National Institute for Public Health
and the Environment
Ministry of Health, Welfare and Sport

Public Health Foresight Study 2018
A healthy prospect

Synthesis

Colophon

Foreword

This time last year, I was already writing in our magazine on '25 years of Public Health Foresight Study' that the PHFS has become an industry standard in 25 years, and one of RIVM's gems. By now, the PHFS-2018 entitled 'A healthy prospect' has become a reality.

Looking at this new Public Health Foresight Study in front of me, I cannot help feeling proud. I am proud of the hard work of so many colleagues, who have managed in close collaboration with many stakeholders to create yet another solid product. I am proud of the contribution RIVM has provided to the future of public health care in the Netherlands with this remarkable report. And I am proud of the fact that this edition of the PHFS is once again innovative: it offers an even broader perspective on factors that affect our health, from health care to lifestyle, and from work to the living environment. This PHFS is solidly positioned at the heart of society: together with professionals, policy-makers and citizens, we have formulated our societal challenges for the future.
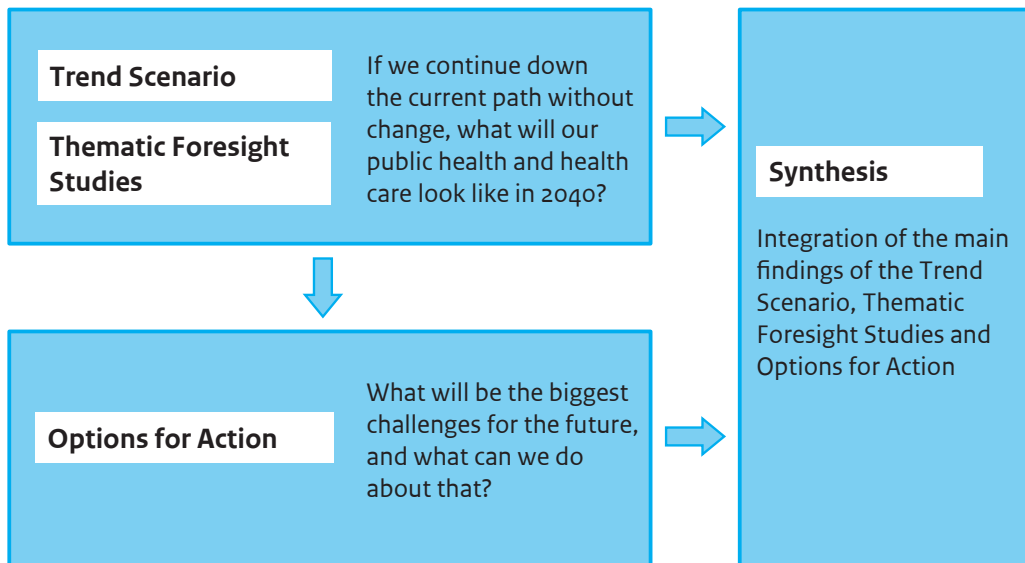
When we look at how our population health is developing, the first thing we notice is how well we are doing: we continue to grow older, and those additional years are spent in good health. At the same time, this PHFS shows that we face major challenges. One of these is the ageing population. By linking various trends, this PHFS has shown that the ageing population considerably increases pressure on formal and informal health care: in addition to the increased number of people with chronic diseases, there is an increase in social issues, such as loneliness. Older people are also living independently for a longer period of time, and often alone. Another challenge that is clear from this PHFS is that we are experiencing more pressure in various areas of our day-to-day life, which leads to more stress. This may potentially affect our mental health. Threats that were already on our scope, such as the consequences of climate change and antibiotic resistance, continue to demand our attention. And we need to remain alert to possible new risks – some of which are still unknown – such as the continued spread of medicine residues and micro-plastics in our environment.

Fortunately, the PHFS helps us to prepare for those challenges. An integrative approach is essential in this context. We know from previous experience that an integrative approach does not happen automatically. It takes time to set up wide-ranging collaborations, and there needs to be room for experimentation. Many organisations have already launched laudable initiatives, thankfully. I sincerely hope that we, as professionals, policy-makers and citizens, will continue to contribute towards building those initiatives – operating across sectors and policy domains, and at the local, regional and national levels. The only way we can tackle the challenges we are facing is by working with each other in coherent collaboration!

André van der Zande
Director-General of RIVM 2011-2018

PHFS-2018: A healthy prospect

Trend Scenario

Thematic Foresight Studies

If we continue down the current path without change, what will our public health and health care look like in 2040?

Options for Action

What will be the biggest challenges for the future, and what can we do about that?

Synthesis

Integration of the main findings of the Trend Scenario, Thematic Foresight Studies and Options for Action

About this Public Health Foresight Study

The four-year Public Health Foresight Study (PHFS) provides insight into the most important societal challenges for public health and health care in the Netherlands. These insights are the basis for the National Health Policy Memorandum ('Landelijke nota gezondheidsbeleid') of the Ministry of Health, Welfare and Sport and for local public health policy. The Public Health Foresight Study is drawn up by RIVM at the request of the Ministry of Health, Welfare and Sport. RIVM produces the report in collaboration with many parties from the community of practice.

The PHFS-2018 consists of four elements: a Trend Scenario, Thematic Foresight Studies, Options for Action and a Synthesis. The Trend Scenario and Thematic Foresight Studies describe a large number of trends that pose challenges for future public health and health care. The Trend Scenario contains figures on life expectancy, health, diseases, lifestyle, health care expenditures and differences in health. The Thematic Foresight Studies are descriptive in nature and deal with important changes in health care demand in the Netherlands, and how wider determinants of health (living environment, labour and education) and technology affect public health and health care. Next, Options for Action have been drawn up for three key challenges for the future. These challenges involve cardiovascular disease and cancer, older people living independently, and mental pressure in teenagers and young adults. The fourth element of the PHFS-2018, the Synthesis, provides an integrated overview of the most important findings from the Trend Scenario, Thematic Foresight Studies and Options for Action.

This publication contains an abbreviated version of the Synthesis. The Synthesis and Options for Action were published in June 2018. The other elements were published previously: the Trend Scenario in the summer of 2017 and the Thematic Foresight Studies at the end of 2017.

All elements are available on the website at https://www.vtv2018.nl/en.

Key messages of the Public Health Foresight Study 2018

The PHFS-2018: A healthy prospect

The status of public health in the Netherlands is looking good. Our average lifespan is increasing steadily, and most people feel healthy and not restricted by activity limitations. However, we are also facing a number of major challenges for the future. To some extent, this is the flip-side of our success: as the number of older people increases, there is also a proportionate increase in people struggling with chronic diseases and social issues, such as loneliness. There are also new developments which could affect our public health, such as increased pressure on our day-to-day lives. The issues we are facing require an integrative approach and the comprehensive engagement of relevant stakeholders. A great deal is already being done in society to tackle these challenges. We can continue to build on these efforts so we can be better prepared for the future.

Future developments: what can we expect?

These key messages are based on the Trend Scenario and the Thematic Foresight Studies sections of the PHFS-2018. They show how our public health situation and health care sector will develop over the next 25 years if we pursue our current course and do not take any additional measures. These key messages show what future challenges we face as society.

The ageing population has a major impact on public health and health care

The percentage of older people in society is increasing. People also reach higher ages more often. As a result more people suffer from chronic diseases such as arthrosis, neck and back complaints, diabetes and dementia. In addition, people often suffer from multiple diseases at the same time. In 2040, dementia will cause the highest mortality and the highest burden of disease. It is not just medical issues that are increasing, either; social issues are increasing as well. The number of lonely older people is on the rise. Older people live independently more often, and often live alone. These developments will lead to more pressure on formal as well as informal health care. Health care services will face the most pressure in regions where the population is shrinking.

Better health, but more disease

Life expectancy will increase from 81.5 years in 2015 to almost 86 years in 2040. Virtually all the years we gain are in perceived good health. Moreover, we will not perceive an increase in activity limitations. However, the number of people with chronic diseases will increase. We are living longer and longer because people with health conditions such as cardiovascular disease and cancer are more likely to survive, amongst others due to better treatment. In addition to the ageing population, that is a significant contributing factor in the sharp increase in dementia as a cause of death. Since cardiovascular disease and cancer are increasingly survivable, more and more people will have to deal with the long-term effects of having had those diseases.

Pressure on our day-to-day lives is increasing

Society is facing increasing pressure in various areas. That could lead to stress and health issues. For instance, students experience intensifying pressure to perform. There are also labour market developments which could lead to increased pressure and stress, such as the increasing influence of the 24-hour economy and the continued increase in flexible employment. Especially in the group of people that have to combine work, child care and informal care, many trends that intensify pressure seem to converge. More extensive urbanisation also results in increased pressure and a higher pace of living, and can lead to less room for green spaces and water for relaxation and recreation.

Lifestyle and the living environment both affect health

In terms of lifestyle, we can see both positive and negative future developments. Fewer people are smoking and more people are exercising. On the other hand, more people are overweight. Unhealthy behaviour is responsible for almost 20 percent of the burden of disease, with smoking being the most significant cause. An unhealthy indoor and outdoor environment causes 4 percent of the burden of disease, with air pollution as the most significant cause. Unhealthy working conditions cause nearly 5 percent of the burden of disease. These trends are not the same for all demographics. Smoking is declining more rapidly amongst people with a high socio-economic status, while obesity is increasing more rapidly amongst people who have a low socio-economic status.

Health problems and social issues often accumulate for vulnerable groups

Some of the older people are in a vulnerable situation due to an accumulation of chronic diseases and other medical and social issues. This group will continue to grow. People who have a lower socio-economic status often have an unhealthy lifestyle. They also have to deal with social issues more often, which are accompanied by stress. Negative effects resulting from labour market developments such as robot automation and digitisation primarily affect less skilled workers. This can exacerbate the social issues and stress in this group. These underlying social issues often need to be resolved first, before creating room to work on a healthy lifestyle.

Health care expenditures are increasing due to demographics and technology
Health care expenditures are increasing 2.9 percent per year on average, reaching 174 billion euros in 2040. That is double the amount compared to 2015. A third of this growth is the result of the ageing population and population growth, while two-thirds can be attributed to other factors such as technology. Technological developments, including (often expensive) new medicines, are responsible for a sharp increase in health care expenditures for e.g. cancer treatment. In 2040, health care expenditures for cancer treatment will be more than four times the amount spent in 2015. There is a complex relationship between technology and health care expenditures. Technological innovations in health care could reduce costs, but that does mean using cost-effective interventions and replacing old technology. That puts serious strain on the way health care is organised.

Health care is changing because of technology and the changing role of the patient
Technology can make a huge difference for our public health and could radically change health care. The use of technology in health care is increasing, but digitisation in particular is proceeding at a slower pace than in other domains of our day-to-day life. This slower pace can be attributed to a number of causes, within the field of health care as well as outside of it. That makes it complicated to expand the adoption of technology in health care. Patients are doing more and more themselves, and their range of options is expanded by new technological possibilities. That requires new and different skills from health care providers and patients, but it also requires a stronger focus on groups who have difficulty with that.

Vigilant to known and emergent risks
Antibiotic resistance still remains a threat to our public health; we need to continue to keep a close eye on this issue. Other key concerns are effective deployment of green spaces and water in the living environment to offset the effects of climate change and declining immunisation coverage. There are also new developments which may entail emergent risks. Technologies such as virtual reality and 3D printing could still cause unknown health effects that would become apparent with more frequent use. In addition, more medication residues, micro-plastics and nano-particles will enter our environment. The health effects they might cause are still unclear at the moment.

Options for action: how can we deal with the challenges we are facing?

These key messages are based on the Options for Action section of the PHFS-2018. This section consists of various elements. It highlights which trends from the Trend Scenario and Thematic Foresight Studies are considered most urgent by citizens and by professionals and students in the public health domain, and it describes options for action in response to a selection of future challenges, as well as the resulting opportunities and focal areas for policy and society. These challenges are: persistently high burden of disease due to cardiovascular disease and cancer;

the steadily growing group of older people still living on their own while suffering from dementia and from other complex issues; and the increasing mental pressure on teenagers and young adults. The options for action are based on the results of a number of wide-ranging stakeholder meetings.

Key challenges for the future according to citizens, professionals and students

Out of all the trends identified in the Trend Scenario and the Thematic Foresight Studies in the PHFS-2018, citizens consider the threat of antibiotic resistance to be the most urgent societal challenge for the future. Professionals and students in the public health domain also consider it an urgent challenge. Other issues that are perceived as extremely urgent included deaths due to cardiovascular disease and cancer, the twofold increase in the number of people suffering from dementia, and the increase in health care expenditures. Professionals consider the deficit in healthy life expectancy in people with a lower socio-economic status to be the most urgent issue, while students believe it is the increased pressure on teenagers and young adults.

Complex challenges require an integrative approach, and assistance from many different stakeholders

Some of the bigger challenges we face are complex in nature, and could be addressed most effectively with an integrative and personal approach. That requires the involvement of many different parties: from policy makers, health care and public health professionals, researchers and citizens, as well as societal stakeholders such as patient organisations, health funds, health insurance companies, employers, industry, retailers and schools. In addition, it requires wide-ranging collaboration: not just between various types of health care professionals, but also across the lines of public health and health care. Integrative policy not only requires local initiatives, but also collaboration between government ministries, especially when dealing with the physical and social living environment.

Taking decisive action based on integrative policy demands a different way of working

The development of integrative and personal policy is already well underway at local and regional levels, but the effectiveness of these policies has not yet been assessed thoroughly. That is in part due to the fact that the usual way of reviewing evidence on effectiveness is not particularly suited to addressing complex problems. That is why a new way of working needs to be developed, requiring new roles and skills from policy makers, professionals, researchers and citizens.

Technology and restructuring of the living environment provide opportunities
Technological solutions such as apps, sensors and alarm systems seem promising in addressing a number of future challenges, such as care for people suffering from dementia and support for self-management of chronic diseases. Changes in the structure of the living environment can provide a significant contribution to encouraging healthy behaviour, but also for instance in fostering relaxation and social interaction, preventing heat stress, and improving air quality. The Environment and Planning Act provides opportunities for integrative local policy with an explicit focus on health.

Many initiatives are already in place for us to learn from and build on
Much is already being done within society and in health care to be better prepared for the future. We can learn from this and use it as a solid foundation to build on. Many of the imminent problems for the future intersect with existing public health policy. This provides opportunities for alignment with approaches to address the long-term challenges that have been identified in this Public Health Foresight Study. Alignment to policies for other fields also offer opportunities to improve our public health by creating a safe, clean and inclusive living environment in which we live, work and learn.

Future trends

This part of the Synthesis shows how our public health situation and health care sector will develop over the next 25 years if we pursue our current course and do not take any additional measures. This approach is used to map out the societal challenges for the future. The substantiation for the texts, numbers and figures presented here can be found in the Trend Scenario, the Thematic Foresight Studies and the background documentation at www.vtv2018.nl/en.

The ageing population has a major impact on public health and health care

The Dutch population is ageing. People are living longer and the percentage of older people is increasing. The ageing population has a major impact on public health and health care. In future, people will be more and more likely to have a chronic disease, often even several at the same time. Social issues such as loneliness are increasing as well. Older people live independently more often, and often live alone. Pressure on formal and informal care will only increase as a result.

The ageing of the Dutch population will continue over the next 25 years. As a result, more and more people will suffer from chronic diseases such as arthrosis, neck and back complaints, and diabetes. In 2040, dementia will cause the highest mortality and the highest burden of disease.

Multimorbidity – suffering from multiple diseases at the same time – will also increase. In addition to chronic diseases, older people are also more likely to suffer from problems such as falling, visual impairment or incontinence. When these problems accumulate, older people become vulnerable.

Due to the ageing population, there is also an increase in social issues. In 2040, there will be 700,000 more lonely 75-year-olds than there are now. Single people are especially likely to feel lonely. The number of people who feel like they do not have sufficient control over their own lives is also increasing.

The pressure on health care will increase due to the ageing population. Many more people will have some type of disease in future that requires treatment. Health care demand will also become more complex due to increasing multimorbidity.

Pressure on informal care (voluntary care by friends and family) is increasing as well. More informal care is needed, as older people live independently more often, and often live alone. At the same time, the generation comprising the children of these parents is growing proportionately smaller. This means that there will be fewer children that can take care of their parents in the future.

The ageing population not only requires a focus on health care, but also on well-being. This shift in focus will help older people to retain a good quality of life, in spite of disease and limitations. An increased focus on well-being demands better collaboration between health care professionals, but also between health care professionals, professionals addressing various aspects of well-being, and informal caregivers.
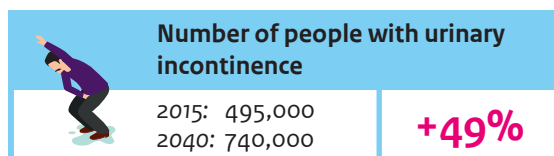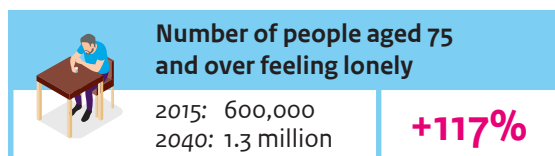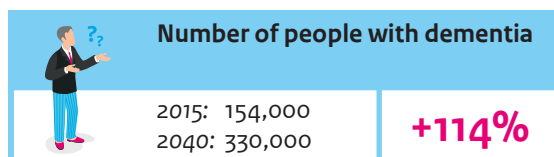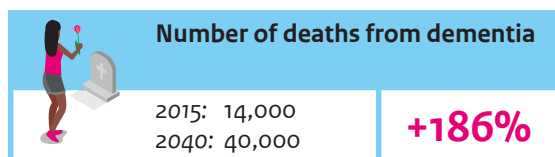
In certain areas of the Netherlands where the population is declining, health care and other services will be under pressure because fewer people live there. At the same time, these regions are also seeing the sharpest increase in the ageing population, accompanied by a growing demand for health care and other services.

Impact of the ageing of the population

Socio-demographic changes in the population

	Number of people aged 65 and over	
	2015: 3.1 million 2040: 4.8 million	**+55%**

	Number of people aged 90 and over	
	2015: 117,000 2040: 340,000	**+191%**

	Number of people aged 65 and over living alone	
	2015: 920,000 2040: 1.73 million	**+88%**

	50-64 year-olds per person 85+ (informal care givers)	
	2015: 10 2040: 4	**-60%**
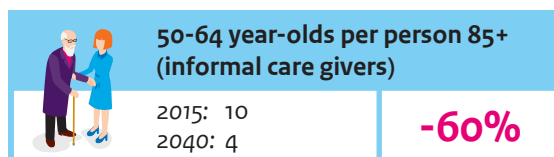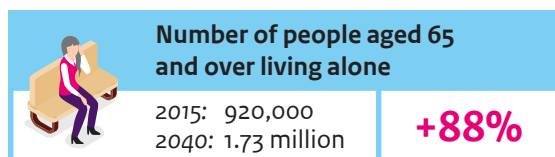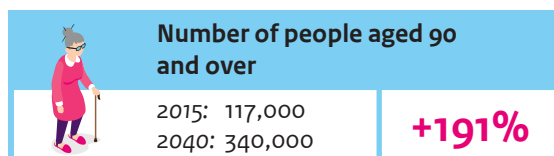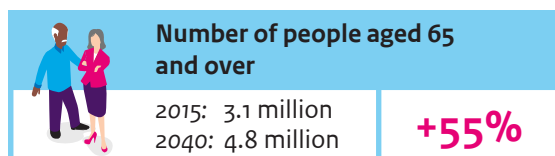
Consequences for population health

	Number of people with multiple chronic diseases	
	2015: 4.3 million 2040: 5.5 million	**+28%**

	Number of people with arthrosis	
	2015: 1.2 million 2040: 2.3 million	**+92%**

	Number of deaths from dementia	
	2015: 14,000 2040: 40,000	**+186%**

	Number of people with dementia	
	2015: 154,000 2040: 330,000	**+114%**

	Number of people aged 75 and over feeling lonely	
	2015: 600,000 2040: 1.3 million	**+117%**

	Number of people with urinary incontinence	
	2015: 495,000 2040: 740,000	**+49%**

Consequences for healthcare

	Number of cataract operations among people aged 75 and over	
	2015: 62,000 2040: 128,000	**+106%**

	Number of people with dementia who need nursing home care	
	2015: 76,000 2040: 165,000	**+117%**

	First aid visits by people aged 85 and over	
	2015: 125,000 2040: 304,000	**+143%**

	Expenditures on elderly care	
	2015: 17 billion 2040: 43 billion	**+157%**
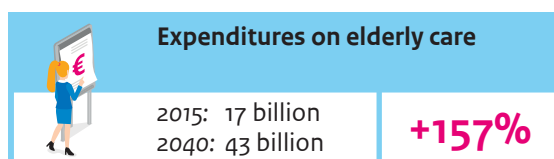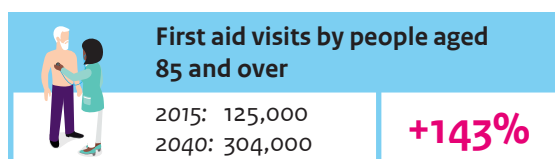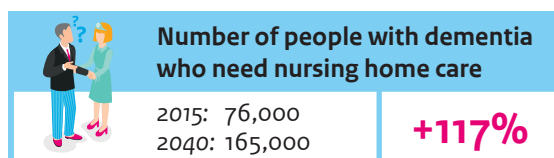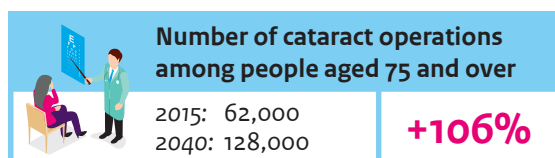
This infographic shows how population health and health care in the Netherlands will develop if historical trends continue without change and no new policies are implemented.

Better health, but more disease

Life expectancy will increase and virtually all the years we gain will be in perceived good health. Moreover, we will not perceive an increase in activity limitations. However, the number of people with chronic diseases will increase. We are living longer and longer because people with health conditions such as cardiovascular disease and cancer are more likely to survive, amongst others due to better treatment. This means that more and more people will have to deal with the long-term effects of these diseases. In future, dementia will become an increasingly significant disease and cause of death.

Life expectancy will increase from 81.5 years in 2015 to almost 86 years in 2040. Although the population is ageing, we do not feel that we are unhealthier. In 2015 and in 2040, almost 80 percent of the population will feel healthy, and approximately 86 percent will not experience any limitations. Even though more and more people will have chronic diseases, the majority of these people will feel healthy and therefore not limited. Similarly, chronic disease does not always mean that people will need to see a doctor regularly.

Figure 1. In 2040, mental disorders will still be a primary cause of burden of disease in young adults.
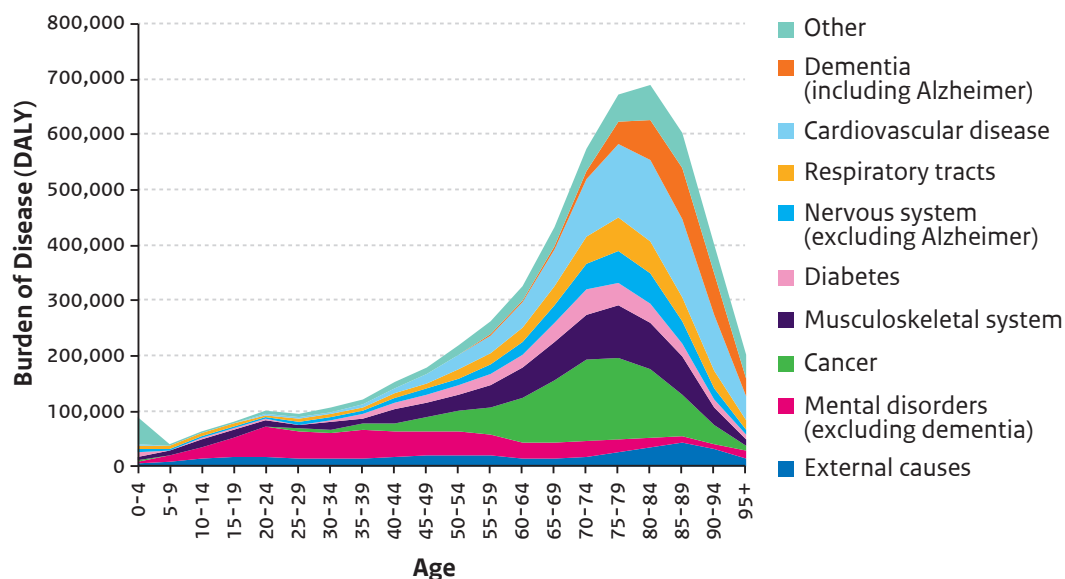
Burden of disease is expressed in Disability Adjusted Life Years (DALYs). DALY is a measure that combines morbidity and mortality.

Figure 2. Cancer and cardiovascular disease will continue to cause the biggest loss in life expectancy.

Loss in healthy years due to disease — **Loss in years due to mortality**

Categories (top to bottom): Cancer, Cardiovascular disease, Nervous system, Mental disorders, External causes, Respiratory tracts, Infectious diseases, Digestive system, Diabetes, Musculoskeletal system

Legend: 2015, 2040
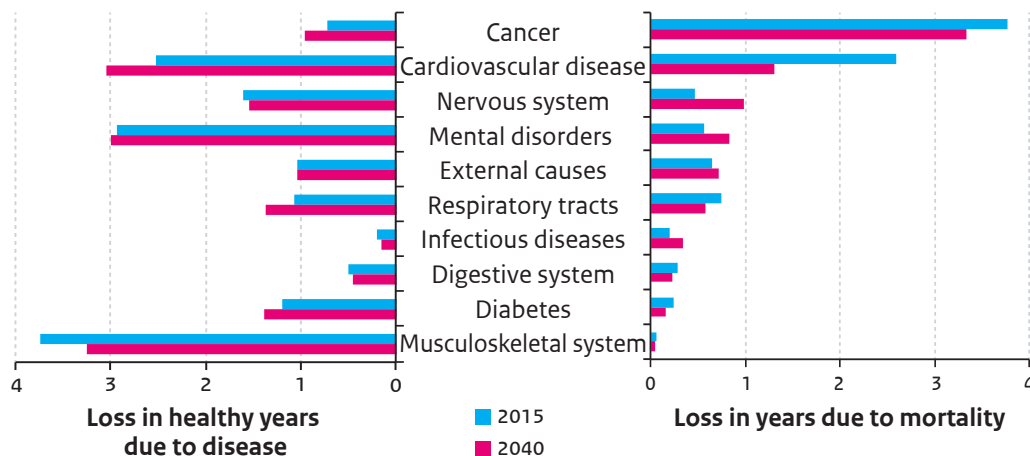
The total life expectancy and life expectancy in perceived good health will increase by approximately four years between 2015 and 2040. This means that virtually all the years we gain up to 2040 will be in perceived good health. We also gain approximately five years without limitations. The number of years without chronic diseases will increase by approximately six months. This means that we gain hardly any disease-free years, but still add a number of years in good health and without limitations.

The ageing population will mean that more people will have to deal with geriatric diseases such as arthrosis, visual and hearing impairments and dementia. Just like our current situation, mental disorders such as depression and anxiety disorders will cause a considerable burden of disease, especially amongst young adults (see figure 1).

Even though cancer and cardiovascular disease will be more common in 2040 than today, their share in total mortality will decrease as people survive these diseases more often. In addition to the ageing population, the decline in mortality from these causes is one of the reasons for the sharp increase in dementia as a cause of death. However, cancer and cardiovascular disease will still cause the biggest loss in life expectancy in the future (see figure 2). Another remarkable shift in causes of death is a significant relative increase in deaths due to personal accidents and infections.

Due to better treatment, more people are living with the consequences of disease. For instance, many patients who have survived cancer suffer from loss of concentration and chronic fatigue. In addition, this group has a higher prevalence of anxiety and depression. That not only affects the lives of these (former) patients and their friends and family; it also intensifies health care demand.

Pressure on our day-to-day lives is increasing

The pressure on our day-to-day lives is increasing and society has to deal with that in various areas. School and university students experience intensifying pressure to perform. People in the workforce have to deal with future trends that intensify pressure, such as the increasing influence of the 24-hour economy. Cities are becoming busier, because more people are living in the city. Increased pressure can lead to stress and to related health problems.

Teenagers and young adults are feeling increasing levels of pressure to perform. Student psychologists are seeing more and more students suffering from increasingly serious and complex symptoms, resulting in more teenagers and young adults being referred to the GP or to mental health care professionals. The use of social media can also lead to more pressure and stress. In some cases, this may result in mental problems such as depression and difficulty sleeping.

There are also various future developments in the labour market which may cause more pressure and stress. Examples include the continuing advance of the 24-hour economy, the increase in flexible employment relationships, and the digital transformation. Skills that affect employability on the job market are changing, and lifelong learning is becoming crucial. Some groups will have difficulty meeting these requirements. In the group of people that have to combine work, child care and informal care, many trends that intensify pressure seem to converge.

In addition, a high-paced environment and noise pollution can lead to stress and mental fatigue. This problem will become bigger in the future as cities will become bigger and busier. Three-quarters of the total population growth up to 2040 will take place in the big and medium-sized municipalities in the Randstad urban conglomeration. The more intensive use of cities may potentially also lead to a decreased availability of green spaces and water for relaxation and recreation.

Lifestyle and the living environment both affect health

Unhealthy behaviour is responsible for almost 20 percent of the burden of disease. Smoking is the most significant cause. An unhealthy indoor and outdoor environment causes four percent of the burden of disease, with air pollution as the most important reason. Unhealthy working conditions cause nearly 5 percent of the burden of disease. Future lifestyle trends are both positive and negative: fewer people are smoking and more people are getting exercise, but we also see an increase in people who are overweight. These trends are not the same for all demographics.

In 2015, unhealthy behaviour such as smoking, alcohol consumption, insufficient physical activity and unhealthy diet were responsible for almost 20 percent of disease of burden, 35,000 deaths and 9 billion in health care expenditures (see figure). Smoking is the primary cause of mortality and morbidity (20,000 deaths and over 9 percent of burden of disease). A positive development is that the downward trend in smoking continues. In 2040, 14 percent of the adult population will still smoke. That figure is currently at 25 percent. More people also meet the physical activity standard. However, more people will be overweight in future. That will increase from 49 percent of the adult population in 2015 to 62 percent in 2040. Almost 40 percent of Dutch population does not smoke, does not drink excessively, and is not overweight. On the other hand, more than one in ten Dutch people have a combination of two or three of these risk factors. These lifestyle trends are not the same for all demographics. Smoking is declining more rapidly amongst people with a high socio-economic status, while obesity is increasing more rapidly amongst people who have a low socio-economic status.

In addition to lifestyle, the environment we live, work and learn in influences our health in various ways. An unhealthy indoor and outdoor environment causes 4 percent of the burden of disease. Air pollution is an important factor here, causing nearly 11,000 deaths. The quality of air, water and soil is expected to continue to improve in the future. There will, however, continue to be regional variation due to local circumstances such as traffic, livestock farming, wood stoves and industry. The structure of the living environment can contribute to offsetting the effects of climate change. An effective deployment of green spaces and water in the living environment is particularly important here. It could also encourage healthy behaviour.
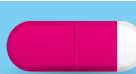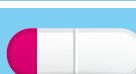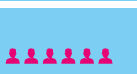
Unhealthy working conditions, such as exposure to substances and physical and mental pressure, cause nearly 5 percent of burden of disease, as well as over 1.5 billion in health care expenditures. An important future trend is the growing influence of the 24-hour economy. People will work evenings and nights more frequently as a result. These working hours are associated with an increase in sleeping issues and with health conditions such as diabetes and cardiovascular diseases.

Contribution of different determinants
to burden of disease, mortality and healthcare expenditures
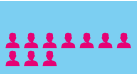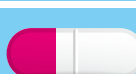
⚠ Numbers cannot be added!

Behaviour

Burden of disease: **18.5 %**
Number of deaths: **35,700**
Health expenditures: **€ 8.6 billion**

Metabolic

Burden of disease: **14.5 %**
Number of deaths: **26,300**
Health expenditures: **€ 9.9 billion**

Behaviour

		BURDEN OF DISEASE (%)	NUMBER OF DEATHS (x1000)	HEALTH EXPENDITURES € (x billion)
	Smoking	9.4%	20.0	2.4
	Unhealthy diet	8.1%	12.9	6.0
	Insufficient physical activity	2.3%	5.8	2.7
	Alcohol use	1.5%	1.8	0.9

Metabolic

		BURDEN OF DISEASE (%)	NUMBER OF DEATHS (x1000)	HEALTH EXPENDITURES € (x billion)
	High blood pressure	6.7%	12.6	5.6
	High fasting glucose	6.6%	10.2	5.8
	Overweight	3.7%	4.2	1.5
	Cholesterol	0.9%	1.1	0.4
	Low mineral bone density	0.7%	2.9	0.4

Occupational

Burden of disease: **4.6 %**
Number of deaths: **4,100**
Health expenditures: **€ 1.6 billion**

Environment

Burden of disease: **4.0 %**
Number of deaths: **12,800**
Health expenditures: **€ 1.2 billion**

Occupational

		BURDEN OF DISEASE (%)	NUMBER OF DEATHS (x1000)	HEALTH EXPENDITURES € (x billion)
	Work environment	3.0%	4.1	1.1
	Psychosocial workload	0.9%	0.0	0.2
	Physical workload	0.7%	0.0	0.3

Environment

		BURDEN OF DISEASE (%)	NUMBER OF DEATHS (x1000)	HEALTH EXPENDITURES € (x billion)
	Outdoor environment	3.5%	11.9	0.8
	Indoor environment	0.5%	1.1	0.4

As a consequence of improved methods, these results cannot be compared with the results of the previous Public Health Foresight study (PHSF-2014).

Health problems and social issues often accumulate for vulnerable groups

The number of older people who are in a vulnerable situation due to an accumulation of problems is increasing. Problems also accumulate for people who are less well educated. They are more likely to lead an unhealthy lifestyle and have more social problems, and are expected to be impacted more negatively by trends in the job market. In many cases, they will not have room to work on a healthy lifestyle until the underlying social issues have been resolved.

An accumulation of problems, such as chronic diseases and other medical and social issues, puts older people in a vulnerable position. They may be able to manage for quite a long time, but minor changes could be enough to unbalance their lives. The number of vulnerable older people is increasing, not only due to the ageing population, but also because people are living to older ages, are more likely to live independently, and are more likely to live alone. Moreover, the number of people who feel like they do not have sufficient control over their own lives is increasing. Older people who have a lot of problems may have particular difficulties expressing their preferences and needs clearly. The same applies for example to older people who have a migrant background and older people who have cognitive limitation.

Problems often also accumulate for people who are less well educated. In addition to an unhealthier lifestyle, they have more social problems, such as unemployment and poverty. Negative effects resulting from future labour market developments, such as robot automation and digitisation, primarily affect less skilled workers and thus intensify the problem. The stress resulting from social issues can have a negative impact on lifestyle. Addressing the underlying causes of the stress, due to workforce mediation or debt counselling, is often a better way to start helping this group to improve their health than a focus on lifestyle factors.

People who come from a migrant background seem to have a higher occurrence of some mental problems and diseases than people from a Dutch background. Examples include dementia, psychosis and depression. This higher occurrence is likely due to an accumulation of risk factors, such as low income, low health skills and a higher frequency of cardiovascular diseases and diabetes.

An accumulation of problems plays a role not only in individual cases, but also in specific neighbourhoods. There is an overlap between neighbourhoods with a higher frequency of unhealthy lifestyles and neighbourhoods that see lots of social issues. These neighbourhoods are scattered across the country, but there is a clear cluster in the north-east of the Netherlands. Within cities, the continuing urbanisation and the rising housing costs will intensify the division between predominantly higher-income neighbourhoods and neighbourhoods with lower-income households. This may intensify the health differences.

There is an overlap between neighbourhoods with a higher frequency of unhealthy lifestyles and neighbourhoods that see lots of social issues.

Accumulation of unhealthy lifestyle factors

per neighbourhood (smoking, overweight, excessive alcohol use)

Number
- 0
- 1
- 2
- 3

—— Provinces

Social assistance plans

per neighbourhood

Percentage
- 1 - 6
- 6 - 8
- 8 - 10
- 10 - 14
- 14 - 28
- no data available

—— Provinces
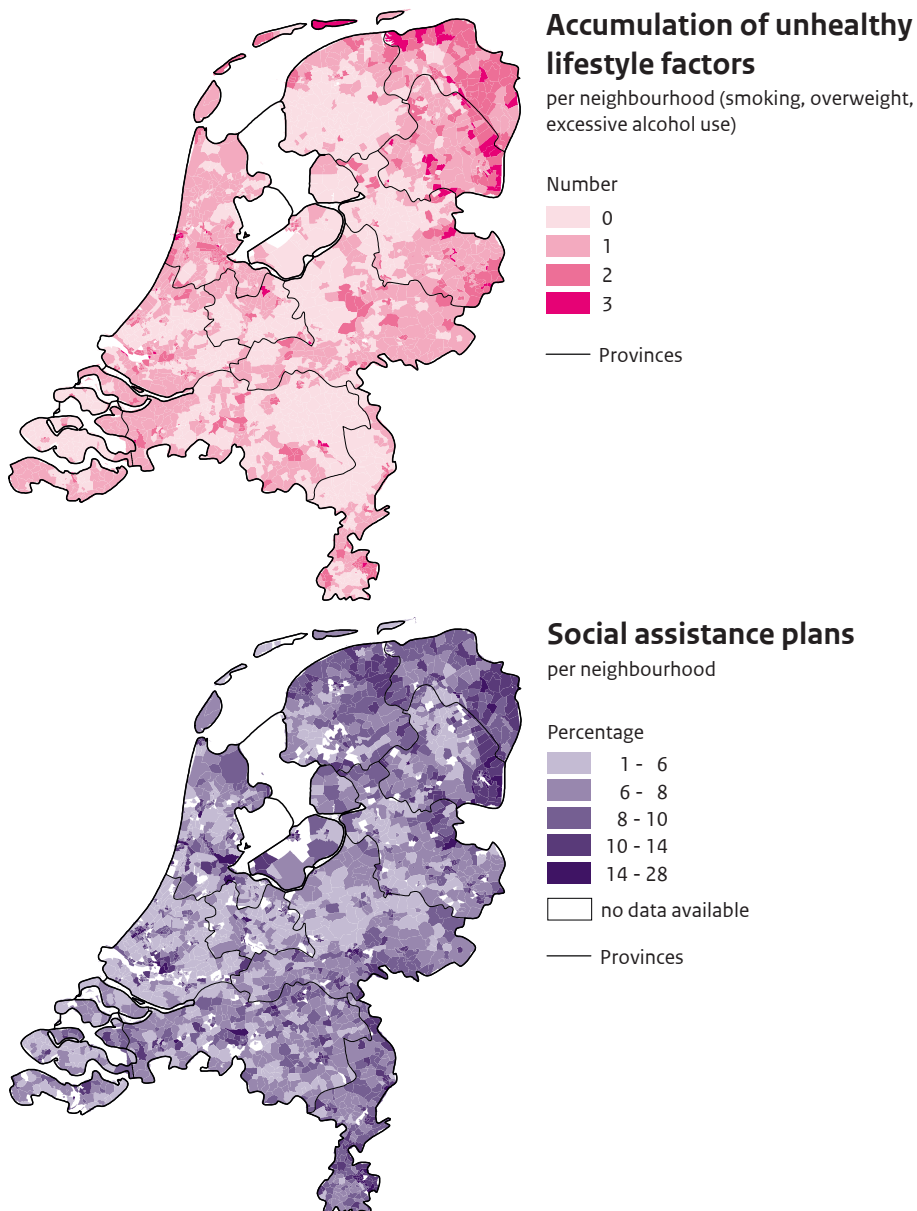
The first map shows the accumulation of an above-average occurrence of unhealthy lifestyle factors in neighbourhoods (smoking, excessive alcohol use, overweight). The second map shows the percentage of households in neighbourhoods that use social assistance plans involving income support and workforce participation.

Health care expenditures are increasing due to demographics and technology

Expenditures on health care will have doubled in 2040. A third of this increase is the result of the ageing population and population growth, while two-thirds can be attributed to other factors such as technological progress. New technological discoveries, particularly new medication, will lead expenditures for cancer treatment to increase fourfold. There is a complex relationship between technology and health care expenditures. Technology can save on costs, but this puts serious strain on the way health care is organised.

Health care expenditures are increasing 2.9 percent per year on average, reaching 174 billion euros in 2040. That represents 9,600 euros per person. One-third of the increase can be attributed to the ageing population and overall population growth. The ageing population has a major impact on geriatric care expenditures. Comparing all health sectors, geriatric care expenditures are increasing most rapidly: from 20 percent of the total health care expenditures in 2015 to 25 percent in 2040. In absolute figures, that is an increase from 17 to 43 billion euros.

Two-thirds of the increase in health care expenditures can be attributed to other factors, such as technological progress. This includes for example new medications and new equipment, like robots that can perform operations. The increase in expenditures for treating various diseases from 2015-2040 will rise most sharply for cancer, by 6 percent annually on average. This growth can be attributed primarily to the use of new medicines. The figure shows a divergence between the increase in cancer occurrence and expenditures related to the disease. The same pattern can be seen for cardiovascular diseases, although it is less pronounced. The progression is more or less parallel for dementia. In 2040, the group of mental disorders, including dementia and intellectual disabilities, will continue to represent the group of diseases involving the highest spending.

Technological innovation in health care has two sides. Historical trends shows that it leads to more health care expenditures, but technological solutions can also save on costs. This can only be achieved by focusing on cost-effective interventions and discontinuing outdated technology in due time. That form of management requires active policies. New technologies can also save on costs by offering options for moving some treatments from the more expensive secondary health care providers to the cheaper primary health care providers. That shift does not happen automatically, and places major strain on the health care sector.

Despite all the technological progress, health care is still largely a human-driven profession, representing 1.4 million jobs in the Netherlands. In contrast to other sectors, many jobs in health care simply cannot be replaced by an automated solution. Since the health care sector is also under more pressure due to the ageing population, guaranteeing sufficient staffing for bedside care is an important focus for the future.

Growth in health care expenditures for cancer and cardiovascular diseases is not proportionate to the frequency of occurrence.

Legend: ━━ Occurrence   ▉ Health care expenditures

Cancer

Occurrence (thousand persons):
- 2015: 547
- 2020: 645
- 2025: 752
- 2030: 844
- 2035: 917
- 2040: 970

Health care expenditures (billion euros):
- 2015: 5.6 €
- 2020: 7.5 €
- 2025: 10.0 €
- 2030: 13.3 €
- 2035: 17,.6 €
- 2040: 23.5 €

Cardiovascular disease

Occurrence (million persons):
- 2015: 1.9
- 2020: 2.1
- 2025: 2.4
- 2030: 2.6
- 2035: 2.8
- 2040: 3.0

Health care expenditures (billion euros):
- 2015: 11.6 €
- 2020: 13.7 €
- 2025: 16.4 €
- 2030: 19.6 €
- 2035: 23.4 €
- 2040: 27.4 €

Dementia

Occurrence (thousand persons):
- 2015: 154
- 2020: 177
- 2025: 207
- 2030: 246
- 2035: 290
- 2040: 330

Health care expenditures (billion euros):
- 2015: 6.6 €
- 2020: 7.6 €
- 2025: 9.1 €
- 2030: 11.0 €
- 2035: 13.3 €
- 2040: 15.6 €

Health care is changing because of technology and the changing role of the patient

In future, technology can make a huge difference for our public health and could radically change health care. Patients are doing more and more themselves, and new technological possibilities expand their range of options. Both trends require new and different skills from health care providers and patients, but it also requires a stronger focus on groups who have difficulty adapting.

New technologies create opportunities for public health. Examples include robotisation, gene technology, 3D printing, virtual reality and eHealth. Innovative techniques open doors to personalised medicine, tailored to patient needs. In cancer treatment, for instance, it is possible to determine the genetic markers of a specific tumour. This makes it possible to predict which treatment will be most successful. Personalised medicine is opening up more and more options for unique treatment tracks, in contrast to the standardised health care processes primarily used today. This demands a change in how health care is organised.

As technology offers more and more possibilities, health care is increasingly shifting to the patient's own home. One example is cancer care, such as chemotherapy. This requires adaptations in the health care system and changes in the skills of health care professionals and patients alike. For patients who have a chronic disease, self-management and autonomy will become increasingly important in future. New technology, such as eHealth applications, will offer additional assistance. This trend also changes the role of the health care provider: in future, patients will increasingly interact with these professionals for coaching, brainstorming, or as a source of information.

Although technology is being used more frequently in health care, there is still a wealth of untapped potential. In particular, digitisation is proceeding at a slower pace than in other domains of our day-to-day life. Multiple factors contribute to this slower adoption. Health care providers and procurers encounter obstacles, patients and health care providers are often cautious about innovations, and not everyone has the digital skills needed to use some of the latest solutions. Information systems that are not connected to each other present another problem. In addition, new technologies involve risks, such as privacy violations and internet dependence. It also raises ethical dilemmas, such as issues about the right to decline to know specific information. Taking all these factors into account, the expanded involvement of technology in health care is a very complex issue.

Vigilant to known and emergent risks

Antibiotic resistance still remains a threat to our public health, and permanent vigilance is needed. Responding to the effects of climate change also continues to require attention, as does the declining immunisation coverage. In addition, there are various new developments which may entail emergent risks. New technologies such as virtual reality and 3D printing could still cause unknown health effects. More medication residues, micro-plastics and nanoparticles will enter our environment as well.

Antibiotic resistance and climate change are known threats to public health in the Netherlands. Although the current impact of these trends is relatively minor, they could potentially have a major impact in future. One potential consequence of increasing antibiotic resistance is that it may no longer be possible to effectively treat infections in future. Climate change may cause an increase in the spread of pathogens and allergens. It also leads to an increase in heat stress. It is important to be ever-vigilant on how these problems develop, adopting an approach that incorporates national and international levels. A third known problem that deserves constant attention is the declining immunisation rate. The risk of future outbreaks of infectious disease is increasing as a result. Measles represent the biggest risk, since it is a highly infectious disease that can have severe consequences.

Besides its positive effects, new technology may also have negative effects on public health. The exact health impact of for example virtual reality and 3D printing is not yet known. It is not unimaginable that an extended stay in a virtual reality could cause mental and physical problems. We do not have a solid grasp on these risks yet. If more 3D-printed products are used in future, it may pose dangers to public health. Toxic chemicals could be released while melting the raw materials and printing the objects, for instance. The final product could also contain defects that make it less safe to use. As production becomes more decentralised, central quality assurance becomes more difficult.

Another future development is that more substances and particles are entering our environment that may have negative effects. Medication use is increasing as a result of the ageing population, causing more medicine residues to end up in surface water. Increasing use of plastics will cause more and more micro-plastics to end up in surface water and other parts of the living environment, including the food chain. Nanotechnology applications are expected to see a continued increase in future. Nanoparticles may be released into the environment in the process. The health consequences of all these developments have not yet been sufficiently clarified.

Options for Action

The first part of this publication shows how our public health situation and health care sector will develop over the next 25 years if we pursue our current course and do not take any additional measures. Collectively, all these trends offer an impression of the challenges that our society faces. This second section looks at what we could do in response to these challenges.

First, it highlights which trends from the Trend Scenario and Thematic Foresight Studies are considered most urgent by citizens and professionals and students in the public health domain. These most urgent issues were identified using a survey. The results of the survey were used to select three challenges to elaborate on. Options for action in response to these challenges are provided in this Public Health Foresight Study. These challenges are: persistently high burden of disease due to cardiovascular disease and cancer; the steady growth in the group of older people still living on their own while suffering from dementia and from other complex issues; and the increasing mental pressure on teenagers and young adults.

The options for action are based on the results of a number of wide-ranging stakeholder meetings. This publication summarises the main recommendations of the stakeholders. Finally, this section describes a number of overarching opportunities and focal areas for policy and society.

The substantiation for the texts, numbers and figures presented here can be found at https://www.vtv2018.nl/en.

Key challenges for the future according to citizens, professionals and students

Citizens and professionals and students in the public health domain were asked about their opinions on the urgency of the trends in the Trend Scenario and Thematic Foresight Studies in the PHFS-2018. All three groups indicated that the threat of antibiotic resistance posed an extremely urgent challenge for the future. Deaths due to cardiovascular disease and cancer, the twofold increase in the number of people suffering from dementia, and the increase in health care expenditures were also considered urgent. Based on the number of responses, developments related to lifestyle and technology were often considered least urgent.

The Trend Scenario and Thematic Foresight Studies present a large number of trends that are relevant to future public health and health care in the Netherlands. A questionnaire was developed to assess what different groups in society viewed as most urgent. Citizens and professionals and students in the public health domain took the survey and expressed their opinions on the urgency of 41 future trends.

All three groups of respondents considered the threat of antibiotic resistance to be an urgent challenge for society. Citizens and professionals also viewed the twofold increase in the number of people suffering from dementia, and the twofold increase in health care expenditures as urgent priorities. Citizens and students were concerned about the fact that cardiovascular diseases and cancer continue to cause the majority of deaths.

Although there is some overlap, there are also differences between the groups. For instance, professionals view the socio-economic differences as extremely urgent, while citizens and students consider this issue to be less urgent. Students believe that the increased mental pressure on teenagers and young adults is the most urgent issue. Developments related to lifestyle and technology were often listed as the least urgent.

The results of the survey were used to select three challenges, which were then developed into detailed options for action in the PHFS-2018. Other considerations were also taken into account in the selection. Relevance for local policy was an important aspect, for instance.

Questionnaire urgency future developments

What do respondents deem **most urgent?**

	Civilians	Professionals	Students
	★ 1,077 respondents	★ 269 respondents	★ 154 respondents
	Representative sample	Policy, public health, healthcare and science	University and vocational studies related to public health and healthcare

Topic	Civilians	Professionals	Students
Threat of antibiotic resistance	★★★★★	★☆☆☆☆	★★★★☆
Cardiovascular disease and cancer will remain the main cause of death	★★★★☆	☆☆☆☆☆	★★★☆☆
Number of people with dementia will double	★★★☆☆	★★★★☆	☆☆☆☆☆
Healthcare expenditures will double	★☆☆☆☆	★★☆☆☆	☆☆☆☆☆
Lag in healthy life expectancy among people with lower socio-economic status	☆☆☆☆☆	★★★★★	☆☆☆☆☆
Increasing mental pressure on youngsters and young adults	☆☆☆☆☆	☆☆☆☆☆	★★★★★
Number of people who experience insufficient control over own life will increase	☆☆☆☆☆	★★★☆☆	☆☆☆☆☆
Correct use of green and water for dealing with the effects of climate change	★★☆☆☆	☆☆☆☆☆	☆☆☆☆☆
Mental disorders remain the main cause of burden of disease	☆☆☆☆☆	☆☆☆☆☆	★★☆☆☆
The number of people who are overweight will increase	☆☆☆☆☆	☆☆☆☆☆	★☆☆☆☆

Questionnaire urgency future developments

What do respondents deem **least urgent?**

Civilians	Professionals	Students
★ 1,077 respondents	★ 269 respondents	★ 154 respondents
Representative sample	Policy, public health, healthcare and science	University and vocational studies related to public health and healthcare

Trend	Civilians	Professionals	Students
In 2040, one in seven adults will smoke	★★★★☆	★☆☆☆☆	★★★☆☆
The increase in healthcare expenditures is for the largest part caused by technology	☆☆☆☆☆	★★★★★	★★★★☆
The increasing use of data will lead to risks for breaches of privacy	☆☆☆☆☆	★★★★★	★☆☆☆☆
Most people do not adhere to the guidelines for healthy nutrition	★★★☆☆	★☆☆☆☆	☆☆☆☆☆
Almost one in ten adults is an excessive drinker	★★☆☆☆	☆☆☆☆☆	★★☆☆☆
Three times as many people with a lower socioeconomic status smoke, compared to people with a higher socioeconomic status	★★★★★	☆☆☆☆☆	☆☆☆☆☆
For some groups of employees, it will be difficult to keep up with the digitisation	☆☆☆☆☆	☆☆☆☆☆	★★★★★
New technologies may cause new risks for population health	☆☆☆☆☆	★★★☆☆	☆☆☆☆☆
Flexibilisation of labour and Robotisation may have a negative impact on health	☆☆☆☆☆	★★☆☆☆	☆☆☆☆☆
New technologies, such as genetic engineering, raise ethical dilemmas	★☆☆☆☆	☆☆☆☆☆	☆☆☆☆☆

The questionnaire contained 41 future trends in total

33

Options for action in response to three societal challenges

Citizens and professionals and students in the public health domain were asked which future developments they considered most urgent. This information was used to select three challenges, which were then developed into detailed options for action. These are the persistently high burden of disease due to cardiovascular disease and cancer, the steady growth in the group of older people still living on their own while suffering from dementia and other complex issues, and the increasing mental pressure on teenagers and young adults. The findings from wide-ranging stakeholder meetings were used as the basis for the options for action. The following table summarises the main recommendations of the stakeholders. How can we deal with the challenges we are facing? What goals are key in society, what is needed to achieve them, and who can contribute?

Challenge	Societal goals	Courses of action
Cardiovascular diseases and cancer are health conditions that continue to occur frequently, will still be the cause of the majority of deaths in 2040, and have a major impact on patients' lives.	Working on integrative prevention measures	• Integrative programmes targeting lifestyle as well as the physical and social environment. • Collaboration between government ministries, especially in the context of the physical and social environment. • Focus on underlying social issues in vulnerable groups.
	Other health care resulting from technology and different organisational structures	• Ensuring better utilisation of options for self-diagnostics and genetic testing. • Effective management of tensions between diverse interests (ethical, legal, health care) in the context of genetic information, for instance via laws and regulations. • Working with all stakeholders to determine which care can be provided at home. • Responding more effectively to the demand for health care in cases of multimorbidity by means of increased and more wide-ranging collaboration. • Developing more knowledge about gender-specific differences in the expression, presentation and treatment of diseases and implementing that knowledge more quickly into medical practice.
	Dealing more effectively with physical, mental and societal consequences	• Focusing more attention on the long-term effects of diseases, both within the health care sector and beyond. • Training patients and health care providers in self-management, and in putting it into practice. • Offering support to people who are unwilling or unable to manage their own care process, e.g. by using case managers.

Challenge	Societal goals	Courses of action
The group of older people living independently who have dementia and other complex problems is increasing significantly.	Better care and support for older people living independently.	• Organising health care options based on what older people still can manage and would rather do themselves. • Supporting older people who have difficulty expressing their preferences and needs. • Flexible approach by professionals in response to civic initiatives that go 'outside the established framework'.
	Ensuring an environment that accommodates older people	• Taking healthy, safe, pleasant ageing into account when structuring the living environment. • Defining balanced policy for older people: stronger focus on what they can still do themselves.
	Caring effectively for informal carers	• More support for informal carers: practical tips, social, material and financial support, and offering replacement care. • Alertness to informal carers being shy about asking for help. • Focus on the care needs of the informal carer, caused by psychological and physical stress.
Mental pressure on teenagers and young adults is increasing, and may have consequences for their psychological health.	Knowledge development regarding mental pressure	• Developing uniform framework of concepts and terminology. • Developing more knowledge about stressors and mechanisms that cause mental pressure. • Monitoring mental health of teenagers to gain more insight into the problem. • Developing more practical knowledge about what does and does not work, in consultation with 'experience experts'.
	Mental health and staying healthy	• Increase range of intervention options for teenagers and young adults about coping with pressure. • Adapting the learning environment, e.g. focusing on student well-being. • Focusing more on promoting mental health amongst young employees in a work environment. • Early identification in locations where teenagers and young adults are and offering appropriate interventions in those locations.
	Acceptance of psychological symptoms	• Counteract negative image through campaigns and public information. • Use 'experience experts' to lower the threshold for seeking help. • Continuing to work towards a society in which psychological symptoms are not an obstacle to participation.

The major challenges we face are complex in nature. They have multiple causes and demand the involvement of various types of professionals from various areas of health care and policy. These types of problems require an integrative and personal approach. Many different parties need to be involved: from policy makers, health care and public health professionals, researchers and citizens, to societal stakeholders such as patient organisations, health funds, health insurance companies, employers, industry, retailers and schools. In addition, it requires wide-ranging collaboration: not just between various types of health care professionals, but also across the lines of public health and health care. Integrative policy not only requires local collaboration, but also collaboration between government ministries, especially when dealing with the physical and social living environment.

Opportunities and focal areas for policy and society

Based on the options for action, overarching opportunities and focal areas for policy and society have been identified. Many of the future challenges we face in public health are complex in nature and demand an integrative and personal approach.

Experience has already been gained with developing integrative policy. The lessons learned there show that shared ambition and vision and mutual trust are key success factors. Taking a broader view than a specific medical discipline, for example by seeking collaboration with professionals in the social sector, is a key factor in the success of a personal approach.

However, not much knowledge is available about the effectiveness of integrative and personal policy at this point. This is due in part to the fact that the usual way of reviewing evidence on effectiveness is not particularly suited to addressing complex problems. A systems approach that views the problem and the underlying factors as a coherent whole would be more appropriate here.

A different way of working will be needed in order to effectively address complex challenges. That change will require new roles and skills from policy makers, professionals, researchers and citizens (see table). Facilitating these role transitions will entail changing existing patterns and habits. And that will not be easy.

Who?	What? New roles and skills needed for complex problems	
Policy maker	• Facilitates initiatives in society. • Develops a different way of providing accountability for policy (focused on process rather than health outcomes in the short term).	Multidisciplinary collaboration across domains
Health care and public health professional	• Acts more as a coach, less as a treatment provider • Collaborates more, especially in health care networks that incorporate multiple domains.	
Researcher	• Takes a different approach to public health (as a complex system) and develops more appropriate forms of measuring and assessing effectiveness. • Involves citizens in research and develops new methods for that purpose (citizen science).	
Citizen	• Contributes to brainstorming and decision-making – in the care process (self-management, shared decision-making) and in the development of interventions at e.g. the neighbourhood level. • Actively participates (self-management, citizen science).	

One high-potential category of solutions is the deployment of technologies, such as eHealth. Solutions such as apps, sensors and alarm systems seem promising in addressing a number of future challenges, such as care for people suffering from dementia and support for self-management of chronic diseases. Since over 80 percent of Dutch people use internet on a daily basis, eHealth interventions would work well in the digital climate in the Netherlands.

The way the living environment is structured also offers opportunities for public health, since it can make a significant contribution to disease prevention. Consider initiatives like banning smoking from the area around school entrances. Effective structuring of the living environment also invites people to get more exercise and to relax, and it fosters social interaction. It also helps to prevent heat stress and improve air quality. The future Environment and Planning Act ('Omgevingswet'), in which municipalities will have to take such factors as health into account in their plan for the environment, provides opportunities for integrative local policy with an explicit focus on health.

Society and the health care sector are already adapting to be better prepared for the future. Consider civic projects and citizen initiatives like health care cooperatives and 'student housing' for older people. Regional initiatives are also emerging in which health care providers, health insurers, municipalities and citizens work together on new, integrative forms of health care. We can learn from this and use it as a solid foundation to build on.

Many of the imminent problems addressed in this Public Health Foresight Study intersect with existing public health policy. This overlap creates opportunities for a coherent approach, in which actions focused on addressing the long-term challenges can be aligned with the established policies of the Ministry of Health, Welfare and Sport. In addition, policies defined by other government ministries can be used to make a significant contribution to addressing future challenges to our public health, for instance by creating a safe, clean environment where people can live, work and learn, which is inclusive and accessible by all.

The status of public health in the Netherlands is looking good. Our average lifespan is increasing steadily, and most people feel healthy and not restricted by activity limitations. Nevertheless, we face some major future challenges. This Synthesis of the Public Health Foresight Study 2018 describes the challenges we will be facing and how we can deal with them. For instance, the number of older people is increasing, and more and more people have chronic diseases. Health care is changing and becoming more complex because of technology and because patients are doing more and more themselves. Informal carers are under increasing pressure, and young people are feeling increasing levels of pressure to perform.

The challenges we face demand a new way of working. We will have to work together more closely, within the health care sector and beyond. The personal situation of each individual needs to be the focus. That also means looking across the lines of public health and health care. A healthy environment is crucial to a healthy future. A great deal is already happening in order to help us prepare more effectively for the future. A healthy prospect!

Committed to *health and sustainability*