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Cluster analysis of non-communicable disease burden, prevention and management across EU27+2 countries

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Abstract

Non-communicable diseases (NCDs) are the leading causes of death and disability in countries across the 27 European Union (EU) Member States, Norway and Iceland (EU27+2) and in the OECD. While all countries are impacted by NCDs, there are substantial cross-country differences in the current burden of NCDs, the contribution of individual risk factors, and the outcomes of prevention and management efforts. Identifying countries with similar NCD profiles, including disease burden, risk exposure and management efforts, can serve as a foundation for meaningful collaboration, employing shared strategies tailored to comparable contexts. This approach can be more effective than grouping countries solely by highest or lowest values on single indicators.

Cluster analysis identified seven distinct groups of countries within the EU27+2, each with a unique NCD profile. Cluster A has a relatively low burden of NCDs and a younger population. Cluster B has a relatively low burden of cancer and cardiovascular diseases (CVDs), with a higher burden of type 2 diabetes (T2DM) and lower rates of physical activity. Cluster C has a higher burden of cancer and has the oldest population. Cluster D has a lower CVD burden amid a high burden of chronic respiratory diseases (CRDs). Cluster E has a heavy burden of NCDs, in particular CVDs. Cluster F has a higher burden of cancer and CVDs along with lower survival rates. Cluster G has relatively poor risk factor control and a higher burden of CVDs, cancer and T2DM. In addition, the remaining 14 OECD countries (OECD14¹) were grouped, providing a broader international benchmark with corresponding comparative analysis. These clusters can help inform collaborative cross-country work to address shared priorities through mechanisms such as Joint Action Projects, Technical Support Instruments (TSIs) and the sharing of best practices in public health.

¹ OECD14 countries: Australia, Canada, Chile, Colombia, Costa Rica, Israel, Japan, Korea, Mexico, New Zealand, Switzerland, Türkiye, United Kingdom, United States

Résumé

Les maladies non transmissibles (MNT) sont les principales causes de décès dans les 27 pays membres de l'Union européenne, en Norvège et en Islande (UE27+2), ainsi que dans l'ensemble de l'OCDE et représentent un fardeau majeur en termes de handicap pour les personnes atteintes. Bien que tous les pays soient affectés par les MNT, il existe des différences importantes à l'échelle européenne concernant le fardeau actuel de MNT, la contribution des facteurs de risque individuels et les résultats des efforts de prévention et de prise en charge. Identifier des pays présentant des profils similaires de MNT - en termes de fardeau, d'exposition aux facteurs de risque et d'efforts de prise en charge - peut servir de socle commun pour favoriser une collaboration efficace, en mettant en œuvre des stratégies adaptées à des contextes comparables. Cette approche pourrait avoir davantage d'impact que de simplement regrouper les pays en fonction de leurs valeurs les plus élevées ou les plus faibles sur des indicateurs individuels.

L'analyse en grappes a révélé sept grappes distinctes de pays, chacun présentant un profil unique de MNT. Grappe A présente un fardeau relativement faible de MNT et une population plus jeune. Grappe B a un fardeau relativement faible de cancer et de maladies cardiovasculaires (CVD), mais un fardeau élevé de diabète et un faible niveau d'activité physique. Grappe C se caractérise par un fardeau élevé de cancer et la population la plus âgée. Grappe D montre un faible fardeau de CVD mais un fardeau élevé de maladies respiratoires chroniques (CRD). Grappe E a un fardeau élevé de MNT, principalement de CVD. Grappe F présente un fardeau élevé de cancer et de CVD ainsi que des taux de survie plus faibles. Grappe G combine un contrôle relativement faible des facteurs de risque avec un fardeau élevé de CVD, cancer et diabète. De plus, les 14 pays restants de l'OCDE ont été regroupés, fournissant un benchmark international plus large avec analyse comparative correspondante. Ces grappes peuvent guider le travail collaboratif entre pays afin d'adresser des priorités communes, grâce à des mécanismes tels que les plans d'action communs, l'instrument d'appui technique (TSI) et le partage des meilleures pratiques en santé publique.

Executive summary

NCDs such as cancer, cardiovascular diseases (CVDs), chronic respiratory diseases (CRDs) and type two diabetes mellitus (T2DM) are the leading causes of death and disability across the 27 European Union (EU) Member States, Norway and Iceland (EU27+2) and the OECD. However, their impact is felt differently by countries, with large cross-country variations in disease burden, primary prevention and management.

International comparison is a useful tool to help countries identify where they stand relative to others in the fight against NCDs. Clustering can be particularly useful in this regard, grouping countries with similar strengths and priorities in tackling NCDs based on alignment across multiple indicators. Unlike ranking countries based on individual disease indicators, cluster analysis ensures the full NCD context including the burden, primary prevention and management (the NCD pathway) is taken together.

A clustering exercise was conducted on 12 indicators covering three dimensions of NCD control (primary prevention, burden and management, referred to here as the NCD pathway), across four NCDs (cancer, CRDs, CVDs and T2DM). Specifically, countries were grouped using agglomerative hierarchical clustering with Ward's linkage method. This approach was applied to the first three principal components derived from a principal component analysis of the standardised 12 indicators, capturing the most important variation in the data. In a final step, the resulting clusters were validated using statistical tests and visual tools to ensure the robustness of the analysis. The clustering provides a useful snapshot of how countries align in terms of NCD burden, primary prevention, and management, but it has limitations. For example, it does not fully capture current policies or health system characteristics. Additionally, the use of non-age-standardised disease rates, while intentional to reflect the population burden, means that the results may partly reflect demographic differences.

Seven clusters were identified, each with a unique NCD profile.

- Cluster A is an eight-country cluster with a low burden of NCDs, strong primary prevention relative to the EU27+2 average and low fatality rates. It has a young population and along with cluster B has the lowest risk of dying prematurely from one of the four NCDs.
- Cluster B is a three-country cluster based in Southern Europe with a relatively high T2DM burden accompanied by relatively high rates of insufficient physical activity and above average levels of obesity, though with a lower burden of the other NCDs. It joins Cluster A in having the lowest risk of premature death from one of the four NCDs.
- Cluster C is a three-country cluster with a relatively high burden of cancer though with relatively good primary prevention and management indicators. It is also the cluster with the oldest population.
- Cluster D is a four-country cluster notable for having a relatively high burden of CRDs contrasted with having a relatively low CVD burden. In terms of primary prevention, it has the lowest burden of CVDs attributable to risk factors though a higher-than-average burden of CRDs attributable to risk factors.

- Cluster E is a three-country cluster characterised by having the highest burden of cancer, CVDs and T2DM of all clusters, with CVDs especially high. It also has relatively poor risk factor control and relatively high fatality rates, with people in this cluster having the highest risk of premature death from an NCD.
- Cluster F is a four-country cluster with a significant burden of cancer, CVDs, and T2DM and a lower burden of CRDs. People in this cluster had the second highest risk of premature mortality from NCDs.
- Cluster G is a four-country cluster with a relatively high burden of CVDs, cancer and T2DM. Primary prevention is suboptimal with poor behavioural risk factor control, and management shows a mixed picture, with poor cancer and CVD outcomes and better outcomes for people living with CRDs.

The clusters identified can be used by countries and intergovernmental organisations to help guide collaborative action on tackling NCDs. For example, within the EU, several mechanisms exist to help Member States work together on addressing common challenges in tackling NCDs, and these include Technical Support Instruments, Joint Action Projects and others. In addition, the 14 OECD countries not in the EU27+2 (herein named OECD14²) may also identify areas in which they align closely with other countries, and which may favour joint action for instance through bilateral discussion, discussion at expert groups or networks, or through other fora. Furthermore, the OECD has published a series of booklets on best practices to help facilitate knowledge diffusion and exchange of policies and programmes in NCD prevention, management and control.

² OECD14 countries: Australia, Canada, Chile, Colombia, Costa Rica, Israel, Japan, Korea, Mexico, New Zealand, Switzerland, Türkiye, United Kingdom, United States.

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Abbreviations and acronyms

CVD	Cardiovascular disease
CRD	Chronic respiratory disease
DALY	Disability adjusted life year
EHIS	European Health Interview Survey
EU	European Union
EU27+2	The 27 European Union member states, Norway and Iceland.
GBD	The Global Burden of Disease study
HPV	Human Papilloma Virus
IHME	Institute for Health Metrics and Evaluation
MI	Myocardial Infarction
MIR	Mortality incidence ratio
MPR	Mortality prevalence ratio
NCD	Non-communicable disease
OECD14	The 14 OECD member states not in the EU27+2: Australia, Canada, Chile, Colombia, Costa Rica, Israel, Japan, Korea, Mexico, New Zealand, Switzerland, Türkiye, United Kingdom, United States.
PCA	Principal component analysis
T2DM	Type 2 Diabetes Mellitus
WHO	World Health Organization

Country codes

In certain parts of the document, ISO 3 codes were used as country abbreviations, with a list provided below.

Country names and ISO 3 codes

ISO-3	Country Name	ISO-3	Country Name
AUS	Australia	ISL	Iceland
AUT	Austria	ISR	Israel
BEL	Belgium	ITA	Italy
BGR	Bulgaria	JPN	Japan
CAN	Canada	KOR	Korea
CHE	Switzerland	LTU	Lithuania
CHL	Chile	LUX	Luxembourg
COL	Colombia	LVA	Latvia
CRI	Costa Rica	MEX	Mexico
CYP	Cyprus	MLT	Malta
CZE	Czechia	NLD	Netherlands
DEU	Germany	NOR	Norway
DNK	Denmark	NZL	New Zealand
ESP	Spain	POL	Poland
EST	Estonia	PRT	Portugal
FIN	Finland	ROU	Romania
FRA	France	SVK	Slovak Republic
GBR	United Kingdom	SVN	Slovenia
GRC	Greece	SWE	Sweden
HRV	Croatia	TUR	Türkiye
HUN	Hungary	USA	United States
IRL	Ireland		

1 Introduction

NCDs such as cancer, CVDs, CRDs and T2DM are the leading causes of death and disability across the 27 European Union (EU) Member States, Norway and Iceland (EU27+2) (OECD, 2026^[1]). NCDs caused 371 million or 82% of all disability adjusted life years (DALYs) across the OECD in 2023 (84% across the EU) (Naghavi et al., 2025^[2]). In addition, they place strain on health systems and budgets, reduce quality of life, and lower workforce productivity across the region.

Population ageing means that the burden of NCDs will continue to rise. The cumulative exposure to environmental and behavioural risk factors over the life course, combined with age-related biological changes (Franceschi et al., 2018^[3]), increase the risk of many NCDs. Certain NCDs, such as ischemic heart disease (IHD), stroke, chronic obstructive pulmonary disease (COPD) and some cancers, have been shown to increase exponentially with age (Le Couteur and Thillainadesan, 2022^[4]). This challenge is intensifying as the share of the population aged 65 years and older increased from 16% in 2014 to 19% in 2024 across the OECD (and from 19% to 22% in the EU), and is expected to reach 28% in 2050 (29% in the EU) (Eurostat, 2025^[5]; United Nations, 2024^[6]; OECD, 2025^[7]). Modelling work by the OECD shows that even if risk factor trends and survival rates remain constant, new NCD cases are expected to increase by 31% in the OECD (29% in the EU) between 2026 and 2050. The incidence would increase from 1 936 per 100 000 people per year to 2 518 in the OECD, and from 2 141 to 2 755 in the EU. The prevalence of multimorbidity is projected to increase even more over the same period: by 75% in the OECD and 70% in the EU (OECD, 2026^[1]).

NCDs are placing an increasing burden on governments not only through the direct costs of treatment, but additionally through their broader impacts on wellbeing and productivity. NCDs raise the likelihood of experiencing depression, a risk which increases with each additional NCD (Everard et al., 2025^[8]). This creates additional challenges for treatment adherence, self-care and workplace productivity. NCDs also reduce productivity through increased absenteeism, reduced working hours and early retirement (Feigl et al., 2019^[9]).

While all EU27+2 countries, as well as the 14 OECD countries not in the EU27+2 (herein named OECD14³), face a rising NCD burden, they have different risk factor prevalences, disease burdens and treatment outcomes (Table 1.1). Mortality and premature mortality rates are commonly used indicators of disease burden and health system performance (Liang et al., 2023^[10]), and Table 1.1 shows dramatic variation across countries: CVD mortality rates vary six-fold across EU27+2 countries (and almost threefold across the OECD14), while cancer mortality rates vary more than twofold across the EU27+2 and more than fourfold across the OECD14. The probability of dying prematurely from an NCD varies almost fourfold across the EU27+2 and almost threefold across the OECD14. In terms of primary prevention, the proportion of people with insufficient physical activity differs by more than fivefold between the most and least physically active countries in the EU27+2 (almost threefold across the OECD14), and there is almost

³ OECD14 countries: Australia, Canada, Chile, Colombia, Costa Rica, Israel, Japan, Korea, Mexico, New Zealand, Switzerland, Türkiye, United Kingdom, United States

a four-fold difference in the percentage of the population currently using tobacco products across both groups.

Table 1.1. Substantial variation in NCD prevention and mortality across EU and OECD countries highlight diverse priorities and set the stage for clustering

Country	Prevention						Mortality				
	Tobacco (% of adults)	Obesity (% of adults)	Insufficient Physical Activity (% of adults)	Alcohol (litres/year)	Air Pollution (PM _{2.5} in µg/m ³)	Fruit and Vegetable (% of adults)	Overall (rate per 100 000 people)				Age 30-70 Prob dying NCD (%)
							Cancer	CVD	CRD	T2DM	
Austria	23	17	23	12	11	6	234	326	41	22	8.3
Belgium	22	22	29	9	11	15	266	230	59	12	7.7
Bulgaria	36	24	37	12	17	5	330	1114	35	34	21.3
Cyprus	32	25	43	5	13	8	158	224	44	37	5.7
Czechia	27	31	27	14	14	8	287	440	42	40	11.7
Germany	20	24	15	11	10	11	297	374	55	24	9.7
Denmark	17	14	14	10	9	23	305	222	90	23	8.9
Spain	25	19	25	11	10	11	253	253	81	20	7.6
Estonia	25	27	19	10	6	13	284	553	17	22	12.6
Finland	20	24	12	10	5	14	254	407	38	10	8
France	29	11	27	11	9	20	284	230	32	19	8.1
Greece	29	34	40	7	14	12	343	473	55	17	10.3
Croatia	31	36	33	11	16	10	332	556	49	36	13
Hungary	29	36	33	11	14	8	330	604	66	28	18.3
Ireland	18	31	24	11	8	33	183	168	50	8	7.7
Iceland	10	23	28	8	5	9	201	200	37	7	6.9
Italy	21	22	45	8	14	11	308	362	55	32	8.3
Lithuania	29	31	24	12	9	16	297	741	22	20	16.5
Luxembourg	24	20	15	11	9	14	199	198	39	11	6.5
Latvia	32	30	18	15	12	7	300	797	18	29	18.7
Malta	24	35	44	6	12	12	229	296	37	33	7.9
Netherlands	20	17	11	9	11	30	285	235	69	18	8.2
Norway	14	20	38	7	6	9	232	201	59	11	7.2
Poland	23	31	40	12	18	9	321	442	28	26	15.4
Portugal	23	27	56	11	8	14	282	308	64	37	8.5
Romania	28	38	40	17	14	2	284	771	40	14	17.7
Slovak Republic	28	30	26	11	15	9	260	498	19	15	12
Slovenia	19	22	23	11	14	5	291	350	34	20	9.2
Sweden	21	16	11	10	6	8	238	286	43	19	6.4
EU27+2 average	24	25	28	10	11	12	271	409	45	22	11
Australia	12	32	28	11	8	No data	205	183	46	17	6.8
Canada	12	27	40	10	6	22	230	202	50	16	8.1
Switzerland	22	14	22	9	9	22	210	227	34	13	6.1

nd												
Chile	27	40	40	8	23	No data	154	144	36	15	7.7	
Colombia	8	24	35	4	14	No data	104	152	39	14	7.9	
Costa Rica	8	32	51	4	14	No data	129	129	29	21	7.9	
United Kingdom	13	29	22	11	10	33	271	235	74	9	10.5	
Israel	21	23	28	3	19	No data	138	110	21	25	6.1	
Japan	16	5	51	6	13	No data	358	291	47	8	7.4	
Korea	19	7	61	8	No data	32	191	150	31	20	4.7	
Mexico	16	36	28	6	14	No data	83	147	29	64	13.7	
New Zealand	10	34	21	9	6	No data	200	213	48	13	8.7	
Türkiye	31	34	44	2	22	3	134	246	45	27	9.8	
United States	17	43	36	10	8	No data	210	272	70	21	12.9	
OECD14 average	17	27	36	7	13	22	187	193	43	20	8	

Note: Heatmap colouring is applied using a green-red scale where dark green indicates more favourable statistics and dark red indicates less favourable statistics for a given indicator. OECD14⁴ represents the unweighted OECD14 average and EU27+2 represents the unweighted EU27+2 average. CRD refers to chronic respiratory disease; CVD is cardiovascular disease; T2DM refers to Type 2 Diabetes Mellitus. Prob dying NCD refers to the probability of dying between the exact ages 30 and 70 years from cardiovascular diseases, cancer, T2DM or chronic respiratory diseases in 2021 (SDG 3.4.1) (WHO, 2021_[11]). Mortality here refers to the mortality associated with each of the NCDs as a non-age standardised rate per 100 000 people, in 2021, from IHME (Naghavi et al., 2024_[12]), with cancer mortality referring to total cancers excluding non-melanomatous skin cancers. Air pollution refers to the mean population-weighted exposure to PM2.5 (microgrammes per cubic metre) in 2020 (OECD Environmental Statistics, 2025_[13]). Alcohol refers to total per capita (15+ years) consumption (in litres of pure alcohol) (SDG Indicator 3.5.2), three-year average, 2022, from the WHO Global Health Observatory (WHO, 2025_[14]). "Fruit and Vegetables" refer to the daily consumption of five or more portions of fruit and vegetables among adults. Data for EEA countries are drawn from the European Health Interview Survey (EHIS), third wave for 2019 (Eurostat, 2025_[15]), and are complemented by Health at a Glance 2023 for OECD14 countries (OECD, 2023_[16]). Data for Canada and Korea refer to 2021. Due to missing data, the OECD14 average for this indicator is calculated based on five countries only. Insufficient Physical Activity refers to the prevalence of insufficient physical activity among adults aged 18+ years (crude estimates) from the WHO Global Health Observatory, 2022 (WHO, 2025_[17]). This is defined as the percent of population attaining less than 150 minutes of moderate-intensity physical activity per week, or less than 75 minutes of vigorous-intensity physical activity per week, or equivalent. Obesity refers to the prevalence of adults aged 18+ with a BMI of 30 kg/m² or higher (crude estimate %), 2022, WHO Global Health Observatory (WHO, 2025_[33]). Tobacco Use refers to non-age-standardised estimates of current tobacco use, tobacco smoking and cigarette smoking among persons aged 15 and older from the WHO Global Health Observatory, 2022 (WHO, 2022_[18]). For more information on these variables, see [Annex H of the Supporting Material](#).

Source: Air pollution (OECD Environmental Statistics, 2025_[13]); Alcohol (WHO, 2025_[14]); Fruit and vegetables (Eurostat, 2025_[15]; OECD, 2023_[16]); Obesity (WHO, 2025_[19]); Tobacco use (WHO, 2022_[18]); Insufficient Physical Activity (WHO, 2025_[17]); Mortality rates are from the Global Burden of Disease Study 2021 and IHME (Naghavi et al., 2024_[12]); Probability of dying prematurely from NCDs (WHO, 2021_[11]).

Given the variation in disease burden, risk factor prevalence and management outcomes across countries, not all the countries share the same priorities in terms of policies to prevent and manage NCDs. For example, a policy on tobacco control may particularly benefit countries with high smoking prevalence. In other countries, a stronger focus on policies to improve the treatment of CVDs may instead prove particularly effective.

Cluster analysis can help identify countries which face similar challenges in terms of disease burden, risk factor prevalence or treatment outcomes, and serve as a starting point for potentially establishing collaborative action to address common challenges. In fact, clustering countries is a well-established

⁴ OECD14 countries: Australia, Canada, Chile, Colombia, Costa Rica, Israel, Japan, Korea, Mexico, New Zealand, Switzerland, Türkiye, United Kingdom, United States

method widely used to identify groups of countries with similar epidemiological profiles, policy contexts, and priority areas, thereby facilitating the sharing of good practices and mutual learning. This includes the OECD Best Practices work (OECD, 2022^[20]; OECD, 2023^[21]; OECD, 2025^[22]), the European Commission Technical Support Instruments (TSIs) (European Commission, 2025^[23]), and the European Commission Joint Action Projects (European Commission, 2023^[24]).

The aim of the project is to cluster countries based on their burden, primary prevention and management for four NCDs - cancer, CVDs, CRDs and T2DM - in order to identify countries that share similar NCD profiles and highlight where countries could align their priorities in tackling NCDs. The paper is structured as follows:

- First, a clustering exercise based on 12 indicators (covering burden, primary prevention and management for the four NCDs groups) divides the EU27+2 countries into seven clusters that highlight general strengths, weaknesses and priorities in tackling NCDs. A discussion section highlights how these results can be actioned upon including potential resource areas to help countries tackle priority issues in NCDs together.
- Each cluster is explored in-depth in the annexes ([see the Support Materials](#)). To move from broad patterns to concrete policy implications, more granular data on NCD burden, risk factor control and management are incorporated. These additional indicators allow for specific, actionable insights to tackle the priorities highlighted by the main clustering process.
- Supplementary analyses focus on each NCD pathway separately, as well as the overall NCD burden and the overall risk factor burden. While the main analysis involved a single clustering exercise encompassing the burden, primary prevention and management of all four NCDs, this supplementary analysis performed a distinct clustering for each theme and NCD. This allows countries to see, for the overall NCD burden, for each NCD and for the risk factors separately, which peers they align with most closely.

2 Methods

Clustering analyses were conducted to group countries with similar profiles across the NCD care pathway (overall burden, primary prevention, and management). First, a clustering exercise which grouped EU27+2 countries using 12 indicators of NCD burden, primary prevention and management was performed, around which most of the paper is structured. In addition, six supplementary clustering exercises were conducted: one focused on primary prevention, one on overall NCD burden, and one on each of the four main NCDs. The results of these additional analyses are presented in [Annex D in the Support Materials](#).

Unlike ranking countries based on individual disease indicators, cluster analysis ensures the full NCD context is considered together. This approach helps identify countries that have the most similar health needs and strengths, making it easier to find common areas and collaborate effectively. In contrast, sorting countries based on single indicators - which is not done for this analysis - might highlight the best or poorest performers in specific areas, but these countries may differ significantly across the broader NCD pathway, making meaningful collaboration and coordinated action more challenging.

The main clustering analysis used 12 variables, covering four NCDs (cancer, CVDs, CRDs and T2DM) across three themes:

- **Disease burden:** The overall disease burden was measured using DALYs lost to each of the four NCDs per 100 000 population. DALYs include years lived with disease and years of life lost due to premature mortality (Murray et al., 2012^[25]). DALYs were not age-standardised, as the aim was to show the overall burden countries faced rather than adjust for demographic differences.
- **Primary prevention:** Prevention of NCDs was assessed using the proportion of NCD burden (based on DALYs) attributable to risk factors. Risk factors as defined by Global Burden of Disease Study (GBD) include behavioural risk factors such as smoking, relatively high alcohol use and diet; environmental and occupational risks such as particulate matter pollution (a form of air pollution) and metabolic risk factors such as high body mass index (BMI) and high fasting plasma glucose among others (Brauer et al., 2024^[26]). Overall, over 50 risk factors distributed among these three categories are included in the GBD 2021 (Brauer et al., 2024^[26]). For this measure, a higher proportion indicates that a larger share of the disease burden is attributable to risk factors, underscoring the greater potential impact of primary prevention interventions. For T2DM, incidence rate was used instead as the proportion of T2DM burden attributable to risk factors is considered to be 100% for all countries (Murray et al., 2020^[27]).
- **Disease management:** The management of NCDs was represented by indicators reflecting case fatality rates. For cancer, a composite indicator was produced based on 5-year survival rates for breast, colon and lung cancer (Allemani et al., 2018^[28]), with mortality to incidence rates used to help predict this indicator for the three countries missing this data (see [Annex H in the Support Materials](#) for more details). For CVDs, mortality to incidence ratios (MIR) were used as data on 30-day fatality for stroke and myocardial infarction is not available for all countries. Mortality to prevalence ratios (MPR) were used for T2DM and CRD.

After countries were clustered based on these 12 indicators, each cluster was analysed in detail. The variables used for the cluster analysis were supplemented with additional data on NCD burden, risk factor control and management approaches and outcomes for the four NCDs ([Annex H in the Support Materials](#)).

These additional indicators were incorporated to give more detail on actionable insights on what specific areas in primary prevention, management or burden may have led to the results and what could be actioned on. For example, while a cluster profile may show a high proportion of cancer attributable to risk factors, the additional data on specific risk factors and vaccination rates can help understand the priority areas for action.

Data on risk factors, burden and disease management was obtained from the OECD, the World Health Organization (WHO) and the Institute for Health Metrics and Evaluation (IHME). Additional data, including demographic, economic and health spending data, was taken from a variety of sources including Eurostat, OECD, the World Bank and UN Population Prospects, among others ([Annex H in the Support Materials](#)). Data extraction and loading were performed in SQL and Python, and data pre-processing and analysis in Python. Non-age standardised estimates were preferred to better reflect each country's health needs, inclusive of current demographic features.

For the main cluster analysis, only one of the clustering variables had missing data (cancer survival). This was addressed by constructing an indicator for cancer survival representing survival from colon, breast and lung cancer, and training a regression model to predict this indicator based on IHME mortality to incidence ratio (MIR). The predictions were used for those countries which did not have survival data ([Annex H in the Support Materials](#)). For the additional variables not used in clustering, averages were calculated for each cluster, ignoring missing values. A summary of missingness for each variable is included in [Annex H in the Support Materials](#).

The main method used for the cluster analysis is agglomerative hierarchical clustering with ward linkage (Box 2.1, with more detailed explanation in [Annex I in the Support Materials](#)). In the main analysis, due to the higher number of variables (12), principal component analysis (PCA) was applied to the scaled and standardised data. Clustering was then performed on the first three principal components. For the supplementary analyses, which had fewer variables, a Gower distance matrix was used as the basis of the hierarchical clustering. This is similar to the methods used in previous OECD work (OECD/The Health Foundation, 2025^[29]; Wiper et al., 2022^[30]).

Box 2.1. Hierarchical Cluster Analysis

The method used to produce the clusters for the main analysis is agglomerative hierarchical clustering. While described in more detail in [Annex I in the Support Materials](#), it can be summarised as follows:

Step 1: Prepare the data in a suitable way for clustering

The first step is to prepare the data in a format that is suitable for clustering. For the main cluster analysis, all variables were continuous (there were no categorical or binary data), though the ranges varied considerably, from between 0 and 1 for some indicators to between 2 926 and 19749 for another. For this reason, data was first scaled and standardised using standard scaler in Python, giving each variable equal weight. Next, due to the higher number of variables (12), principal component analysis (PCA) was performed to reduce the number of dimensions down to three. PCA is a statistical technique used to simplify complex datasets by generating a small number of summary scores that capture the most important variation in the data. This helped to identify common trends across variables, reduce statistical noise, and make patterns easier to interpret.

Step 2: Perform hierarchical clustering

The second step is to perform hierarchical clustering on the prepared data. Hierarchical clustering is also known as agglomerative or bottom-up clustering and follows this order:

- Each country starts as an individual cluster.
- Clusters closest together are then merged.
- This continues until only one cluster remains.

There are several ways to consider the distance between clusters, such as taking the nearest point of one cluster to the nearest point of another, taking the furthest points, or taking the average distance between all pairs of points in the two clusters. Consistent with previous OECD work (OECD/The Health Foundation, 2025^[29]; Wiper et al., 2022^[30]), ward linkage was used as the method of choice, which determined the distance between two clusters by minimising the increase in variance when the two clusters are merged. This was chosen as it helped produce clusters that are as similar as possible with respect to the variables chosen.

Step 3: Analyse the resulting clusters

Throughout the process, quality checks were performed to guide clustering choices. This included statistical tests such as the silhouette score (Rousseeuw, 1987^[31]) and Davies Bouldin index (Davies and Bouldin, 1979^[32]) to assess the cluster quality across different numbers of clusters. Additionally, clusters were inspected to ensure they are meaningful in size and comparable in profile for policy considerations. Heatmaps were also used to visually understand how countries aligned in terms of the indicators used in the clustering.

3 Understanding the seven country clusters and their NCD profiles

Seven clusters were identified based on the 12 variables covering primary prevention, disease burden and management. Each cluster represents a distinct NCD profile (Table 3.1):

- **Cluster A: favourable burden in a younger population.** This is the cluster with the largest number of countries (eight). It is geographically dispersed, but includes four Nordic countries (Iceland, Finland, Norway and Sweden). This cluster has among the lowest burdens of cancer, CVDs and T2DM, while its burden of CRDs is on par with the average. People in this cluster have the lowest probability of dying prematurely from one of the four NCDs, along with people in Cluster B. This could be due to both primary prevention and management efforts, with statistics that are among the best of any cluster. Additionally, the lower burden could also be due to the young age of this population, which is the youngest of all clusters with an average age of 40, and only 19% over the age of 65. In depth analysis on Cluster A is available in [Annex A in the Support Materials](#).
- **Cluster B: high T2DM burden with poor control of key risk factors.** This is a three-country cluster based in Southern Europe. This cluster has a relatively low burden of cancer and CVDs, with a higher burden of CRDs and T2DM. The burden of cancer and CRDs attributable to risk factors is relatively low in this population, and for CVDs is on par with the EU27+2 average. However, there is a relatively high incidence of T2DM, explained in part by poor control of key risk factors, including relatively high rates of insufficient physical activity (20 percentage points higher than the EU27+2 average), and by higher rates of obesity. The cluster has good management indicators for all selected NCDs: although T2DM fatality is slightly higher than average, inspection of additional management indicators demonstrates good tertiary prevention. Overall risk of dying prematurely from one of the four NCDs is joint lowest along with Cluster A. In depth analysis on Cluster B is available in [Annex B in the Support Materials](#).
- **Cluster C: higher cancer burden in an older population.** This is a three-country cluster which includes two neighbouring countries (Italy and Slovenia), plus Germany. Cancer is a particular concern for this cluster: the burden of cancer is higher than average, while the burdens of CRDs, CVDs and T2DM are lower than average. Primary prevention indicators are relatively good across the four NCDs. In terms of disease management, cancer and CVD indicators are relatively good, with T2DM worse than average. This is also the cluster with the oldest population, with an average age of 45 and with 22% of the population over the age of 65. In depth analysis on Cluster C is available in [Annex C in the Support Materials](#).
- **Cluster D: low CVD burden amid high CRD burden.** This is a four-country cluster comprising Western European countries including two neighbours (Belgium and the Netherlands). This cluster is characterised by a relatively high burden of CRDs contrasting with a lower burden of the other NCDs (relative to the EU27+2 average). It has the lowest burden of CVDs attributable to risk factors against a higher burden of CRDs attributable to risk factors. Fatality rates are lower than average

for cancer and CVDs, though higher than average for CRDs. Overall, there is a relatively low risk of dying prematurely from an NCD in this cluster. In depth analysis on Cluster D is available in [Annex D in the Support Materials](#).

- **Cluster E: heavy burden of NCDs, in particular CVDs.** This is a three-country cluster of Central and Eastern European countries: Bulgaria, Croatia and Hungary. It has the highest burden of cancer, CVDs and T2DM across all clusters (with the CVD burden more than twice the EU27+2 average). This cluster has the highest proportion of cancer, CRD and CVD burden attributable to risk factors, as well as the highest incidence of T2DM, reflecting poor control of risk factors. Cancer survival is the lowest of any cluster and CVD fatality rates the highest of any cluster, with a higher-than-average CRD and T2DM fatality rates. Overall, the probability of dying prematurely from an NCD is the highest of any cluster, and this cluster also has the second oldest population. In depth analysis on Cluster E is available in [Annex E in the Support Materials](#).
- **Cluster F: high burden of CVDs, cancer and T2DM.** This cluster comprises three neighbouring countries: Estonia, Lithuania and Latvia, as well as the Slovak Republic. This cluster has a significant burden of CVDs and a higher-than-average burden of cancer and T2DM, though has a lower CRD burden. The CVD burden appears driven by risk factors with the proportion of CVD burden attributable to risk factors higher than average, while lower than average for cancer and T2DM. In terms of management, cancer, CVD and T2DM fatality rates are higher than average, while CRD fatality rates are lower than average. Overall, people in this cluster have the second highest risk of premature death from an NCD. In depth analysis on Cluster F is available in [Annex F in the Support Materials](#).
- **Cluster G: poor risk factor control and high burden of CVDs, cancer and T2DM.** This four-country cluster comprises Czechia, Greece, Poland and Romania. It has a relatively high burden of CVDs, cancer and T2DM, though has a lower burden of CRDs. The proportion of CVD, CRD and cancer burden attributable to risk factors is also higher than average, as is incidence of T2DM, indicating poor risk factor control. In terms of management, cancer and CVD fatality rates are higher than average suggesting poorer management for these NCDs. Overall, this cluster has a higher-than-average probability of premature death from an NCD. In depth analysis on Cluster G is available in [Annex G in the Support Materials](#).

Table 3.1. Countries clustered by primary prevention, management and burden of the four NCDs

	Variable	EU27+2	A	B	C	D	E	F	G	OECD14
			AUT FIN FRA IRL ISL LUX NOR SWE	CYP MLT PRT	DEU ITA SVN	BEL DNK ESP NLD	BGR HRV HUN	EST LTU LVA SVK	CZE GRC POL ROU	
Burden	Cancer DALYs (per 100 000)	5789	4661	4735	6005	5662	7594	6490	6750	4040
	CRD DALYs (per 100 000)	1126	1105	1221	1105	1518	1270	604	1135	1086
	CVD DALYs (per 100 000)	6823	4140	4534	5579	3888	13074	10932	8979	3588
	T2DM DALYs (per 100 000)	983	644	1315	980	853	1462	1012	1158	1129
Primary prevention	Cancer attributable to risk factors (%)	42%	40%	40%	42%	44%	48%	41%	45%	37%
	CRD attributable to risk factors (%)	48%	42%	42%	49%	50%	59%	50%	54%	43%
	CVD attributable to risk factors (%)	75%	70%	74%	72%	68%	86%	84%	80%	72%
	T2DM (Incidence per 100 000)	317	255	432	317	308	412	272	342	411
Management	Cancer survival rate	0.48	0.66	0.66	0.59	0.61	0.16	0.24	0.24	0.55
	CRD MPR	0.005	0.004	0.004	0.005	0.008	0.006	0.003	0.004	0.005
	CVD MIR	0.32	0.22	0.32	0.26	0.22	0.50	0.40	0.41	0.22
	T2DM MPR	0.0030	0.0024	0.0036	0.0034	0.0026	0.0035	0.0033	0.0029	0.0024
Additional Variables ¹	Probability dying from NCD (age 30-70) (%)	11%	7%	7%	9%	8%	18%	15%	14%	8%
	Age 65+ (% of population)	20%	19%	19%	22%	20%	22%	20%	21%	16%
	Median Age	42	40	41	45	42	44	42	43	37
	GDP per capita, USD, PPP	57366	81653	50149	54110	62738	37652	41662	41771	46150
	Health Expenditure (HE) 2022 (% of GDP)	9%	9%	10%	10%	10%	7%	7%	7%	9%
	Spending on Prevention (% of HE)	4%	5%	2%	6%	5%	4%	4%	4%	5%

Note: Heatmap colouring is applied using a green-red scale where dark green indicates more favourable statistics and dark red indicates less favourable statistics for a given indicator. OECD14 refers to OECD Member Countries that are not part of the EU27+2. Disability Adjusted Life Years (DALYs) are per 100 000 individuals and along with attributable risk are non-age standardised. MPR represents the Mortality to Prevalence ratio, and MIR represents the Mortality to Incidence ratio. ¹Variables marked under the heading 'Additional Variables' are not used for clustering and instead are added after the clustering process is completed to add additional insights to better understand how clusters compare to each other. Among these additional variables, age over 65 is based on 2022 data from the World Bank; GDP per capita, purchasing power parity (PPP) is expressed in constant 2021 international USD; health expenditure on prevention represents the share of total current health expenditure allocated to preventive care; health expenditure is reported as a proportion of GDP; probability of dying from NCD (age 30-70) is the probability of dying between the exact ages 30 and 70 years from cardiovascular diseases, cancer, T2DM or chronic respiratory diseases in 2021 (SDG 3.4.1) (WHO, 2021_[11]).

Source: NCD DALY rates are from the Global Burden of Disease Study (GBD) 2021 (Naghavi et al., 2024^[12]). Proportion of NCDs attributable to risk factors is from IHME based on GBD 2021 (Brauer et al., 2024^[26]). For T2DM, non-age standardised incidence rate of T2DM (per 100 000), both sexes, all-ages, 2021 from IHME based on GBD 2021 (Naghavi et al., 2024^[12]). Cancer survival rates are from CONCORD-3 (Allemani et al., 2018^[28]). Mortality, Incidence and Prevalence Rates for the MIR and MPR ratios are from IHME (Naghavi et al., 2024^[12]). Age over 65 (World Bank, 2022^[33]); Median age (UN Population Prospects, 2024^[34]); Probability of dying from NCD (WHO, 2021^[11]); GDP per capita (World Bank, 2022^[35]); Healthcare expenditure on prevention in 2022 (OECD Health Statistics, 2025^[36]). Further details on these variables and their respective sources are available in [Annex H in the Support Materials](#).

Overall, these clusters reveal significant diversity in health profiles across Europe (Table 3.1). Some clusters have younger populations and lower rates of premature mortality (Cluster A and B), though priorities differ: Cluster A has lower NCD burdens and stronger prevention across all NCDs, whereas Cluster B faces challenges related to T2DM and its underlying risk factors, with relatively good statistics across other NCDs. Other countries, often with older populations or weaker prevention and management, face more severe challenges. For example, countries in Cluster C generally demonstrate relatively good risk factor control and management, but have higher-than-average cancer burden, partly due to having the oldest populations of any cluster. In contrast, countries in Cluster D combine a CVD burden that is more than 40% lower than the EU27+2 average with a relatively high burden of CRDs. At the other end of the spectrum, several countries in Clusters E, F and G face heavy NCD burdens, especially CVDs, cancer, and T2DB, driven by poor control of risk factors and weaker management, which result in the highest probabilities of premature death from NCDs.

While countries within each cluster broadly align in their overall profile of NCD burden, prevention and management, the clustering process inevitably involves trade-offs: countries may align more closely on some indicators than others, and certain clusters may include potential outliers. The heatmap presented in Table 3.2 helps to visualise these similarities and variations more closely. For instance, while countries in Cluster B are closely aligned in terms of T2DM burden, prevention and management, there is greater variation in terms of cancer burden. In contrast, countries in Cluster C are closely aligned in terms of cancer burden, prevention and survival, with more variation across CRD burden.

Table 3.2. NCD burden, risk factors and management vary considerably across EU27+2 and OECD countries

A heatmap of the values for each of the clustering variables by EU27+2 country, grouped by cluster, with OECD14 countries below.

Cluster	Country	BURDEN				Prevention				Management			
		Cancer	CRD	CVD	T2DM	Cancer	CRD	CVD	T2DM	Cancer	CRD	CVD	T2DM
A	Austria	4828	1064	5201	686	41%	51%	73%	198	0.671	0.004	0.240	0.0051
	Finland	5083	1055	6445	847	37%	36%	77%	350	0.582	0.003	0.284	0.0011
	France	5784	855	4024	606	43%	41%	58%	210	0.642	0.003	0.213	0.0037
	Iceland	4298	1068	3207	553	38%	43%	74%	251	0.820	0.003	0.223	0.0012
	Ireland	3985	1198	2926	491	40%	41%	72%	231	0.523	0.005	0.210	0.0017
	Luxembourg	4242	1066	3342	620	44%	45%	67%	270	0.566	0.004	0.237	0.0018
	Norway	4628	1332	3319	598	36%	40%	67%	246	0.688	0.005	0.181	0.0019
	Sweden	4443	1204	4660	748	37%	41%	69%	286	0.750	0.003	0.206	0.0026
B	Cyprus	3485	1135	3840	1178	40%	47%	76%	396	0.900	0.004	0.309	0.0047
	Malta	4895	1060	4882	1326	40%	39%	77%	426	0.496	0.003	0.305	0.0031
	Portugal	5825	1469	4880	1443	39%	39%	71%	472	0.577	0.004	0.332	0.0030
C	Germany	6065	1317	6053	886	43%	50%	74%	306	0.671	0.005	0.259	0.0033
	Italy	5975	1077	5302	1030	41%	48%	71%	317	0.603	0.006	0.267	0.0043

	Slovenia	5975	920	5381	1022	43%	48%	71%	329	0.501	0.003	0.259	0.0027
D	Belgium	5445	1319	3799	792	44%	50%	67%	283	0.720	0.006	0.214	0.0017
	Denmark	6025	1780	3736	726	44%	56%	72%	245	0.585	0.009	0.208	0.0040
	Netherlands	5924	1541	3837	733	44%	50%	66%	254	0.632	0.006	0.218	0.0030
	Spain	5255	1433	4179	1161	45%	45%	65%	451	0.518	0.008	0.242	0.0018
E	Bulgaria	7914	999	19749	1588	46%	57%	87%	427	0.100	0.004	0.650	0.0034
	Croatia	7150	1131	8803	1434	47%	62%	84%	405	0.144	0.005	0.442	0.0040
	Hungary	7719	1680	10671	1363	49%	58%	86%	402	0.232	0.008	0.403	0.0032
F	Estonia	6099	508	8723	1022	39%	47%	84%	273	0.413	0.003	0.305	0.0033
	Latvia	6785	613	13716	1207	40%	51%	84%	276	0.289	0.003	0.484	0.0042
	Lithuania	6811	654	12192	922	40%	50%	84%	232	0.140	0.004	0.429	0.0034
	Slovak Republic	6264	643	9097	899	44%	52%	84%	308	0.132	0.003	0.399	0.0023
G	Czechia	6222	1067	7651	1540	45%	57%	80%	427	0.277	0.006	0.291	0.0043
	Greece	6748	1291	7207	961	45%	55%	77%	279	0.334	0.005	0.391	0.0021
	Poland	7104	1049	7726	1294	46%	50%	80%	401	0.244	0.002	0.437	0.0029
	Romania	6927	1134	13333	839	46%	54%	82%	260	0.124	0.005	0.525	0.0023
	EU27+2 average	5789	1126	6823	983	42%	48%	75%	317	0.480	0.005	0.320	0.0030
OECD14	Australia	4314	1137	3210	688	39%	37%	66%	247	0.790	0.005	0.199	0.0033
	Canada	4778	1200	3836	1018	42%	42%	67%	481	0.653	0.005	0.169	0.0016
	Chile	3547	914	2963	946	34%	37%	77%	447	0.254	0.004	0.243	0.0018
	Colombia	2753	868	3167	930	28%	37%	74%	317	0.522	0.007	0.248	0.0021
	Costa Rica	3344	794	2860	1227	29%	35%	72%	390	0.621	0.004	0.165	0.0025
	Israel	2930	608	2004	825	36%	46%	68%	286	0.481	0.003	0.161	0.0043
	Japan	6145	1006	4696	1065	39%	34%	69%	398	0.432	0.006	0.266	0.0007
	Korea	4185	806	2929	1609	40%	53%	72%	670	0.513	0.004	0.203	0.0013
	Mexico	2374	703	3246	2372	29%	39%	79%	462	0.405	0.006	0.238	0.0070
	New Zealand	4406	1190	3630	719	39%	42%	70%	282	0.807	0.005	0.221	0.0021
	Switzerland	4184	942	3347	956	42%	48%	71%	422	0.660	0.003	0.234	0.0013
	Türkiye	3518	1218	4915	1181	44%	59%	82%	390	0.352	0.006	0.236	0.0037
	United Kingdom	5369	1812	4097	841	44%	44%	70%	373	0.511	0.005	0.246	0.0009
	United States	4721	2010	5339	1441	45%	47%	74%	598	0.829	0.004	0.235	0.0016
		OECD14 average	4040	1086	3588	1129	37%	43%	72%	411	0.550	0.005	0.220

Note: Heatmap colouring is applied using a green-red scale where dark green indicates more favourable statistics and dark red indicates less favourable statistics for a given indicator. CRD refers to chronic respiratory disease; CVD is cardiovascular disease; T2DM refers to Type 2 Diabetes Mellitus. OECD14 refers to OECD Member Countries that are not part of the EU27+2. Burden here refers to the crude Disability Adjusted Life Years (DALYs) per 100 000 individuals in each country for each of the four NCDs. Prevention refers to the proportion of the NCD attributable to risk factors for cancer, CRD and CVD. For T2DM, prevention refers to the crude incidence rate of T2DM. Management for cancer refers to the cancer survival composite indicator (see [Annex H in the Support Materials](#)); for CVD this refers to the Mortality to Incidence ratio; for CRD and T2DM it refers to the Mortality to preference ratio.

Source: NCD DALY rates are from the Global Burden of Disease Study (GBD) 2021 (Naghavi et al., 2024^[12]). Proportion of NCDs attributable to risk factors is from IHME based on GBD 2021 (Brauer et al., 2024^[26]). For T2DM, non-age standardised incidence rate of T2DM (per 100 000), both sexes, all-ages, 2021 from IHME based on GBD 2021 (Naghavi et al., 2024^[12]). Cancer survival rates are from CONCORD-3 (Allemani et al., 2018^[28]). Mortality, Incidence and Prevalence Rates for the MIR and MPR ratios are from IHME (Naghavi et al., 2024^[12]). Further details on these variables and their respective sources are available in [Annex H in the Support Materials](#).

OECD14 countries face a lower burden of cancer and CVD and a higher T2DM burden

Challenges and priorities for NCDs differ between OECD14 and EU27+2 countries, driven more by differences in prevention efforts and demographics than by variations in NCD management. On average, OECD14 countries have a lower burden of cancer and CVD, partly due to substantially younger populations and more favourable prevention profiles, such as lower tobacco consumption. In contrast, they experience a higher burden of T2DM, driven by higher obesity rates and lower levels of physical activity. Overall, the probability of dying between the ages of 30 and 70 from one of the four NCDs is lower in the OECD14 (8%) than in the EU27+2 (11%), though it remains higher than the lowest-risk clusters in the EU27+2, indicating room for improvement for OECD14 countries. Some key findings are:

- The OECD14 has a significantly younger population than the EU27+2 average and all cluster averages, although some outliers exist. The median age is 37 in the OECD14, compared with 42 in the EU27+2, and 16% of the OECD14 population is aged 65 and older, compared with 20% in the EU27+2 (averages are unweighted). This is reflected in the fact that 9 of the 10 youngest OECD Member States by median age are in the OECD14, while 8 of the 10 oldest OECD countries are in the EU27+2. However, there is considerable heterogeneity among OECD14 countries. For instance, Japan has the oldest population across both groups, with Korea also among the 10 oldest.
- The OECD14 exhibits a lower average burden of cancer and CVDs than even the lowest-burden clusters, and all OECD14 countries, apart from Japan, have lower cancer and CVD burdens than the EU27+2 average, highlighting differing priorities in NCD control. The average proportion of cancer and CVD attributable to risk factors is also lower than the EU27+2 average, while the cancer survival and CVD fatality indicators likewise show more favourable outcomes for the OECD14. This suggests that the lower burden reflects both a substantially younger population (apart from Japan, which has the oldest) and potentially more favourable prevention and management.
- In contrast, the burden of T2DM is higher in the OECD14 compared to the EU27+2, while the burden of CRDs is broadly similar, although with some variation among countries. The average T2DM burden is 1 129 DALYs per 100 000 in the OECD14, compared with 984 in the EU27+2. Mexico stands out, with a burden of 2 372 DALYs, more than double the OECD14 average, while Korea and the United States also substantially exceed the OECD14 average. In contrast, Australia and New Zealand are the only OECD14 countries among the 10 lowest-burden countries across both groups. The incidence of T2DM is also significantly higher than the EU27+2, as are contributory risk factors such as childhood and adult obesity where rates are 14% (vs 9%) and 27% (vs 25%) for childhood and adult obesity respectively, with levels of insufficient physical activity also higher in the OECD14 (36% vs 28%). In terms of management, while the T2DM fatality indicator is lower in the OECD14 than the EU27+2, hospital admission rates are higher, while treatment rates and the use of cholesterol lowering agents and first line antihypertensives among people with T2DM are broadly similar. Overall, this suggests that the higher burden in the OECD14 is likely driven by differences in risk factor exposure rather than differences in management.
- The average burden of CRDs is similar across the EU27+2 and OECD14, however risk factors contribute differently. For example, the proportion of CRDs attributable to risk factors is lower in the OECD14 than the EU27+2 at 43% vs 48%, with a 7-percentage point lower tobacco consumption on average in the OECD14. In contrast, air pollution is on average higher in the OECD14 at 13 $\mu\text{g}/\text{m}^3$ vs 11 $\mu\text{g}/\text{m}^3$ in EU27+2.

Priorities for each of the seven clusters

The cluster exercise revealed several priorities that each cluster may consider (Table 3.3) to bring countries into closer alignment across burden, prevention and management. In this analysis, priorities are based on comparison with other clusters and on observed patterns between risk factors driving NCD burden, reflecting logical associations at a macro level, rather than by absolute risk, burden, or on which interventions are modelled to have the greatest impact. For example, even the best performing cluster for CVD and cancer still has a higher burden than the OECD14 average, so these remain priorities for all clusters. That said, there is some convergence for certain clusters - for example, all countries in cluster E could consider prioritising obesity as a leading priority to reduce premature mortality, based on modelling work by the OECD (OECD, 2026^[1]). In the following paragraphs, each clusters priorities are summarised, with in-depth analysis for each cluster A through to G presented in Annex A through to G respectively (see [Annex A to G in the Support Materials](#)).

Table 3.3. Priorities for each of the seven clusters

Priorities reflect comparisons with other clusters, rather than absolute risk or burden, to bring countries across the EU27+2 into alignment.

Cluster		A	B	C	D	E	F	G
Countries		Austria Finland France Ireland Iceland Luxembourg Norway Sweden	Cyprus Malta Portugal	Germany Italy Slovenia	Belgium Denmark Spain Netherlands	Bulgaria Croatia Hungary	Estonia Lithuania Latvia Slovakia	Czechia Greece Poland Romania
Priority focus	Burden	Generally low: CRD focus	T2DM focus	Cancer	CRDs	All NCDs: CVD focus	CVDs and cancer focus	All NCDs: CVDs, cancer and T2DM focus
	Primary Prevention	Sustain relatively good performance	Obesity and physical activity focus	HPV vaccination, air pollution, childhood obesity and diet focus.	Continue air quality and tobacco progress.	All risk factors would benefit from attention: obesity and tobacco focus.	Tobacco, obesity and alcohol focus.	All risk factors would benefit from attention: obesity and physical activity focus.
	Management priority	Above average in most indicators: Reduce CRD hospitalisations.	Improve acute CVD care; improve uptake of colorectal and cervical screening	Different for each of the three countries	Above average in most indicators	Cancer screening and health system data collection and monitoring	Cancer and CVD management, T2DM tertiary prevention.	Cancer screening; CVD management; health system data collection and monitoring

Source: Authors' analysis of the data.

Countries in Cluster A could focus on sustaining and strengthening their strong primary prevention, given these are central to the cluster's relatively low burden of most major NCDs. Continued investment in healthy-lifestyle promotion, especially maintaining relatively high levels of physical activity, healthy diets and low tobacco use, will help preserve these gains as populations age. Targeted action is most needed

for chronic respiratory diseases, the only area where the burden is not markedly below the EU27+2 average; reducing CRD incidence and hospitalisations could be pursued through enhanced early detection, improved COPD and asthma management, and ongoing reductions in air pollution. Improvements in HPV vaccination coverage could further reduce cancer burden, even though outcomes are already relatively strong.

Countries in Cluster B may consider tackling the drivers of their disproportionately high T2DM burden, with a particular focus on reducing obesity, childhood obesity and insufficient physical activity. Strengthening policies that support healthier diets, active living and weight management would also help curb metabolic risks that contribute to both T2DM and CVDs. Although cancer and CVD outcomes are generally favourable, management of acute cardiovascular events would benefit from further attention, given above-average 30-day mortality for stroke and myocardial infarction. Improving uptake of cervical and colorectal cancer screening could complement already comparatively strong HPV vaccination and relatively high survival rates. For chronic respiratory diseases, primary prevention could be reinforced, especially asthma prevention and early management, and reducing tobacco use.

Countries in Cluster C could focus on relatively high cancer burden, which is strongly influenced by the cluster's older population but can still be mitigated through improved prevention, most notably by increasing HPV vaccination coverage and strengthening colorectal cancer screening to match the relatively strong breast and cervical programmes. Air pollution reduction may also provide an important prevention opportunity, as it contributes significantly to CRD incidence and the proportion of CRDs attributable to risk factors. While CVD and T2DM outcomes are favourable, maintaining strong management systems and further improving nutrition (particularly increasing fruit and vegetable intake) would help preserve relatively low burdens as the population continues to age.

Countries in Cluster D may want to focus on their high burden of chronic respiratory diseases, particularly COPD, which drives both elevated disease burden and relatively high hospital admission rates. Despite notable progress in reducing tobacco use and air pollution, further strengthening of CRD prevention, early detection and management can help bring hospitalisations down. At the same time, the cluster would do well to maintain its relatively strong performance in CVDs and T2DM, preserving gains in physical activity, healthy diets and relatively low obesity levels, which underpin excellent outcomes across these pathways. For cancer, where outcomes are generally favourable, continued improvement in risk factor control and sustained relatively high screening and HPV vaccination rates will help offset the relatively high proportion of cancers attributable to modifiable risks.

Countries in Cluster E may want to focus on strengthening primary prevention, as they face the highest NCD burden and the worst risk-factor profile across all clusters. This can include action to reduce tobacco and alcohol use, reverse rising obesity, and address the sharp deterioration in physical activity, while building on progress in lowering air pollution and improving diets. Given the relatively high burden of cancer, with relatively low survival rates, major improvements in screening, HPV vaccination, early detection and treatment could deliver significant impact. Importantly, Cluster E suffers from substantial gaps in health system data, especially for disease management indicators. Countries could consider whether improvements can be made in data collection, reporting and quality monitoring to better understand performance, target interventions, and track progress over time.

Cluster F faces a relatively high burden of CVDs and elevated burdens of cancer and T2DM, driven largely by modifiable risk factors including relatively high alcohol consumption, rising obesity, and persistently high tobacco use. Although some primary prevention indicators (physical activity, diet, air quality) compare favourably, prevention efforts are needed to address the other key risk factors. This cluster would also benefit from addressing gaps in secondary prevention and treatment, particularly cancer screening, CVD management and acute treatment, and T2DM treatment.

Cluster G may consider population-wide prevention policies to address relatively high levels of air pollution, tobacco and alcohol use, unhealthy diets, physical inactivity and obesity. Obesity and insufficient physical activity are particularly elevated relative to the EU27+2 average. Improving early cancer detection and outcomes through expanded screening coverage and stronger primary prevention, including HPV vaccination, could deliver considerable impact. Acute and chronic CVD outcomes could be improved by enhancing emergency care quality, reducing avoidable hospital admissions and scaling up secondary prevention. Finally, reducing tobacco exposure and improving air quality would be key to preventing future increases in the burden of CRDs.

EU action plans to address NCDs

The stark contrasts in NCD burden and management across the EU27+2 underscores the need for tailored strategies that strengthen primary prevention and improve risk factor control, particularly in high-burden clusters. The EU has started a comprehensive effort to address these challenges through initiatives such as Europe's Beating Cancer Plan (European Commission, 2021^[37]) and the EU Action Plan on Cardiovascular Health (European Commission, 2025^[38]). These strategies place strong emphasis on the promotion of healthier environments and on prevention, including tackling tobacco, harmful alcohol consumption, unhealthy diets, insufficient physical activity and obesity. They also aim to improve early detection and screening and expand vaccination coverage (such as HPV and hepatitis B). In addition, both plans prioritise better disease management by supporting integrated care pathways, improving access to innovative treatments and reducing inequalities in health outcomes across Member States.

The findings from the cluster analysis provide valuable insights to guide prioritisation within these plans (Box 3.1, Box 3.2). By identifying where prevention and management gaps are most pronounced, these results help target interventions where they can have the greatest impact. Clusters with high disease burden and poor risk factor control could be prioritized for prevention, while those with elevated fatality rates and weaker care systems could benefit from stronger management strategies.

Box 3.1. Europe's Beating Cancer Plan

Europe's Beating Cancer Plan (European Commission, 2021^[37]) was launched in 2021 with EUR 4 billion of funding, comprising 10 flagship initiatives and 32 further actions to help address the growing burden of cancer in Europe. It aims to save lives through sustainable cancer prevention, improve early detection of cancer, ensure high standards of quality care, reduce cancer inequalities across the EU and improve the quality of life for cancer patients, survivors and carers. The OECD has played a key role in the plan from the outset, and in recent years has launched *Tackling the impact of Cancer on Health, the Economy and Society* (OECD, 2024^[39]), the second analytical report on *Delivering High Value Cancer Care* (OECD/European Commission, 2026^[40]), and the second round of the EU Country Cancer Profiles (OECD/European Commission, 2025^[41]) among others. This work could help towards achieving the target to reduce cancer inequalities across the EU. With respect to the identified clusters:

- Clusters E, F, G and C all have cancer burdens above the EU27+2 average, listed here from highest to lowest. Cluster E stands to benefit most from action on cancer, across both primary prevention and management. It has the highest cancer burden, poor control of risk factors, lower vaccination rates and the lowest survival rates. Screening rates for colorectal cancer are particularly low across all countries in this cluster, while HPV vaccination coverage is below average, driven largely by Bulgaria. Performance on all other assessed risk factors is also poorer than average.
- Cluster C, by contrast, has above-average survival and screening rates. However, further action on prevention is warranted, as the cluster has a relatively high cancer incidence rate against a backdrop of an older population. It underperforms on certain prevention indicators, with HPV vaccination coverage below the EU27+2 average and air pollution levels above average.
- Clusters F and G could both benefit from improved cancer management, given their lower-than-average survival rates. Cluster G has particularly low screening uptake, while Cluster F records below-average screening for breast and cervical cancer but above-average colorectal cancer screening. Latvia is a notable exception within Cluster F, with colorectal cancer screening rates less than half the EU27+2 average. In terms of primary prevention, Cluster F could prioritise increasing HPV vaccination coverage and addressing obesity, tobacco and alcohol use. In Cluster G, both Poland and Romania have recently introduced HPV vaccination into their national immunisation programmes; monitoring coverage and uptake could therefore be a priority to assess impact in the coming years. Action on obesity, physical activity and air pollution could also be prioritised.

Box 3.2. EU Action Plan on Cardiovascular Health (Safe Hearts Plan)

The EU Safe Hearts Plan was launched in December 2025 and represents the first ever EU approach to tackling CVDs, supported by evidenced provided by the OECD *State of Cardiovascular Health in the EU* (OECD, 2025^[42]). The Safe Hearts Plan is centred on three pillars – prevention, early detection and screening, and treatment and care (including rehabilitation), supported by three cross-cutting themes on digital innovation, research and knowledge, and tackling inequalities (European Commission, 2025^[38]). This work could help towards achieving the target to reduce CVD inequalities across the EU. With respect to the identified clusters:

- Clusters E, G and F all have CVD burdens above the EU27+2 average, listed here from highest to lowest. Cluster E is a particular priority for action, with a burden almost twice the EU27+2 average. Although all countries in this cluster exceed the average, Bulgaria warrants special attention: its CVD burden is almost three times the EU27+2 average and nearly double its combined burden of cancer, CRD and T2DM. In Cluster E, 86% of the CVD burden is attributable to risk factors - the highest proportion of any cluster - reflecting poorer-than-average control across all included risk factors. While the CVD fatality indicator is also above average, assessment of management is constrained by missing data on 30-day MI and stroke mortality, as well as hospital admissions.
- Countries in Cluster G also experience a relatively high CVD burden, driven by both risk factor exposure and management challenges. Primary prevention efforts could focus on obesity, insufficient physical activity and tobacco use. In addition, acute and post-acute care pathways warrant review, given 30-day stroke mortality rates that are approximately twice the EU27+2 average and persistently elevated hospital admissions.
- Cluster F could similarly prioritise reductions in obesity, tobacco and alcohol use, alongside a review of its acute and post-acute pathways, as hospital admissions and 30-day stroke and MI mortality remain above the EU27+2 average.

Even if cancer or CVDs are not the main priority of a cluster, it is important to note that no country should neglect either NCD. Cancer and CVD remain leading causes of death and disability in the EU27+2 and even the clusters with the lowest cancer and CVD burdens exceed the OECD14 average, underscoring the pressing need to address these NCDs in Europe. CVD alone accounted for one-in-three of all deaths in the EU (1.7 million deaths in 2022), affecting an estimated 62 million people (OECD, 2025^[42]). Cancer is equally devastating and carries worrying projections: Europe's ageing population means that cancer cases are set to increase by 30% between 2022 and 2050, even as the population of the EU is projected to decline by 3% over the same period. Cancer specific health expenditure is also set to increase 59% in the EU between 2023 and 2050, and cancer will lower workforce output by EUR 161 PPP per capita per year in the EU over the same period (OECD, 2024^[39]).

4 Discussion

The cluster analysis grouped EU27+2 countries into seven clusters based on their primary prevention, management and burden of cancer, CRDs, CVDs, and T2DM. These clusters can be used by countries and intergovernmental organisations to help guide collaboration action on tackling NCDs. Identifying and working with countries facing similar challenges can help lift the overall standard of health across Europe and ensure that the greatest needs are addressed.

Several mechanisms exist to help EU Member States work together to address aspects of NCD prevention, management and control. These include European Commission technical support instruments (TSIs) (Box 4.1) and Joint Action Projects (Box 4.2). In addition, the OECD has published a range of booklets on best practices across OECD member countries to help facilitate knowledge diffusion and exchange of policies and programmes in NCD prevention, management and control.

Box 4.1. Technical Support Instrument (TSI)

The technical support instrument (TSI) is the EU programme that provides tailor-made technical expertise to EU Member States to design and implement reforms. The support is demand driven and does not require co-financing from Member States. It offers Member States a unique service to help them tackle reform challenges, including for example strategic and legal advice, studies, training, and expert visits on the ground. It can cover any phase of the reform process, from preparation and design to development and implementation of the reforms. It has a budget of EUR 864 million for the period 2021-2027 (in current prices).

Multi-country and multi-regional projects are a priority of the TSI and have risen in recent years from two in TSI 2021, to 21 in TSI 2022 and 34 under TSI 2023. Member states have also demonstrated their interest in strengthening cooperation at the regional level through 10 multi-regional projects (European Commission, 2024^[43]).

TSI provides a unique combination of expertise from the European Commission, EU Member States' national administrations, international organisations and/or the private sector. Reform areas covered include:

- Green transition (including climate action, circular economy and energy transition)
- Digital transition
- Health and long-term care
- Skills, education and training
- Governance and public administration
- Competitiveness
- Financial sector and access to finance
- Revenue administration and public financial management
- Labour market and social protection
- Migration management

EU Member States can request technical support under the TSI Implement resilience-enhancing reforms in the context of EU economic governance; prepare, amend, implement and revise national recovery and resilience plans under the Recovery and Resilience Facility; implement economic adjustment programmes; implement reforms undertaken at their own initiative.

Source: European Commission (2025^[23]).

Box 4.2. EU Joint Actions

Another flagship measure of the EU that can bring countries together in finding solutions to NCD challenges are the Joint Actions. Joint Actions are “collaborative projects that involve several EU and associated countries with the objective to address key EU health policy priorities, for example, by sharing, testing and refining successful tools, methods and approaches” (European Commission, 2023^[24]).

Joint Action Prevent Non-Communicable Diseases (JA PreventNCD) is a Joint Action project aimed at reducing Europe’s cancer and NCD burden through coordinated strategies on health determinants, focusing on effective policies, societal and personal risk factors (JAPreventNCD, 2025^[44]). The project’s goal is to minimise fragmentation and duplication of efforts and to engage national authorities at various levels to enhance the impact of actions taken, with a rigorous evaluation of these actions to assist authorities in prioritising the most effective prevention strategies (JAPreventNCD, 2025^[44]). JACARDI, the Joint Action on Cardiovascular Diseases and Diabetes in Europe, is another joint action which supports European countries in reducing the burden of cardiovascular diseases and diabetes. The project carries out 142 tailor-made pilot projects in public and clinical settings, based on proven practices for the prevention and management of cardiovascular disease and diabetes.

Other Joint Actions working on NCDs include the Joint Action on Tobacco Control, the second Joint Action towards the European Health Data Space and the Joint Action on the transfer of best practices in primary care, among others.

Source : (NFP4Health, 2025^[45]; European Commission, 2023^[24]).

Another benefit of international collaboration is the ability to learn from countries who have successfully implemented policies and programmes that have helped prevent, control or manage NCDs. The OECD helps to facilitate the exchange of leading practices between countries by undertaking thorough evaluations of best practices across OECD and EU27+2 countries. Practices are evaluated using a standard framework co-developed with member countries, based on five criteria: effectiveness, efficiency, equity, evidence-base and extent of coverage.

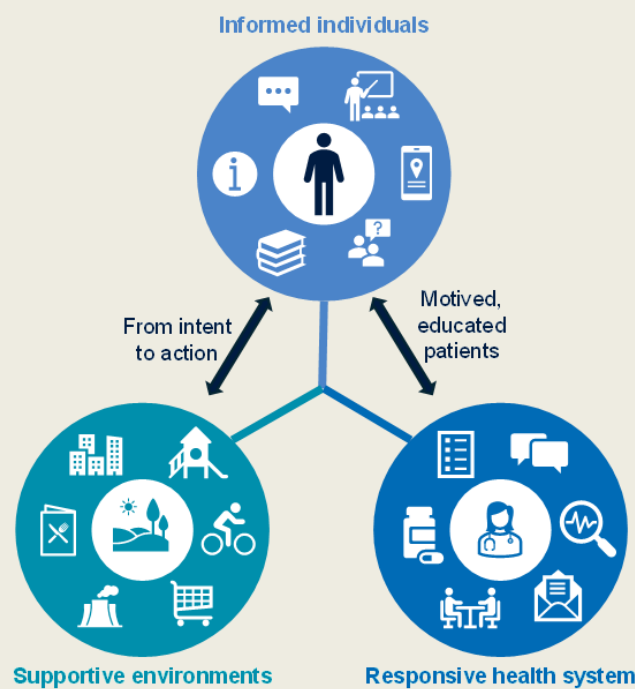
The OECD publishes these evaluations together with cluster analysis to assess transferability to other contexts. There are a range of best practice booklets available that cover prevention and control of NCDs. This includes best practices to promote healthy eating and active lifestyles (OECD, 2022^[20]), integrating care to prevent and manage NCDs (OECD, 2023^[21]) and promoting good mental health in children and young adults (OECD, 2025^[22]) among others (OECD, 2025^[46]). The OECD has also produced a guidebook for policy makers explaining the steps involved in selecting, implementing and evaluating policy actions and interventions to improve public health (OECD, 2022^[47]).

Countries should also consider the three pillars of successful NCD strategies when tackling NCDs (Box 4.3).

Box 4.3. Implementing NCD strategies: The three interconnected pillars

Although the policy mix will differ across countries depending on their specific risk factor profiles and health priorities, there are three interlinked pillars that underpin all successful NCD strategies: empowered individuals, supportive environments, and responsive health systems (Figure 4.1). These three pillars are mutually reinforcing. Empowering individuals with information and education is critical, but its impact is amplified when the surrounding environment makes healthier choices easier, more affordable, and more accessible. At the same time, even the most informed and motivated individuals may need support from a responsive health system to detect problems early and prevent complications. In turn, primary care plays a crucial role in providing individuals with information and education. The most successful strategies to tackle NCDs, whether in prevention or management, should leverage these three core pillars.

Figure 4.1. Three core pillars for successful NCD strategies



Source: The health and economic benefits of tackling non-communicable diseases (OECD, 2026^[1]).

Limitations

Although the clustering process has the advantage of grouping countries based on alignment of NCD burden, primary prevention and management, it is not without limitations. Notably, none of the clustering variables directly capture current policy strategies or health system characteristics. As a result, the clustering provides a snapshot where countries currently stand and does not account for ongoing initiatives to tackle NCDs or the complexities of implementing interventions within specific policy contexts. While many of the countries in each cluster grouping are geographically close and some share health system characteristics, others differ significantly in their primary prevention and NCD management strategies. To help address these limitations, the OECD *Best Practices in Public Health* series undertakes a transferability analysis to help countries understand whether leading practices are transferrable to the local context (OECD, 2022^[47]). Additionally, other OECD publications have examined in greater detail how countries cluster based on health system characteristics and features (OECD/The Health Foundation, 2025^[29]).

Another important consideration of this work is that disease burden and incidence rates are not age standardised. While this is intentional, as it allows countries to be grouped based on actual NCD burden rather than adjusting for age differences, it has important implications for comparability. In particular, it can disadvantage countries with older populations, making those with younger populations appear to perform better in preventing NCDs, when part of this difference may reflect a demographic dividend. For example, Cluster A which has the lowest overall NCD burden is also the youngest cluster, whereas Cluster E, with the highest burden, is the second oldest. However, Cluster C, despite having the oldest population on average, manages to maintain a lower disease burden than many other clusters. Overall, presenting crude rates highlights where the NCD burden is currently highest and where needs are greatest, helping to guide planning efforts. Other publications, such as the *Health at a Glance* series, can help give an indication of performance on age- and sex-standardised indicators, depending on the indicator (OECD/European Commission, 2024^[48]; OECD, 2023^[16]).

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