

ORIGINAL RESEARCH

Noncommunicable diseases 2030: assessing Portugal's progress towards the noncommunicable disease-related target of the Sustainable Developmental Goals

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ABSTRACT

Background: Noncommunicable diseases (NCDs) are the biggest killers worldwide. One of the targets for the United Nations Sustainable Developmental Goal (SDG) 3, SDG target 3.4, is to reduce premature mortality from NCDs by one third by 2030. The object of this study was to determine whether Portugal will be able to achieve this target.

Methods: Data were obtained from the Statistics Portugal online database. Linear and quadratic projections were performed using weighted and non-weighted linear and exponential regression models and confidence intervals.

Results: Projections show that, for premature mortality due to diabetes, Portugal will reach the desired level of reduction a few years ahead of schedule.

For premature mortality due to respiratory diseases, there is a 50% probability that the desired level of reduction will be achieved. However, premature mortality due to cardiovascular diseases is not decreasing at a rate fast enough to be reduced by one third by 2030. Similarly, premature mortality due to malignant tumours is not decreasing fast enough to reach the desired reduction in time.

Conclusions: The trends analysed in this study indicate that Portugal is on track to reach target 3.4 by 2030, but further actions are needed to guarantee that the goal is accomplished.

Keywords: NONCOMMUNICABLE DISEASE, SUSTAINABLE DEVELOPMENTAL GOALS, PORTUGAL

INTRODUCTION

Once considered a set of conditions associated with affluent countries, the noncommunicable disease (NCD) burden is now a global crisis that affects all societies. Cardiovascular diseases, malignant tumours, respiratory diseases and diabetes are the four major NCDs that together top the charts with the highest mortality rates. It is estimated that NCDs account for 70% of deaths worldwide every year (1), which is an astonishing proportion, considering that NCD awareness was only first promoted by WHO in 2005 (2) and NCDs were not included in the Millennium Development Goals.

Since then, NCDs have gained rapid recognition as some of public health's biggest challenges. Within the WHO European Region, approximately 89% of deaths are attributed to NCDs, and one third of these deaths occur prematurely (between the ages of 30 and 69 years) (3). It therefore came as no surprise when, in the 2030 Agenda for Sustainable Development, which was adopted in 2015 by the United Nations and WHO Member States and includes 17 Sustainable Developmental Goals (SDGs) that address a broad range of social, economic and environmental development issues, one of the SDGs addressed the NCD pandemic: the goal of SDG target 3.4 is to reduce premature mortality from NCDs by one third, through

prevention and treatment, by 2030, as well as to promote mental health and well-being.

Portugal is one of the WHO Member States that pledged to meet this target. This study examines Portugal's prospects of accomplishing the goals set out in SDG target 3.4, by analysing its current position with respect to these goals and then projecting future trends that will affect the possibility of achieving them.

In 2017, approximately 86% of deaths in Portugal were from NCDs (4). The shared risk factors for the four major NCDs are as follows:

- harmful consumption of alcohol,
- physical inactivity,
- tobacco use,
- unhealthy eating.

In addition, there are strong socioeconomic differences in the prevalence of these risk factors in Portugal. Thus, in taking steps to reduce premature mortality from NCDs, policy-makers also have the opportunity to tackle the socioeconomic gradient (5).

In Portugal's population, where, in 2014, 20% were smokers, 24% were classified as obese and 34.5% had raised blood pressure – combined with an average consumption per capita of 12.9 L of pure alcohol per year (6) – more progress needs to be made towards reaching the targeted 30% reduction in premature mortality from NCDs. Even though the WHO European Region is the only WHO region on track to reach SDG target 3.4 (3), none of the WHO Member States can achieve the goals outlined in this target through increasing access to treatment alone; greater efforts have to be made to prevent disease and promote health, and these will only be accomplished with the cooperation of all government bodies and society.

Considering that most NCDs can take decades to develop, it is in society's best interest that extensive and effective interventions for disease management be implemented. The Portuguese National Health Plan, revised and extended in 2015 with updated targets and goals for 2020, aims to excel within the European Region by setting four ambitious yet realistically achievable goals (7). The first is to reduce premature mortality to less than 20% of total deaths. This conforms both to SDG target 3.4 and to the NCD global voluntary target set by WHO to reduce overall mortality from the four major NCDs by 25%

by 2025 (8). Other goals presented in the National Health Plan, which are also in harmony with global objectives, are as follows:

- increase healthy life expectancy at 65 years of age by 30%;
- reduce the prevalence of tobacco consumption in the population aged under 15 years of age and eradicate exposure to second-hand smoke;
- control the incidence and prevalence of excess weight and obesity in children, limiting its increase by 2020.

In order to meet SDG target 3.4, Portugal has taken into consideration the WHO-recommended interventions and "best buys" for the prevention and control of NCDs (9), and has implemented a series of preventive measures for disease development and early detection of NCDs, including progress monitoring indicators (3). Alongside the introduction of new legislative and fiscal measures to enforce population-wide prevention, the following national strategies and programmes have been created to target specific diseases and risk factors:

- **The National Programme for Cerebrocardiovascular Diseases 2017** focuses on reducing premature deaths from cerebrocardiovascular diseases and ischaemic heart disease to ≤ 1000 a year, reducing in-hospital mortality from acute myocardial infarction to 7%, increasing the number of primary angioplasty treatments for acute myocardial infarction to 470 per million inhabitants, increasing the number of patients submitted to fibrinolytic or endovascular reperfusion therapy in cerebrovascular accidents to 1800 treatments per year for the next four years and reducing salt consumption in the population by 3–4% per year (10).
- **The National Programme for the Control of Diabetes 2017** intends to reduce the development of diabetes in 30 000 identified high-risk patients, identify and perform early diagnosis of 30 000 new cases of diabetes and reduce by 5% premature mortality due to diabetes by 2020 (11).
- **The National Programme for Health in Schools 2015** aims to promote healthy lifestyles, increase health literacy in the educational community, improve the quality of school atmospheres to minimize health risks, prevent disease in the educational community and reduce the impact of health issues on students' school performance (12).
- **The National Programme for Oncological Diseases 2017** plans to expand coverage of cancer screening tests, including tests for breast cancer, uterine cancer and

colorectal cancer, to the entire population by 2020; reduce the number of oncology surgeries performed that exceed the maximum time for guaranteed response, as defined by the Portuguese National Health Service¹, to below 10% by 2020; and promote the integration of care for breast cancer, uterine cancer and colorectal cancer in primary health care establishments and hospitals (14).

- **The National Programme for the Promotion of Healthy Eating 2017** aims to halt the increase in the number of overweight children, reduce salt use by 10%, reduce sugar use by 10%, reduce the amount of trans fats in food products to a maximum of 2%, increase daily consumption of fruit and vegetables by 5% and increase knowledge of the Mediterranean diet by 20% (15).
- **The National Programme for Respiratory Diseases 2017** plans to increase the number of new asthma diagnoses in primary health care centres by 20%, double the number of chronic obstructive pulmonary disease diagnoses confirmed by spirometry in primary health care centres and reduce by 10% the number of hospitalizations that could have been prevented or treated at primary health care centres, all by 2020 (16).
- **The National Programme for Smoking Prevention and Control 2017** focuses on reducing underage smoking prevalence to below 17%, halting the rise of tobacco consumption in women, eliminating exposure to environmental tobacco smoke and reducing regional disparities in smoking prevalence among adults (17).
- **The National Strategy for the Promotion of Physical Activity, Health and Well-Being 2016–2025** promotes increasing physical activity and reducing sedentary behaviour through advice from health care professionals, partnerships with institutions, and research into possible intervention methods (18); one of its main aims is to promote physical activity across all socioeconomic levels, as the development of more than one chronic condition simultaneously (multimorbidity) has been shown to have an onset 10–15 years earlier among those living in deprived areas than among those living in more affluent ones (5).

Alongside the development of national strategies and programmes, since 2015, several pieces of legislation aimed at reducing the risk factors associated with NCDs have been implemented. New legislations stipulate the following:

- all government institutions' cafeterias and canteens must provide a vegetarian meal option within their menus;
- new tobacco products without combustion (such as e-cigarettes) must have tighter regulations regarding environmental smoke exposure, publicity and promotion;
- free counselling must be provided to anyone desiring to quit smoking;
- anti-tobacco medications must be subsidized by the government when prescribed, and available to all;
- all alcoholic beverage sales and consumption must be restricted to adults over the age of 18.

These measures were created as a response to the observed health needs of the Portuguese population and the projections of how those needs will change by 2025. However, in order to guarantee fulfilment of SDG target 3.4, these projections need to be extended to 2030, to determine whether further action needs to be taken.

METHODOLOGY

The data used for this study were compiled by the Directorate-General of Health with values obtained from the Statistics Portugal online database covering 1990–2014 (19). Mortalities were coded based on the Tenth Revision of the International Classification of Diseases (ICD-10) (20). The following NCD-related codes were used: I00–I99 for circulatory system diseases, C00–C97 for malignant neoplasms, E10–E14 for diabetes and J30–J98 for chronic respiratory diseases.

Linear ($Y = a + bX + \epsilon$) and quadratic ($Y = a + bX + cX^2 + \epsilon$) projections were obtained using weighted and non-weighted linear and exponential regression models and respective confidence intervals. Weights were calculated as inverse to distance in time of data, with additional optimization for the weight to have the shortest possible distance between the two most recent data points and respective projections.

RESULTS

The models show Portugal's current position, what is expected by 2025 and what progress needs to be made in combating the four major NCDs – cardiovascular diseases, malignant tumours, respiratory diseases and diabetes – in

¹ Two months after surgical indication (13).

order to accomplish SDG target 3.4. It is difficult to determine accurately how the projections and trends will develop in the future, as these are dependent on an infinite number of variables. It is possible, however, to create an estimate based on observations made in recent decades, on the assumption that these will continue to progress in a similar way.

PREMATURE MORTALITY FROM CARDIOVASCULAR DISEASES

Cardiovascular diseases are responsible for approximately 30% of deaths every year in Portugal (10). This value was in continuous decline until 2013, leading to a reduction in the probability of dying prematurely from cardiovascular diseases (Fig. 1, see Annex for keys to the regression models). In 2014, however, it had a resurgence, making the evolution of this probability unclear. There is a strong likelihood that the current probability of premature death from cardiovascular diseases will remain constant until 2025. The exponential regression model presents itself as less sensitive to the 2014 value and points to a scenario in which it is plausible that the reduction in probability continues on its trajectory to the desired objective. Overall, the current evidence suggests that, for this particular group of diseases, the desired 25% reduction in premature mortality by 2025 is unlikely to be achieved, but the result will be very close to the objective.

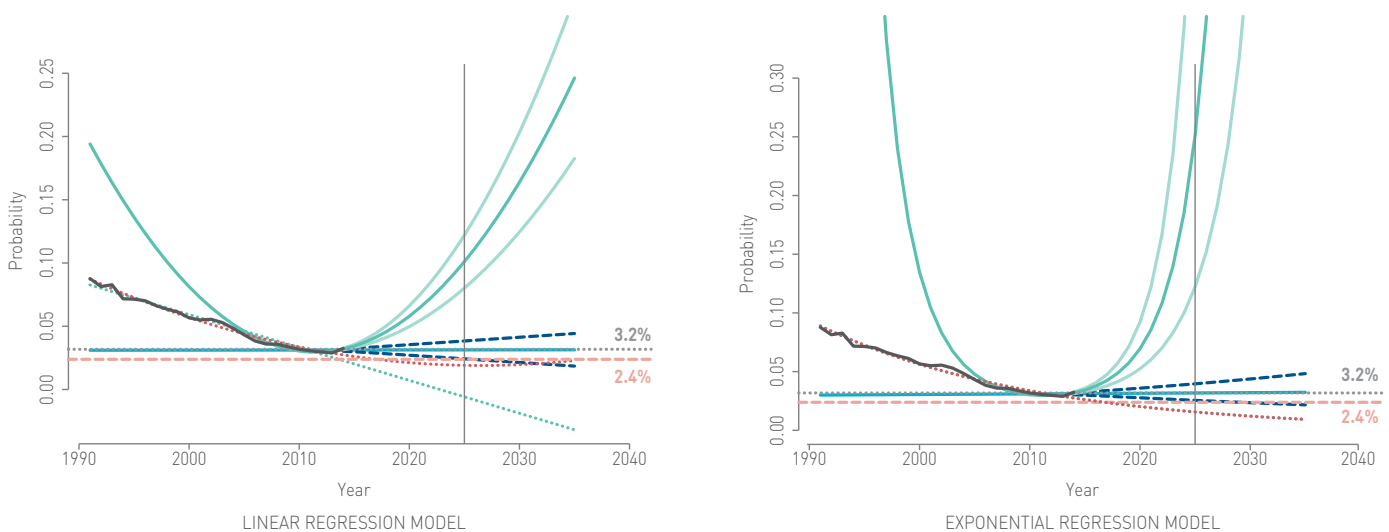
Compared with other Member States in the European Region, Portugal has a low rate of premature mortality from cardiovascular diseases, especially among Member States with similar lifestyles (21). It is interesting to note that, until

2013, Portugal and Austria presented an almost identical decreasing trend in premature mortality from cardiovascular diseases. In 2014 Eurostat identified a peak increase in Portugal, while Austria continued its overall decreasing trend. Also worthy of note is Latvia's continuous decreasing trajectory: in 2011 Latvia had 2726 premature deaths from cardiovascular diseases (180 more than Portugal), but by 2015 Latvia had managed to reduce this to 2280 (605 fewer than Portugal). Nevertheless, however impressive this achievement, it is important to bear in mind that Latvia has a population almost five times smaller than Portugal's and presents almost the same number of premature deaths from cardiovascular diseases (22). Portugal seems to be experiencing a plateau, with an overall slowly decreasing trend, and so would probably benefit from identifying and studying Austria's, Latvia's and other successful European countries' approaches to tackling the issue.

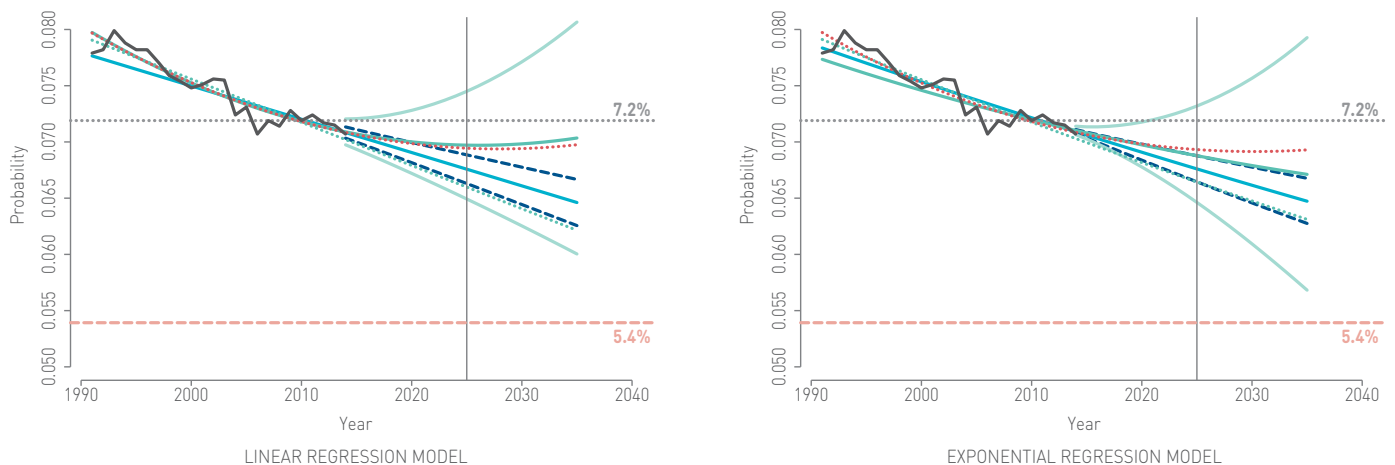
PREMATURE MORTALITY FROM MALIGNANT TUMOURS

The probability of dying due to malignant tumours between the ages of 30 and 69 years in Portugal has been decreasing for decades (Fig. 2). However, in recent years, the rate of decrease has plateaued out, at approximately 7% of all mortality. All projections predict a continuous decrease until 2025, but not at a rate fast enough to reach the desired reduction in premature mortality, so Portugal will most likely fall far short of the goals set out in SDG target 3.4.

FIG. 1. LINEAR AND EXPONENTIAL PROJECTIONS OF THE PROBABILITY OF DYING PREMATURELY FROM CARDIOVASCULAR DISEASES



Note: key in Annex.

FIG. 2. LINEAR AND EXPONENTIAL PROJECTIONS OF THE PROBABILITY OF DYING PREMATURELY FROM MALIGNANT TUMOURS

Note: key in Annex.

This plateau in the rate of decrease has also been observed in other Member States in the European Region (22), making it difficult to identify possible successful strategies to break free from the plateau and reduce the number of premature deaths from malignant tumours. Taking into account population size, Portugal finds itself within the average, with similar values to those presented by Belgium, the Czech Republic and Greece (21). In contrast to most of the other Member States in the European Region, the Czech Republic is one of the few that has managed slowly but consistently to reduce the number of premature deaths from malignant tumours. The annual difference observed is small – a reduction of approximately 360 deaths – but is, nonetheless, important and significant (22). Portugal and the other member states will benefit from analysing and identifying the strategies used by the Czech Republic to combat premature mortality from malignant tumours.

PREMATURE MORTALITY FROM RESPIRATORY DISEASES

As shown in Fig. 3, in Portugal, there has been an overall declining tendency for premature mortality from respiratory diseases, but the tendency exhibits cyclical behaviour. It is expected that this will continue, and projections point to a 50% probability that the reduction in premature mortality necessary to achieve SDG target 3.4 will be achieved within this disease group by 2030.

PREMATURE MORTALITY FROM DIABETES

In Portugal, in 2014, there was an accentuated drop in the probability of dying prematurely from diabetes. The trend in the reduction of premature mortality from diabetes in

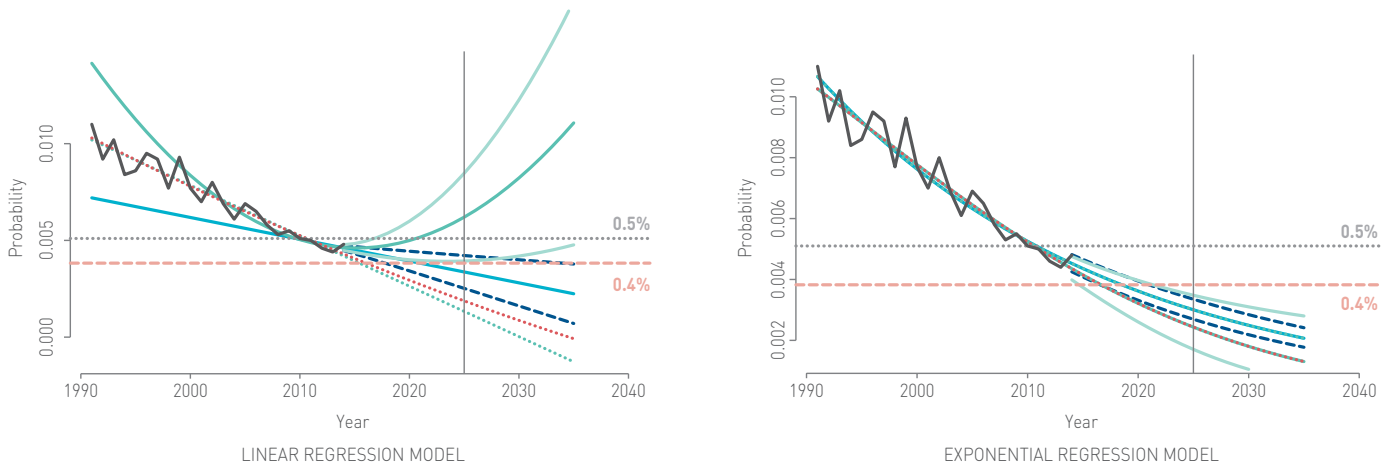
Portugal is very similar to that in the Netherlands and is better than those in other western European countries where there is a similar lifestyle (22). Figure 4 shows the declining tendency overall, which should allow Portugal to position itself very close to the desired goal set out in SDG target 3.4 by 2030. The linear regression model is very optimistic; the exponential regression model is slightly less so but is, nevertheless, still promising. Both projections indicate that the desired reduction in premature mortality from diabetes will be accomplished a few years ahead of schedule.

OVERALL PREMATURE MORTALITY FROM NCDs

Projections for overall premature mortality from the four major NCDs demonstrate a slow and less accentuated declining trend (see Fig. 5). The resurgences observed in 2014 in the cardiovascular and respiratory diseases projections are reflected in these final models. Despite this, all models indicate a downward trend to 2025, but under current conditions it seems that Portugal will fall short of reaching the 25% reduction of NCD-related mortality by 2025 and thus of fulfilling the commitment to reduce it by one third by 2030.

Nonetheless, with over a decade until 2030, it is still possible to plan and align strategies, policies and society in order to accomplish the goals set out in SDG target 3.4 and thereby fulfil the commitment made to the United Nations and to WHO Member States.

FIG. 3. LINEAR AND EXPONENTIAL PROJECTIONS OF THE PROBABILITY OF DYING PREMATURELY FROM RESPIRATORY DISEASES



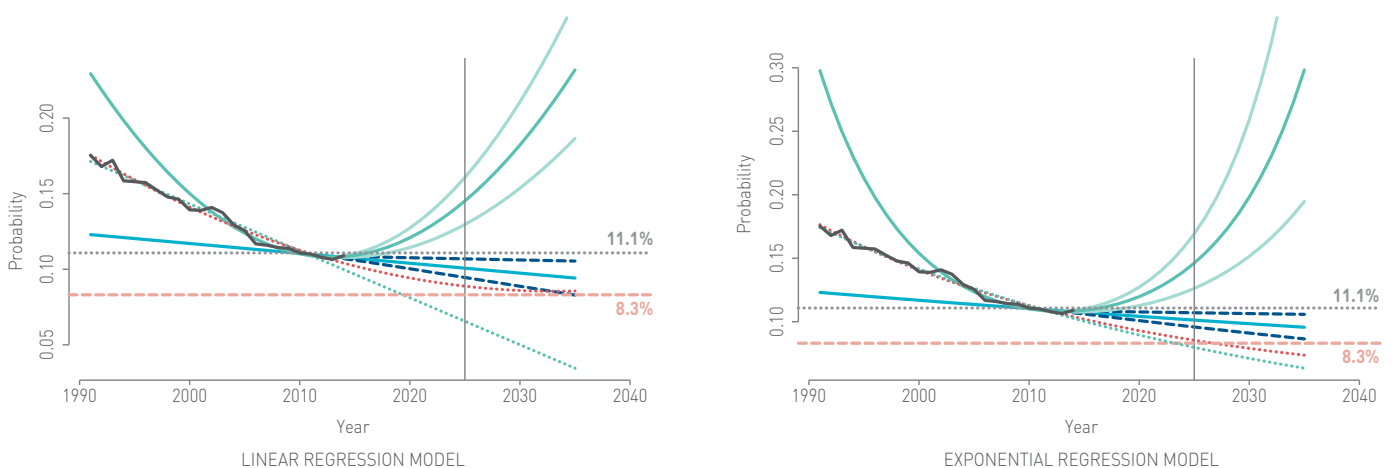
Note: key in Annex.

FIG. 4. LINEAR AND EXPONENTIAL PROJECTIONS OF THE PROBABILITY OF DYING PREMATURELY FROM DIABETES



Note: key in Annex.

FIG. 5. LINEAR AND EXPONENTIAL PROJECTIONS OF THE PROBABILITY OF DYING PREMATURELY FROM THE FOUR MAJOR NCDs



Note: key in Annex.

DISCUSSION

The results of this study show that, even though there is still time before the 2030 deadline set out in SDG target 3.4, additional efforts must still be made in order for Portugal to meet that target. Success in this endeavour will mean not just reaching the agreed goal but, first and foremost, seeing an improvement in the overall health of the Portuguese population. With a more active population making healthier lifestyle choices, the onset of NCDs can be prevented and postponed, insuring longer life and increasing its quality.

The reductions observed in all the projections are due not only to sanitation improvements and advancements in the medical field but also to the continuous efforts of the government to develop national strategies and programmes and implement necessary legislations. Several other initiatives are currently under development to decrease the NCD burden further. For example, as of June 2018, in an attempt to promote healthier eating habits, only food that is classified as healthy for consumption is provided for sale within all government health institutions. A list of excluded food products has been developed, which includes products that contain high levels of fat, sugar and salt (23).

In addition, the Ministry of Health is an important and trusted source of information on health and well-being, for both the general population and authorities. For example, one of the Ministry's campaigns, called "Health in winter", provided an online interactive educational book on how to deal with the cold temperatures; in just three months, it received over 3 million views (24). These efforts are part of a project launched in 2016 called NHS+ Proximity. Its aim is to strengthen the role of the citizen in the Portuguese health system by providing information that allows the general population to make informed decisions based on knowledge (25). Increasing overall health literacy also works towards tackling the socioeconomic differences observed in Portugal. For example, among adults aged 25–74 years, 43.1% of the obese population have only a basic education, while 14.7% have a university degree (5). To manage this problem, Portugal has recently implemented a system called "Integrated assistance process for pre-obesity in adults" to identify, manage and battle pre-obesity in an attempt to prevent progression to obesity and other more severe clinical conditions (26).

To empower the public about risk factors associated with NCDs, the Directorate-General of Health has developed several campaigns, using press releases, short educational videos, radio podcasts and posters. Recent campaigns include "I smoke,

you smoke", to enlighten adults that approximately 80% of tobacco smoke is invisible (addressing the fact that children are exposed to and inhale second-hand smoke) (27), and "Make the right choice, take the stairs", which aims to motivate people to use stairs instead of elevators and escalators (28), as well as "Sugars hidden in food" (29), in which nationally famous actors promote healthy eating in television commercials. In addition, the Ministry of Health has formed a partnership with the four main public television channels, resulting in the channels agreeing to broadcast messages promoting public health throughout the year.

In 2015 a report on the overall health status of the Portuguese population was conducted for the first time: the "Health of the Portuguese population" report, which contained records on various aspects of health for that year. This report will be produced annually, in order to study how different aspects of health evolve within the population (30). The 2021 census will also yield information on the evolution of NCDs. Together, these reports will provide information on the impact of the efforts made in reducing major risk factors for NCDs.

Although the outcome predicted in this study is not ideal, overall, Portugal has remained on a par with most countries located in the western part of the WHO European Region. For example, in 1990 the level of premature mortality from the four major NCDs was less than 30%, and, since then, it has decreased continuously (3).

On the other hand, unlike the case for most of the countries in the northern part of the WHO European Region, in Portugal and other western European countries, the rate of NCD-associated premature mortality is higher in men than in women (3): for example, in Portugal, the probability of dying from the four major NCDs is almost twice as high for men as for women (31). In order to tackle this, Portugal will benefit from studying the strategies that countries in the northern part of the WHO European Region use for NCD prevention and control.

As Portugal is one of the EU countries that have implemented the greatest number of the NCD-related progress monitoring indicators adopted by the United Nations General Assembly in 2017 (3), there is a strong impetus for it to fully achieve the goals outlined in SDG target 3.4 (3). The indicators that have yet to be fully implemented by Portugal are related to tobacco and are under discussion for future implementation. This is an important step considering that, in 2016, over 11 800 deaths in Portugal resulted from tobacco use (17).

In addition, a large proportion of the respiratory diseases in Portugal are due to air pollution, which not only causes respiratory problems but also triggers cardiovascular diseases and cancers. For example, a country profile of Portugal prepared by the European Environment Agency showed that, in 2013, approximately 5170 people died prematurely from NCDs caused by particulate matter (32). The majority of air pollutants found in Portugal come from industrial processes and road transport, making traffic restrictions within the most polluted areas a necessary measure not only for climate change but also for NCD control and prevention. The fact that factors other than lifestyle play a significant role in mortality from NCDs indicates that, in order to reduce the NCD burden, it is not enough to empower the public; national and international organizations and government institutions must work together to address environmental concerns.

CONCLUSION

The trends analysed in this study indicate that, if no further action is taken, Portugal is unlikely to accomplish the goals set out in SDG target 3.4. It must be taken into account, however, that all these projections are subject to continuity of previous conditions, and that the initiatives and efforts recently implemented in Portugal are intended to speed up the reduction. This, in turn, may lead to different results and conclusions from those of the projections.

Taking into consideration the 2025 projections, Portugal needs to analyse how best to tackle the four major NCDs in order to be able to accomplish the goals set out in SDG target 3.4. In an optimistic scenario, projections show it is possible that, by 2025, Portugal can reduce premature mortality from the four major NCDs by 25%. However, in order to meet SDG target 3.4, additional effort is required, from national, international, governmental and nongovernmental organizations. As Portugal is on track to achieve the necessary reduction in premature mortality due to diabetes, future strategies and actions should focus on reducing premature mortality from cardiovascular diseases, malignant tumours and respiratory diseases. If this can be done, it is possible that Portugal will just about manage to achieve SDG target 3.4.

Conflicts of interest: None declared.

Disclaimer: The authors alone are responsible for the views expressed in this publication and they do not necessarily represent the decisions or policies of the World Health Organization.

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ANNEX

KEYS FOR THE LINEAR REGRESSION MODELS (A) AND THE EXPONENTIAL REGRESSION MODELS (B)

(a)	(b)
— Temporal evolution	— Temporal evolution
..... Linear regression Exponential linear regression
..... Quadratic linear regression Exponential quadratic regression
..... Weighted linear regression Weighted linear regression
--- 95% Confidence Interval (CI) of weighted linear regression	--- 95% Confidence Interval (CI) of weighted linear regression
..... Weighted quadratic regression Weighted exponential quadratic regression
--- 95% Confidence Interval (CI) of weighted quadratic regression	--- 95% Confidence Interval (CI) of weighted exponential quadratic regression
..... Baseline (observed value of 2010) Baseline (observed value of 2010)
--- 25 % reduction target