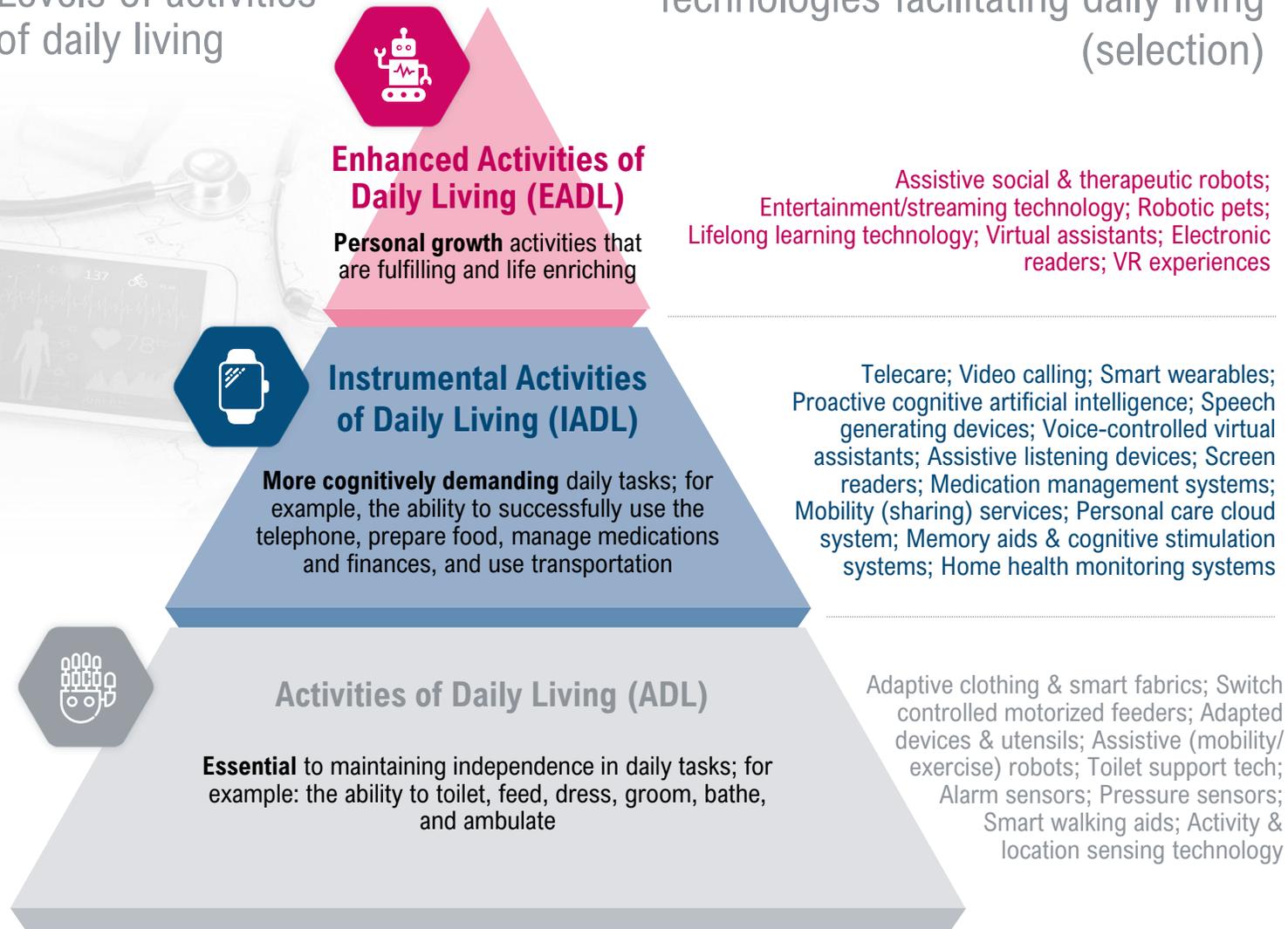
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Technology can support the elderly in many more daily activities – Innovations significantly increase independence and quality of life

Levels of activities of daily living

Technologies facilitating daily living (selection)

Enhanced Activities of Daily Living (EADL)

Personal growth activities that are fulfilling and life enriching

Assistive social & therapeutic robots; Entertainment/streaming technology; Robotic pets; Lifelong learning technology; Virtual assistants; Electronic readers; VR experiences

Instrumental Activities of Daily Living (IADL)

More cognitively demanding daily tasks; for example, the ability to successfully use the telephone, prepare food, manage medications and finances, and use transportation

Telecare; Video calling; Smart wearables; Proactive cognitive artificial intelligence; Speech generating devices; Voice-controlled virtual assistants; Assistive listening devices; Screen readers; Medication management systems; Mobility (sharing) services; Personal care cloud system; Memory aids & cognitive stimulation systems; Home health monitoring systems

Activities of Daily Living (ADL)

Essential to maintaining independence in daily tasks; for example: the ability to toilet, feed, dress, groom, bathe, and ambulate

Adaptive clothing & smart fabrics; Switch controlled motorized feeders; Adapted devices & utensils; Assistive (mobility/ exercise) robots; Toilet support tech; Alarm sensors; Pressure sensors; Smart walking aids; Activity & location sensing technology

> A standard classification of desired activity levels in eldercare distinguished between **3 different desired levels of activities**; the first two are concerned with important activities of every day living, while the third encompasses enhanced and personally fulfilling activities

> Tracking and encouraging activities is increasingly supported by innovative technology: **smart wearables** monitor activity levels as well as vital signs all-in-one; data can be shared remotely with assigned carers and next of kin through a personal care cloud

> For enabling **personal growth** into high age, and to make life more enjoyable, technology can be increasingly more complex while being more natural for the user, for example, assistive social and therapeutic robots

> **Robotic pets** represent an exemplarily novel way in the care of **dementia patients**: According to the Journal of Alzheimer's Disease, the need for pain and psycho-active medication is reduced in dementia sufferers that interact with robotic pets

> The use of different **VR experiences** can be beneficial, too – for **dementia patients**, but also for empathy training of professional caregivers as well as family members

Sources: Verywell Health; WATI; Journal of Alzheimer's Disease; ADI; Roland Berger

Roland Berger

What works? Care technology providers assess latest solutions already in use – Adoption by caregivers is low but interest and likely to use is high

Two surveys on the use of LTC technology: Providers vs caregiving community

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A **critical view** taken from a survey (2019) of **US care tech providers** finds what works …

> **Technology solutions that facilitate the workforce** are more prominent, e.g. technologies, such as **remote monitoring devices/systems** increasing the efficacy of staff, **enhanced documentation tools** reducing bureaucracy or **wearable technologies** acting as a two-way communication tool

> **Teaching and training of care workers**: New **educational tools** have been developed to increase knowledge on certain conditions, promote proper **caregiving techniques**, and **teach sympathy/empathy** to improve care delivery

> **Technology that addressed workforce recruitment, retention, and staffing efficiency**: For example, **predictive analytics** are used to identify candidates best suited for certain long-term care positions, which is beneficial to both initial recruitment as well as long-term retention. Other techniques to improve retention include more **choice in shift scheduling**, work location, and clientele

> **Staff efficiency can be improved by real-time location tracking** for **quick assistance** in emergent situations and analysis of those location patterns for enhanced long-term insights

> **Socially Assistive Robots** (SARs), such as robotic dogs, cats, and seals, have been found to **increase social connectedness** for isolated adults

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… and what doesn't – yet, or in a very limited capacity:

> While **robotic solutions that connect to home automation systems and family members** continue to be developed and improved, they are not likely to mitigate the workforce shortage

> **Robots assisting with lifting** patients (e.g. Robear) to help take the physical strain off the care worker are **generally used side-by-side with the worker**

> Technology that will **fully replace the direct care workforce** is still a distant goal

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Potential barriers
to a more widespread **adoption** of **care tech products** and **services** include:

Usability/perceived usefulness

Technological complexity
incl. time to train/learn

Cost

Privacy & data security
concerns

Lack of internet connectivity
in rural areas

A **nuanced view** from a (2017) US survey of **caregivers** finds…

…that **59%** of caregivers say they are **likely to use** a currently available technology, while **71%** of caregivers are **interested** in technology to support their caregiving tasks, but …

… adoption is low – only **7%** of caregivers **are already using** or **have used** technology available in the market

> Top uses are tools for scheduling, tracking care activities, and managing prescriptions

> Younger care professionals are **twice as likely to adopt new care technology**, however the perception that care technology may not improve quality of care is persistently widespread
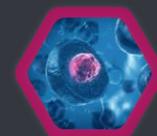
Roland Berger

Health and caregiving are increasingly central to everyone's future – It is vital for all businesses to be prepared …

Actions recommended for companies in all sectors

Pandemics & Other Challenges

Lessons from Covid – Pandemics are rare, epidemics are not: Transferring lessons learnt from outlier events to more frequent, more localized future health challenges is a must; taking stock of impacts and weak spots – including in supply chains but also political and public health frameworks – strengthens corporate preparedness long term

Prepare for climate related health impacts – Climate change and other environmental impacts on health vary by region and sector; companies face an increasing range of future issues specific to their business model and (inter)national spread, from freak weather events to water shortages. Global awareness is best paired with nuanced, localized preparedness based on modelling of climate impacts on business activities including workforce health

Enlighten employees about health risks – Occupational health issues as well as associated lifestyles are shaping the health status of the workforce – impacting sick days, retention, (early) retirement and ultimately, productivity. Encouraging healthy activities and promoting good nutrition, supported by latest occupational health information, challenges traditional patterns for better employee wellbeing

Diseases & Treatments

Promote prevention – With a considerable share of (chronic) diseases being preventable, role models are needed, not just in schools, but also in the workplace; partnering with sports charities, sponsoring outdoor volunteering organizations and cooperation with local health centers while enabling continued access to relevant wellbeing information champions preventative action and increases awareness

Incorporate age-awareness – A healthier workforce is a more productive and happier workforce – for longer; global aging combined with the rise in retirement thresholds extends the working life of a more experienced, older workforce; companies wishing to keep such know-how and skills need to combine age-awareness with flexibility, adapting jobs to fulfill employees' changing capabilities while tapping into their sustained potential

Encourage the use of time-saving health tech – Where workplace absenteeism due to time-consuming medical appointments is an issue, the use of telehealth and virtual consultations can drastically reduce time lost; mental wellbeing can be supported remotely, too. New therapies also bode well for shorter or one-off treatments, better recovery prospects. "New normal" working from home broadens the possibility to tap into a wider, all-abilities workforce supported by technology
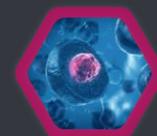
Caregiving

Offer care cover as a benefit – Very few countries have a fully formalized, developed and supportive care system in place; but with increased longevity comes the need for more and longer care. For an increasingly environmentally aware workforce offering care benefits (as part of a healthcare package or stand-alone/top up) might well in the future replace the traditionally coveted company car, or become a sought-after corporate USP in countries where care options or reform is slow or nonexistent

Grant care options – Caring for relatives informally is extremely common around the world – but most often invisible and fraught with pitfalls and opportunity costs for all involved; companies can mitigate these stresses by being (more) flexible, allowing for reduced hours, care sabbaticals or innovative job share schemes, ultimately increasing loyalty and retention among valued, skilled employees

Source: Roland Berger

Roland Berger

… while the health and care sector faces particular challenges and opportunities

Actions recommended for companies involved in health and care sectors

Pandemics & Other Challenges

Maintain broad vision and test for synergies in R&D –

Particularly in drug and vaccine research, there may be overlaps in fields of application. Novel vaccine technologies, such as mRNA, originally stemming from cancer research have made a significant difference in the fight against coronavirus. When creating drugs and vaccines, it is important to maintain an open, synergetic perspective and factor in other fields of application. Black or grey swans – "slight chance events" – do occur and offer world-changing opportunities

Improve training opportunities for health & care workers –

Even though staffing situations are often tenuous, investing in continued professional training and development of health and care workers is a key advantage in a sector straining under retention and recruitment issues. Regular upskilling promotes the sector's career prospects and helps workers to adapt quickly to dynamically changing situations, keeping health & care practices on point

Diseases & Treatments

Tap into personal health and self-care data interests –

Digitization and the shift towards more person-centric and predictive healthcare – including better and more easily informed and responsible self-care practices – provide a ready audience for tools, apps and devices that nudge as well as support an increasingly health-conscious consumer base, opening up new markets and widening target audiences

Harness the power of technology in diagnosis and treatment –

Today, the problem of multimorbidity is already tremendous - AI and database research can help improve with patient diagnosis and results-based therapies. Treatment outcomes can also be tracked with wearables, for example, to help patients recover as quickly as possible or to prevent complications, and to encourage following treatment plans more independently

Caregiving

Tap into the value of technology in caregiving –

Care technology applications and best practices can already be observed in several countries; organizations involved in care are well placed to incorporate more technological support in and around care specific administrative processes but also drive forward best use applications while increasing much needed care technology training for care workers – in line with care expectations. Care technology providers who understand the fundamentals of quality of care and can align their solutions pairing usability with cost find an increasingly tech-savvy, captive audience

Address the gender imbalance in recruiting and retention –

Historically a predominantly female domain, the care sector must find new ways to incentivize male care worker recruitment and their future retention. Emerging technological aspects of care may help to facilitate this, reshaping care job profiles and career paths in the sector in the decades to come
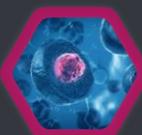
Source: Roland Berger

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1
Pandemics
& Other
Challenges

2
Diseases &
Treatments

3
Care-
giving

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