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

Methodology for Trend Scenario for Dutch Public Health Foresight Report (VTV) 2018

Version 2

Colophon

This is a background document to the Dutch Public Health Foresight Report (VTV) 2018 (version 2).

Version 1 of this reporting was published in July 2017, at the same time as the Trend scenario. Afterwards, the Cost of Illness data were updated for 2015 and the method of the burden of disease calculations was improved including corrections for the occurrence of multimorbidity. For the Synthesis, additional projections have been included, for example for additional types of cancer. The description of these adjustments are included in version 2.

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Contents

1 Introduction

The Public Health Foresight 2018 (VTV-2018) consists of various products, including a Trend Scenario. The Trend Scenario describes the future developments that are relevant to public health and health care, ranging from key drivers and determinants to health status and expenditure on health care. The question at the centre of the study is: if historical trends continue in the future in the same way and if no new or additional policies are developed, what will the future look like? The Trend Scenario is therefore not a forecast or a prediction, as it is very likely that new policies will be introduced that will influence future developments. The purpose of the Trend Scenario is to identify societal challenges for the future. The base year of the scenario is 2015 and the timeline is 25 years.

The Trend Scenario contains the following sections or One-Pagers:

1. How old will we get in the future?
2. How healthy will we be in the future?
3. What diseases will we have in the future?
4. How (un)healthy will we live our lives in the future??
5. How will health care expenditure evolve in the future?
6. How will health inequalities develop in the future?

The most relevant developments that affect the outcome measures used, the so-called key drivers, will also be described.

This document provides a justification for the method that is used to make future projections in the various sections of the Trend Scenario. To this end, the data sources used, the selection of data and indicators (for example with regard to diseases and causes of death), the analysis methods and the projection methods are described. This document is a shorter version of the longer, Dutch version. In the Dutch version additional methodological information is presented for each One-Pager.

2 Trend Scenario Method

The Trend Scenario is one of the parts of the scenario methodology as used within the VTV.

2.1 Scenario methodology

The scenario methodology follows several steps, one step of which is the development of the Trend Scenario. This Trend Scenario is the result of a systematic inventory of the key drivers and trends according to the DESTEP format. DESTEP charts Demographic, Economic, Sociocultural, Technological, Ecological and Politico-institutional developments. Using the VTV conceptual model, these DESTEP developments are related to mediating factors such as determinants, disease and mortality, which in turn affect the outcome measures of public health and health care (Figure 1).

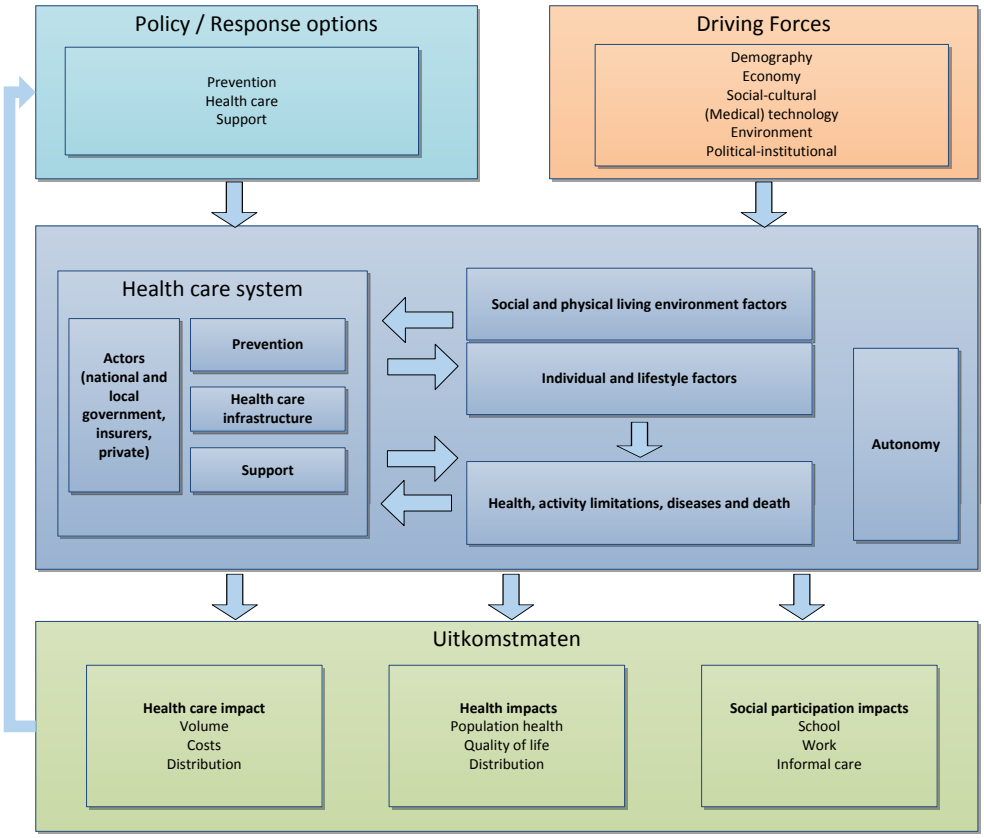

Figure 1 VTV conceptual model

2.2 Topics and indicators

In each section of the Trend Scenario various topics are addressed. For each topic one or more indicators are used. The table below provides an overview of which topics are dealt with in the different sections. The selection of the topics and indicators used was made on the basis of, in

particular, relevance (what are the main outcome measures for describing future developments in public health?) and data availability.

Table 1 Overview of the topics in the six One-Pagers

Trend Scenario One-Pager	Topics
How old will we get in the future?	(Period) Life expectancy
	Healthy life expectancy
	Causes of death
How healthy will we be in the future?	Perceived health
	Perceived activity limitations
	Loneliness
	Mental health
	Control
What diseases will we have in the future?	Prevalence of one or more chronic diseases (multimorbidity)
	Consequences of having a chronic disease
	Prevalence and incidence of specific diseases or disorders
	Burden of disease
How (un)healthy will we live our lives in the future?	Smoking, daily and occasional
	Overweight and obesity
	Physical activity
	Alcohol consumption
	Nutrition
	Sleep duration
How will health care expenditure evolve in the future?	Total health care expenditures, absolute and per person
	Annual increase in health care expenditure
	Health care expenditures by age, sex, sector, disease group
	Breakdown of health care expenditures according to demography and other factors
How will health inequalities develop in the future?	Socio-economic inequalities in (healthy) life expectancy, overweight, smoking
	Regional inequalities in life expectancy (municipal level) and air quality
	Male-female differences in disease burden
	Age differences in the perception of ill health and activity limitations as a result of a chronic disease
	Perceived health and income according to type of employment contract

2.3 Input data and analyses of historical trends

In order to make future projections, we first of all analyse historical data. The input data for these analyses are taken predominantly from

national data sources. Table 2 (appendix) gives a condensed overview of the most commonly used data sources for the analyses and projections in the Trend Scenario. VZinfo.nl provides an overview of and justification for most of the sources[1].

The analysis of historical trends determines what changes have occurred over time. These changes are analysed using various regression methods. Regression methods are used to identify explanatory variables that are related to an outcome variable. On the basis of one or more (independent) explanatory variable(s) a projection can be made for a (dependent) outcome variable.

Policy-neutral and the trend in policy
The aim of the Trend Scenario is to put in place a policy-neutral future scenario, comparable to other Future outlooks[2]. This means that the existing policies will continue and new policies will be disregarded. This implies that in the analyses of historical data an inherent, implicit (historical) policy trend is assumed. The effects of specific policies on the historical trends differ from topic to topic. For example, it is highly likely that in recent years the policy impacted health care expenditure to a far greater extent than, for instance, overweight. However, in the historical analyses policy effects cannot be distinguished from other effects such as income developments. Hence, in the Trend Scenario policy-neutral also implies that there is a historical, trend-based policy but that no new or additional policy will be introduced.

2.4 Future projections

The following methods are used to make future projections:

- Demographic projections: projections are made only on the basis of future changes to the size and age structure of the population, while the relative sex-specific and age-specific figures (for example for prevalence) from the base year of the projection are kept constant. This method is used if there are no historical series available (for example in the case of most incidence and prevalence data) or if the analyses of the historical data have not shown any changes over time, or if these changes are not sufficiently robust. Hence, the future changes are fully determined on the one hand by the size of the population and on the other hand by the changing age structure such as ageing of the population.
- Demographic and epidemiological projections: if there are changes in the relative sex-specific and age-specific figures, these changes are projected into the future. These future changes are then added to the above-mentioned demographic changes.

The projections in most sections of the Trend Scenario are based on a combination of demographic and epidemiological projections. If there

[1] https://www.volksgezondheidenzorg.info/bronnen-methoden-en-achtergronden
[2] http://www.wlo2015.nl/

are no adequate historical trend data available, only a demographic projection is made.
In previous VTVs, model-based projections were also made using, for example, the DYNAMO HIA model[3]. DYNAMO HIA has not been updated with the most recent data. Such an update, which requires a major effort, was not carried out for the VTV-2018, as only a limited number of risk factors and diseases are modelled in DYNAMO HIA. Moreover, the added value of a model-based projection for the Trend Scenario is limited by the dominant role of demography. It can, however, be useful to carry out model-based analyses in order to, for example, determine the effects of interventions. However, this issue does not arise in the Trend Scenario.

CBS population forecast
For the projections in the Trend Scenario, frequent use is made of the CBS's Population Forecast 2016-2060[4]. For instance, the future population size and structure are used as a foundation for, amongst others, incidence and prevalence projections and expenditure on health care. The Population Forecast 2016–2060 describes the expected development of the Dutch population between 2016 and 2060 on the basis of assumptions relating to number of children, migration and mortality. The mortality forecast, which is part of the Population Forecast, is used as a starting point for the projection of mortality according to cause of death, and the associated life expectancy is also taken from the CBS population forecast.

2.5 Selections of diseases / disorders and causes of death

In order to describe public health, the VTV uses selections of diseases and causes of death. These are used in various sections of the Trend Scenario. Various selections are made depending on the topic.

VTV selection of diseases
The selection as developed for the VTV-2014 is used for the Trend Scenario. Fifty-nine diseases and disorders are selected using several selection criteria, such as high mortality, high expenditure, avoidability and policy relevance. Further information about this selection of diseases can be found in the report *A new selection of diseases for the Public Health Status and Forecast Reports*[5]. For the Synthesis, additional projections have been made for an additional number of diseases. These include 22 types of cancer (in addition to the 7 types of cancer in the selection of 59 diseases) and alcohol-induced liver diseases. In addition, a projection has been made for the whole cancer ICD group (all tumours, ten-year prevalence). The Appendix Table 2 contains an overview of all diseases.

Mortality

[3] Lhachimi SK, Nusselder WJ, Smit HA, van Baal P, Baili P, Bennett K, Fernández E, Kulik MC, Lobstein T, Pomerleau J, Mackenbach JP, Boshuizen HC. DYNAMO-HIA-a Dynamic Modeling tool for generic Health Impact Assessments. PLoS One. 2012;7(5):e33317.
[4] https://www.cbs.nl/nl-nl/achtergrond/2016/50/kernprognose-2016-2060
[5] https://www.volksgezondheidenzorg.info/selectie-van-ziekten

The Trend Scenario describes mortality related to the diseases in the VTV selection of diseases. As we want to project the mortality for the ICD Main Groups too, additional analyses were necessary. For instance, dementia and stroke were split up into two groups for the analyses and projections as these diseases come under two different ICD Groups. Also, for each ICD group a residual group was defined for all the residual deaths in that ICD group that are not included in the VTV selection of diseases. This enables us to show projections for the future of the ICD Groups in addition to the projections of the VTV diseases. As regards mortality according to ICD Groups we are in line with the CBS[6] classification. The CBS based this classification on the categories in the 10th revision of the *International Classification of Diseases and Related Health Problems* (ICD-10)[7]. The ICD-10 coding of the causes of death that are included in the Trend Scenario is presented in Table 2 (Appendix).

Within the ICD Group Injuries, we can no longer draw a distinction for mortality as regards the nature of the underlying cause such as personal accidents, sport or work, as this is no longer classified as such. However, in the Trends Scenario these causes are still distinguished for Injuries with regard to incidence.

Burden of disease
The burden of disease, expressed in Disability-Adjusted Life Years (DALY), consists of two components, the Years of Life Lost (YLL) and the Years Lost due to Disability (YLD). Added together these form the DALY. The YLL is a measure for the number of years that people die prematurely due to a specific cause of death, and the YLD is a measure for the occurrence of diseases, taking into account their severity (disability weight). Both the YLL and the YLD are distinguished by sex, age and disease or cause of death. The level of detail regarding diseases or cause of deaths depends on the detail of the underlying data. Since all deaths are allocated to a certain cause of death, according to the ICD10 classification, the YLL represents 100 percent of mortality in the Netherlands. For the YLD, only the previously mentioned selection of diseases are known, which do not represent all morbidity in the Netherlands. The remainder of the YLD (i.e. the part not covered by the selection of diseases) is estimated based on the ratio between the known YLL and the known YLD in each ICD main group.

Until 2018, the YLDs in the VTV were not corrected for multimorbidity (having multiple diseases at the same time). This results in an overestimation of the YLD[8]. Also the burden of disease projections in the Trend Scenario were initially not corrected for multimorbidity. For the Synthesis of the VTV-2018 this correction was made to allocate adequately the burden of disease to different determinants.

[6] http://statline.cbs.nl/statweb/publication/?vw=t&dm=slnl&pa=7052_95
[7] https://class.who-fic.nl/browser.aspx?scheme=ICD10-nl.cla
[8] Hilderink HBM, Plasmans MHD, Snijders BEP, Boshuizen HC, Poos MJJC, van Gool CH. Accounting for multimorbidity can affect the estimation of the Burden of Disease: a comparison of approaches. Archives of Public Health. 2016;74(1):37. doi:10.1186/s13690-016-0147-7.

For this correction, the disability weights for combinations of diseases have to be calculated. Instead of adding up the disability weights of the individual diseases, a multiplicative method is applied. This method ensures that the value of the disability weight of a combination of diseases stays below one. When simply adding the separate disability weights this value could exceed one. In addition to the combined disability weights, it is necessary to know how often combinations occur. Combinations of certain diseases might occur relatively more often than may be expected on the basis of independence. This can, for example, be the case when different diseases have a common risk factor, or because one disease might be a complication of another disease. However, data on the occurrence of combinations of disorders are very limited. Therefore, it is assumed that combinations of diseases occur independently. Combinations up to five different diseases are taken into account, for each 5-year age group, and for men and women.

3 Presentation of the results

The results of the Trend Scenario are presented using six One-Pagers, which give the main results of the Trend Scenario. These results and their presentation involve several choices that are explained here. For instance, the results presented are of course just a selection of all the results of the Trend Scenario. The results are presented in such a way that they are accessible, i.e. relatively easy to read and to interpret. To this end, the underlying, more detailed analyses, for example of five-year age groups and/or sex, are aggregated into broad age groups and also into population level. The aggregation level chosen, serves to support the message, while losing as little as possible of the underlying information. Another choice that has to be made for the presentation is about the measure or unit in which certain indicators are expressed. For some indicators this is absolute numbers (for example the number of people who are lonely), for others it is a relative measurement (for example the percentage of smokers), and for still others it is the differences compared to 2015 (for example an increase in healthy life expectancy). Often, several measures are used side by side. Again, the choice was based on the aim of presenting the message in as accessible a way as possible.

All the quantitative results are the result of underlying calculations. These figures are rounded off for the purpose of readability and to avoid pseudo-accuracy. The rounding was based on the size of the results. For instance, incidence and prevalence have been rounded to the nearest hundred. The graphic representation of the results also includes several choices. With regard to the time axis, attempts were made to show the results from 1990 in order to give the projection a visual representation 25 years ahead of the trends over the last 25 years. However, this is not possible for all the graphs because of the limited data availability. In the case of the Y axis, it was decided to use a scale that again supports the message, without making the differences too large or too small (visually). In a few cases three-year moving averages are shown for the historical data in order to create a more ordered picture.

4 Appendix (additional table)

Table 2 The VTV Diseases with coding, source and operationalisation

No	Disease	Mortality ICD-10 code	Disease ICPC Coding	Source	Indicator
1	Infectious diseases of the gastrointestinal tract	A00-A09	D70, D73	Incidence	D70, D73
2	Diseases in the National Immunisation Programme	Not included	Not included	Not included	n.a.
3	AIDS and HIV infection	B20-B24, Z21	Taken from CIB	CIB	Annual prevalence
4	Zoonotic diseases	Not included	Not included	Not included	Annual prevalence
5	Hospital infections and antimicrobial resistance	Not included	Not included	Not included	Annual prevalence
6	Infectious and parasitic diseases-Other	Other in ICD chapter A00-B99	Not included	Not included	n.a.
7	Colorectal cancer	C18-C21	ICD coding IKNL	IKNL	Ten-year prevalence
8	Lung cancer	C33-C34	ICD coding IKNL	IKNL	Ten-year prevalence
9	Skin cancer	C43-C44	ICD coding IKNL	IKNL	Ten-year prevalence
10	Cervical cancer	C53	ICD coding IKNL	IKNL	Ten-year prevalence
11	Prostate cancer	C61	ICD coding IKNL	IKNL	Ten-year prevalence
12	Non-Hodgkin lymphoma (NHL)	C82-C85, C88,	ICD coding IKNL	IKNL	Ten-year prevalence
13	Breast cancer	C50	ICD coding IKNL	NZR	Annual prevalence
14	Lip and oral cavity cancer	C00, C01, C02, C03, C04, C05, C06, C07, C08	ICD coding IKNL	IKNL	Ten-year prevalence
15	Nasopharynx cancer	C09, C10, C11, C12, C13, C14	ICD coding IKNL	IKNL	Ten-year prevalence
16	Esophageal cancer	C15	ICD coding IKNL	IKNL	Ten-year prevalence
17	Stomach cancer	C16	ICD coding IKNL	IKNL	Ten-year prevalence
18	Liver cancer	C22	ICD coding IKNL	IKNL	Ten-year prevalence
19	Galblaas cancer	C23	ICD coding IKNL	IKNL	Ten-year prevalence
20	Pancreatic cancer	C25	ICD coding IKNL	IKNL	Ten-year prevalence

No	Disease	Mortality ICD-10 code	Disease ICPC Coding	Source	Indicator
21	Nasal Cavity, Middle Ear & Accessory Sinuses cancer	C30-C31	ICD coding IKNL	IKNL	Ten-year prevalence
22	Larynx cancer	C32	ICD coding IKNL	IKNL	Ten-year prevalence
23	Mesothelioma	C45	ICD coding IKNL	IKNL	Ten-year prevalence
24	Soft Tissue Sarcoma cancer	C49	ICD coding IKNL	IKNL	Ten-year prevalence
25	Corpus Uteri cancer	C54,C55	ICD coding IKNL	IKNL	Ten-year prevalence
26	Ovary cancer	C56	ICD coding IKNL	IKNL	Ten-year prevalence
27	Testis cancer	C62	ICD coding IKNL	IKNL	Ten-year prevalence
28	Larynx cancer	C64	ICD coding IKNL	IKNL	Ten-year prevalence
29	Urinary cancer	C65-C66, C68	ICD coding IKNL	IKNL	Ten-year prevalence
30	Bladder cancer	C67	ICD coding IKNL	IKNL	Ten-year prevalence
31	Brain cancer	C71	ICD coding IKNL	IKNL	Ten-year prevalence
32	Thyroid Gland cancer	C73	ICD coding IKNL	IKNL	Ten-year prevalence
33	Hodgkin lymphoma	C81	ICD coding IKNL	IKNL	Ten-year prevalence
34	Plasma Cell Tumors	C90	ICD coding IKNL	IKNL	Ten-year prevalence
35	Leukemia	C91-C95	ICD coding IKNL	IKNL	Ten-year prevalence
36	Neoplasms-Other	Other in ICD chapter C00-C99	Not included	Not included	n.a.
37	Diseases of the blood -Other	ICD Chapter D50-D99	Not included	Not included	n.a.
38	Diabetes	E10-E14	T90	CMR Measuring stations	Incidence
39	Endocrine, nutritional and metabolic diseases -Other	Other in ICD chapter E00-E99	Not included	Not included	n.a.
40	Mood disorders	F30-F34, F38-F39	Ti study	NZR	Health care prevalence
41	Schizophrenia	F20	P72	Not included	n.a.
42	Autism spectrum disorders	Not included	n/a	Kidney foundation	Annual prevalence
43	Anxiety disorders	F40-F42	Ti study	Not included	n.a.
44	Personality disorders	Not included	P80	NZR	Health care prevalence
45	Behavioural disorders	Not included	P22	NZR	Annual prevalence
46	Intellectual disabilities	F70-F79	SCP classification	NZR	Annual prevalence

No	Disease	Mortality ICD-10 code	Disease ICPC Coding	Source	Indicator
47	Alcohol-related disorders	F10	P15, P16	NZR	Annual prevalence
48	Substance-related disorders	Not included	Not included	NZR	Annual prevalence
49	ADHD	Not included	P21	NZR	Annual prevalence
50	Burn-out (overworked, surmenage, adjustment disorders, stress-related disorders)	Not included	P78	NZR	Annual prevalence
51	Dementia in Chapter Mental and behavioural disorders	F01-F03	P70	allocation based on YLD	Annual prevalence
52	Mental and behavioural disorders-Other	Other in ICD chapter F00-F99	Not included	Not included	n.a.
53	Parkinson's disease	G20-G22	N87	Not included	n.a.
54	Epilepsy	G40-G41	N88	VeiligheidNL	Incidence (SEH)
55	VTV visual impairments	Not included	F84, F92-F93, R83	VeiligheidNL	Incidence (SEH)
56	Hearing impairments	Not included	H84-H86	VeiligheidNL	Incidence (SEH)
57	Migraine	G43	N89	VeiligheidNL	Incidence (SEH)
58	Dementia in Chapter diseases of the nervous system	G30	P70	allocation based on YLD	Annual prevalence
59	Stroke in Chapter diseases of the nervous system	G45	K89-K90	allocation based on YLD	Annual prevalence