

# Impact of the COVID-19 Pandemic on the Implementation of WHO-Recommended Lifestyle and Preventive Interventions Across Country Income Groups

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## Abstract

**Objective:** In 2019 Noncommunicable Diseases (NCDs) caused 41 million deaths being the main cause of mortality world-wide. WHO has developed NCDs Action Plan to reach UN Sustainable Development Goal (SDG) “by 2030, reduce by one-third, premature mortality from NCDs through prevention and treatment”. As from beginning 2020, the Coronavirus Disease (COVID-19) pandemic has presented a main danger to global health. We decided to analyse whether the COVID-19 could influence WHO lifestyle and NCDs management interventions.

**Methods:** Lifestyle Modification (LM) concerns diet, physical activity, tobacco and alcohol consumption. Assessment of NCDs interventions is based on the presence of the evidence-based guidelines/protocols/standards for management of major NCDs. Drug treatment and counselling components suppose that countries have provision of drug treatment and counselling for eligible people at high risk.

**Results:** No changes of LM during the pandemic. Obvious difference in the implementation level depends on the income level. It decreases from countries with High-income (HIC) to countries with Low-Income (LIC). The pandemic did not worsen implementation of the tobacco reduction measures. They increased during this period. Better implementation is seen in HIC. Management assessment score was growing from 2015 to 2022 in all countries besides Lower-Middle-Income (LMIC). During the pandemic implementation there decreased.

**Conclusion:** It's imperative to accelerate progress of the LM to meet the SDG. New and refocused commitments and capacities at different levels are key to reverse worrying trends in LMIC.

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**Keywords:** Noncommunicable Diseases; Prevention; COVID-19; Socioeconomic Development; WHO

## Introduction

During the period 2000-2019 Global Life Expectancy at birth (GLE) grew from 67 years to 73 years primarily due to better control of many infectious diseases and decline of child and maternal mortality. Visible progress in the prophylaxis and treatment of Noncommunicable Diseases (NCDs) has also played important role in this process [1]. NCDs are major cause of death all over the world and poses disruptive consequences for people and society causing 74% or 41 million deaths in 2019. Four major NCDs Cardiovascular Disease (CVD), cancer, Chronic Respiratory Disease (CRD) and diabetes killed 33.3 million people in 2019. CVD was responsible for 17.9 million deaths, cancer 9.3 million, CRD 4.1 million and diabetes 2.0 million [2]. NCDs prevention and control were principal elements of the WHO NCDs Action Plan and 13<sup>th</sup> General Programme of Work which accomplishment should promote the achievement of the UN Sustainable Development Goal (SDG) 3.4 “by 2030, reduce by one-third, premature mortality from NCDs through prevention and treatment and promote mental health and well-being” [3-7].

Globally over the period of last two decades the total NCDs risk of death has been decreasing demonstrating success achieved during this period. The greatest decrease of mortality caused by three main NCDs during the period from 2000 to 2019 was due to CRD 37% decline in age-standardized rates for all ages together, then by CVD (27%) and cancer (16%). Diabetes mortality nevertheless, a little raised, by 3% during the same time [2]. Risk factors modification and better management of NCDs are significant factors in this process.

Modifiable risk factors, like unhealthy diet, low physical activity, excessive use of alcohol and the tobacco use, increase the risk of NCDs. Tobacco (including second-hand smoke) is responsible for more than 8 million deaths annually. Excessive salt/sodium consumption is responsible for 1.8 million deaths every year. Alcohol accounts for 3 million annual deaths, more than 50% of them are NCDs death including cancer. 830 000 deaths every year are due to low physical activity [8]. A crucial approach to NCDs prevention is decreasing the level of these common and modifiable risk factors [9].

NCDs management interventions along with lifestyle modifications are essential for achieving the SDG target on NCDs. NCDs management includes screening, detection and treatment on NCDs and also provision of access to palliative care for those who require it. Essential NCDs management of high impact can be provided through a Primary Health Care (PHC). This approach allows to improve early detection and prompt treatment. Evidence-based PHC approach is a good investment since, if provided timely to patients, they can diminish the need for more costly therapy [10].

Upon request of governments and other stakeholders WHO developed a low-cost solution called “best buy” for management and lifestyle interventions to facilitate countrywide NCDs prevention and control. These interventions are affordable, feasible, scalable cost-effective in all settings [11]. It's also important monitoring dynamics of the diseases and risk factors to lead WHO priorities and preventive policy [12].

As from early 2020, the pandemic of Coronavirus Disease (COVID-19) has represented a huge danger to health worldwide with the impact on human behaviour and the functioning of all health systems. At his time, exposure to major NCDs behavioural risk factors significantly modified. For instance, lockdowns led to declining of the usual physical activity, plenty of people could not follow healthy diet due to economic insecurity.

Widespread disruption of essential health services has been observed due to pandemic-related social restrictions. Health professionals were placed under tremendous pressure due to high patient caseloads, shortages of staff, medicines, diagnostics, medical equipment and finally with under-resourced health facility infrastructures.

As the impact of COVID-19 pandemic took place at the global scale, it's extremely important to analyse whether the COVID-19 had an impact on the WHO global life style and NCDs management interventions to achieve UN SDG 3.4.

The intention of this study was to investigate changes in the WHO “best buy” lifestyle modification measures and NCDs management assessment during the main pandemic period in WHO Member States with various level of economic development.

## Material and Method

Data were extracted from the WHO NCD Country Capacity Surveys, as published in the NCD Progress Monitors of 2015, 2017, 2020 and 2022.

### *Lifestyle Modification*

NCDs attributable risk factors in our study concern diet, low physical inactivity, excessive use of alcohol and tobacco.

### *Tobacco*

The following Tobacco Demand Reduction Measures (TDRM) according to the WHO Framework Convention on Tobacco Control (FCTC) have been evaluated [13].

1. Reducing of affordability by increasing excise taxes and prices on tobacco products
2. Eliminating of exposure to passives tobacco smoke in all indoor working areas, public transport and public places

3. Implementing of simple/standardized packaging and big graphic health warnings on all tobacco packages
4. Enacting and enforcing complete bans on sponsorship, promotion and advertising of tobacco
5. Implementing of efficient mass media campaigns educating the society regarding the harms of smoking, including secondhand smoke or tobacco use

#### *Excessive Use of Alcohol*

According to the WHO Global Strategy to Reduce the Harmful Use of Alcohol the following measures have been evaluated [14]

1. Enacting and enforcing of limitations of the availability of retailed alcohol by reducing hours of sale
2. Prohibition on advertising through mass media or complete bans
3. Increase of excise taxes on alcoholic beverage

#### *Unhealthy Diet*

To reduce the impact of unhealthy diet the subsequent measures have been implemented by Member States.

1. Adoption of national policies reducing consumption of salt/sodium in the population
2. Adoption of national policies limiting saturated fat and virtually removing trans fatty acids in the food supply [15]

#### *Low Physical Activity*

At least one countrywide public awareness and motivational communication concerning physical activity have been recently implemented, among them low physical activity behavioural modification mass media campaign [16].

#### *Scoring System*

To make a quantitative analysis of LM achievements we gave 2 points to completely accomplished activities, 1 point to partially accomplished and 0 points to not accomplished, do not know or no response answers. For example, if a Member State succeeded to organize at least one national/countrywide campaign on low physical activity, it obtained 2 points. If a Member State encouraged community involvement in local actions aimed at increasing the level of physical activity, it received 1 point. List of five interventions against tobacco use, for instance, could receive ten points in case of their full achievements, six points for harmful alcohol intake, four for unhealthy diet and two points for physical activity increasing. Hundred percent implementation of the lifestyle modification measures could bring the country 22 points. 100% accomplishment of 5 tobacco cessation activities bring 45%, 3 activities against excessive use of alcohol 27%, 2 of healthy diet 18% and 1 activity to increase level of low physical activities 9%.

#### *Assessment of NCDs Management*

NCDs management is based on the existence of the NCDs guidelines focused on people-centred PHC and universal health coverage approach as outlined in the WHO Action Plan [3]. These national guidelines, standards or protocols should be evidence-based, accepted and endorsed by government or appropriate authorities. In case when guidelines exist for four major NCDs and the Member State provides the needed supporting documentation it gains two points as fully achieved activity. When the Member State has guidelines for at least two of the four major NCDs it's considered as partially achieved and gains only one point.

Medical treatment and consulting allowed that countries have supply of medication, including glycemic control and consulting at the PHC level of eligible people at high-risk of heart attacks and strokes. If the consulting was given, this activity was considered fully achieved and Member State gained two points; if partially given, Member State gained one point. Other categories were the following: not gained, not applicable to Member States due to national condition, Member State replied "do not know" to the question of the survey and no response to health facilities consulting. All WHO progress monitor indicators are presented in WHO NCDs Progress Monitor publications [12,17-19]. Cancer management issues (vaccination against human papillomavirus and prevention of cervical cancer) were not analysed because of lack of information regarding this "best buy".

#### *Statistical Analysis*

All statistical analyses were conducted in SPSS version 22.0 (SPSS Inc.). Continuous data were represented as mean  $\pm$  standard deviation and analysed by Student's test. A two-sided statistically significant difference was considered at  $P < 0.05$  level.

## Results

Lifestyle Modification Measurement (LSMM) score and Percentage of Accomplishment (PA) in 2020 and 2022 presented in Table 1.

| countries                                           | High-income<br>HIC<br>n=62            |               | Upper-Middle-<br>income<br>UMIC<br>n=54 |               | Lower-Middle-<br>income<br>LMIC<br>n=49 |              | Low-income<br>LIC<br>n=29 |              |
|-----------------------------------------------------|---------------------------------------|---------------|-----------------------------------------|---------------|-----------------------------------------|--------------|---------------------------|--------------|
|                                                     | 2020                                  | 2022          | 2020                                    | 2022          | 2020                                    | 2022         | 2020                      | 2022         |
| Lifestyle modification<br>measures (score), m       | 12.4 ±<br>3.8                         | 12.1 ±<br>4.1 | 10.4 ±<br>4.3                           | 10.3 ±<br>4.4 | 8.0 ±<br>3.6                            | 8.1 ±<br>3.4 | 6.0 ±<br>3.5              | 6.4 ±<br>3.6 |
|                                                     | HIC/UMIC<br>$t = 2.27$<br>$p < 0.05$  |               | UMIC/LMIC<br>$t = 2.86$<br>$p < 0.01$   |               | LMIC/LIC<br>$t = 2.06$<br>$p < 0.05$    |              |                           |              |
|                                                     | HIC/LMIC<br>$t = 5.62$<br>$p < 0.001$ |               | UMIC/LIC<br>$t = 4.35$<br>$p < 0.001$   |               |                                         |              |                           |              |
|                                                     | HIC/LIC<br>$t = 6.73$<br>$p < 0.001$  |               |                                         |               |                                         |              |                           |              |
| Accomplishment (%)                                  | 56%                                   | 55%           | 47%                                     | 47%           | 36%                                     | 37%          | 27%                       | 29%          |
| Tobacco demand-<br>reduction measures<br>(score), m | 5.6 ±<br>2.2                          | 5.7 ±<br>2.0  | 4.8 ±<br>2.3                            | 5.2 ±<br>2.5  | 4.2 ±<br>2.0                            | 4.5 ±<br>1.7 | 3.0 ±<br>2.5              | 3.5 ±<br>2.6 |
|                                                     | HIC/LMIC<br>$t = 3.42$<br>$p < 0.01$  |               | UMIC/LIC<br>$t = 2.88$<br>$p < 0.01$    |               |                                         |              |                           |              |
|                                                     | HIC/LIC<br>$t = 4.04$<br>$p < 0.001$  |               |                                         |               |                                         |              |                           |              |
| Accomplishment (%)                                  | 56%                                   | 57%           | 48%                                     | 52%           | 42%                                     | 45%          | 30%                       | 35%          |

**Table 1:** Lifestyle modifications measures in countries with different level of economies in 2020 and 2022\*.

We can see no statistically significant changes for LSMM and PA within all groups of countries with different income level during the COVID-19 pandemic. PA decreased from 56% to 55% in HIC did not change in UMIC 47% and slightly increased in LMIC from 36% to 37% and in LIC from 27% to 29%. Obvious difference in the implementation depends on the economic development of the analysed countries. We can see gradual statistically significant decrease of the accomplishment level from HIC to LIC. Higher income countries much better implemented LSMM comparing with the lower income countries both in 2020 and 2022 years. PA in 2020 in HIC was 2.1 time higher than in LIC. In 2022 this difference was 1.9 time, i.e. practically did not change.

COVID- 19 pandemic did not worsen implementation of the TDRM. Like LSMM we can see gradual statistically significant decreasing of the implementation TDRM from HIC to LIC both in 2020 and 2022. However, implementation in 2022 even increased comparatively with 2020 by 1% in HIC by 4% in UMIC, by 3% in LMIC and by 5% in LIC. Distinction of TDRM implementation between Member States is statistically significant depending on their socio-economic status.

Better implementation is seen in higher developed countries. Regarding assessment of the NCDs management approach we analysed Management Assessment Score (MAS) since 2015, a baseline year for the achievement of the SDG 3.4 (Table 2).

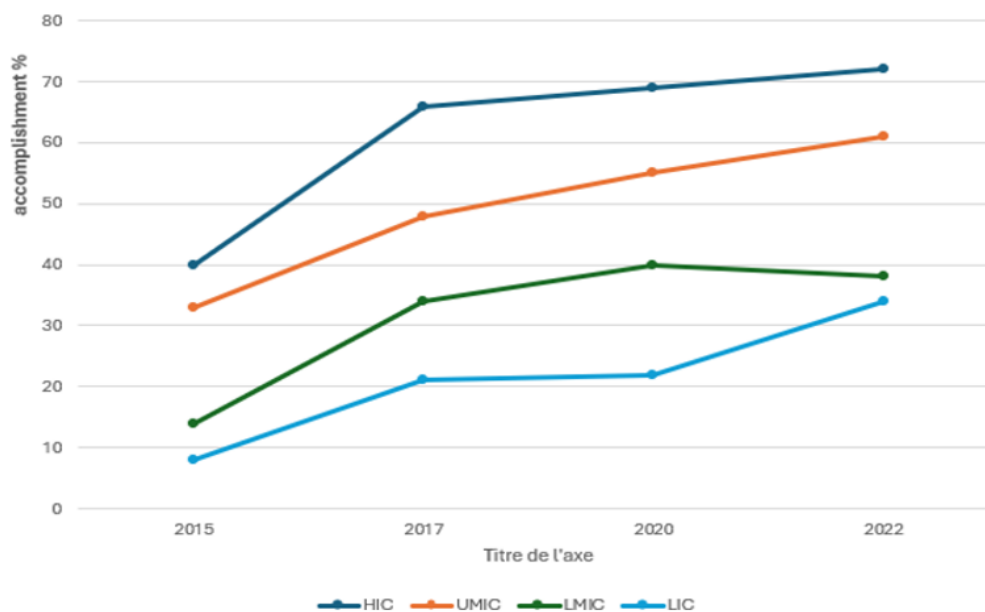
| Counties                              |                             | Years | 2015                                                                    | 2017                | 2020                                     | 2022                |
|---------------------------------------|-----------------------------|-------|-------------------------------------------------------------------------|---------------------|------------------------------------------|---------------------|
| HIC<br>High income countries          | management (score),<br>m±SD |       | 1.62 ± 1.52<br>n=57                                                     | 2.62 ± 1.42<br>n=62 | 2.76 ± 1.31<br>n=62                      | 2.87 ± 1.34<br>n=62 |
|                                       |                             |       | 2015/2017<br>t = 3.72<br>p < 0.01                                       |                     | 2015/2020<br>t = 4.38<br>p < 0.001       |                     |
|                                       |                             |       | 2015/2022<br>t = 4.77<br>p < 0.001                                      |                     |                                          |                     |
|                                       | Accomplishment (%)          | 40%   | 66%                                                                     | 69%                 | 72%                                      |                     |
| UMIC<br>Upper-middle income countries | management (score),<br>m±SD |       | 1.33 ± 1.26<br>n=57                                                     | 1.94 ± 1.34<br>n=54 | 2.19 ± 1.42<br>n=54                      | 2.44 ± 1.33<br>n=54 |
|                                       |                             |       | 2015/2017<br>t = 2.47<br>p < 0.05                                       |                     | 2015/2020<br>t = 3.37<br>p < 0.01        |                     |
|                                       |                             |       | 2015/2022<br>t = 4.51<br>p < 0.001<br>2017/2022<br>t=1.25<br>0,05<p<0.1 |                     |                                          |                     |
|                                       | Accomplishment (%)          | 33%   | 48%                                                                     | 55%                 | 61%                                      |                     |
| LMIC<br>Lower-middle income countries | management (score),<br>m±SD |       | 0.56 ± 0.76<br>n=50                                                     | 1.37 ± 0.97<br>n=42 | 1.58 ± 1.13<br>n=42                      | 1.54 ± 1.09<br>n=42 |
|                                       |                             |       | 2015/2017<br>t = 4.62<br>p < 0.001                                      |                     | 2015/2020<br>t = 5.70<br>p < 0.001       |                     |
|                                       |                             |       | 2015/2022<br>t = 5.60<br>p < 0.001                                      |                     |                                          |                     |
|                                       | Accomplishment (%)          | 14%   | 34%                                                                     | 40%                 | 38%                                      |                     |
| LIC<br>Low income countries           | management (score),<br>m±SD |       | 0.34 ± 0.67<br>n=30                                                     | 0.83 ± 0.93<br>n=22 | 0.90 ± 0.90<br>n=22                      | 1.38 ± 0.99<br>n=22 |
|                                       |                             |       | 2015/2017<br>t = 2.32<br>p < 0.05                                       |                     | 2017/2022<br>t = 1.80<br>0.005 < p < 0.1 |                     |
|                                       |                             |       | 2015/2020<br>t = 2.71<br>p < 0.01                                       |                     | 2020/2022<br>t = 1.24<br>0.05 < p < 0.1  |                     |
|                                       |                             |       | 2015/2022<br>t = 4.71<br>p < 0.001                                      |                     |                                          |                     |
|                                       | Accomplishment (%)          | 8%    | 21%                                                                     | 22%                 | 34%                                      |                     |

**Table 2:** Non communicable diseases management assessment in countries with different level of economies in 2015-2022.

We see gradual statistically significant improvement of the MAS since 2015 to 2022 in all socio-economic groups of countries. Like for LSMM accomplishment level is higher in higher income countries and reach 72% in HIC and 61% in UMIC in 2022

comparatively with 40% and 33% in 2015. Percentage of accomplishment increasing also during the COVID-19 pandemic in HIC from 69% in 2020 to 72% in 2022, in UMIC from 55% to 61% and LIC from 22% to 34%. In LMIC MAS in 2022 is less than in 2020 and percentage of accomplishment decreases from 40% in 2020 to 38% in 2022.

Generally, MAS growing from 2015 to 2022 in all socio-economic groups of countries besides LMIC. Like for the lifestyle modifications lowest accomplishment level is seen in lower income countries. In LIC it reached only 34% in 2022 and in LMIC 38%. The pace of changes in NCDs MAS is presented in Fig. 1.



**Figure 1:** Non-communicable disease management assessment in countries with different level of economies in 2015-2022.

It was well growing from 2015 to 2017 in all countries. It continued growing in HIC, UMIC and LMIC from 2017 to 2020 but slowed down in LIC. However, during the COVID-19 epidemic it visibly increased in LIC. During this period in HIC and UMIC it continues to increase. It decreased only in LMIC.

## Discussion

Since 2000 GLE increased from 66.8 years to 73.1 years in 2019. This steady gain was wiped out within just couple of years after beginning of the COVID-19 pandemic. GLE in 2020 fell by 0.7 years to 72.5 years (back to 2016) and by a further 1.1 years to 71.4 years in 2021 (back to 2012) [4]. Excessive, associated with COVID-19 mortality from 1 January 2020 to 31 December 2021 was assessed as almost 15 million people [1].

In 2000 NCDs caused 59.5% of deaths worldwide, rising to 73.9% in 2019. In the mean time the mortality from infectious diseases declined from 32.2% to 18.2%. Mortality caused by injuries practically unchanged remaining about 8%. Since COVID-19 came as a new infectious disease mortality from communicable diseases jumped back to the level of 2012 (23.0%) in 2020 and further back to the level of 2005 (28.1%) in 2021. At the same time, the proportion of NCDs mortality decreased to 69.9% in 2020 and to 65.3% in 2021 and the mortality from injuries dropped to 7% in both years [20].

We did not observe during the COVID-19 period significant worsening of the accomplishment LSMM. It slightly decreased in HIC, remained at the same level in UMIC and even raised in lower income Member States. In general, COVID-19 pandemic could decrease the pace of implementation of LSMM in particular in higher income countries which have much better percentage of accomplishment comparing with LIC.

At the same time, one of the major components of the lifestyle modification tobacco reduction measures continued improving in all socio-economic groups. The Global NCDs Action Plan 2013-2020 comprises an objective for reduction of the prevalence of smoking and other use of tobacco by 30% in 2025, comparing to 2010 [3,21]. Worldwide at the age of 15 years and older the

prevalence of smoking and tobacco use was estimated as 20.9% in 2022. It decreased relatively by 21% comparing with the 2010 prevalence of 26.4%. In case of existing trends remain, a 25% relative decline in prevalence is expected in 2025. Also, it's short of the 30% reduction objective, positive changes are inspiring since smoking prevalence and tobacco use has been decreasing globally, especially in Africa where majority of countries belong to LIC [22].

It's expected to achieve a 32% reduction in 2025 relative to 2010. It remains the continent with the lowest prevalence of tobacco use [23]. According to our data accomplishment of TDRM in LIC increased by 5% during the COVID-19 period, well corresponding to the above mentioned WHO projection.

Despite reduction in exposure to tobacco use risk exposure remains high, especially for factors such as alcohol consumption or obesity where the prevalence of obesity is moving in the wrong direction with no immediate sign of reversion, for instance, suspension of mass-communication campaigns was seen in 34% of countries [22,24]. Globally, between 1990 and 2022, age-standardized prevalence of obesity among adults aged 18 years and older steadily increased. Prevalence among women was always higher than among men. In 2022, it was 17.9% a 4.3 percentage points higher than among men 13.6% [25].

It's critical to accelerate progress of the lifestyle modifications through coordinated activities of governments, local communities, WHO and other international organizations, to implement the SDG targets by 2030.

Patients with NCDs have enormous risk of exacerbations or death due to COVID-19 [26-29]. For example, diabetics or obese persons are more inclined to hospitalization or death from COVID-19 [26]. Along with the beginning of pandemic, disturbance to essential NCDs services including abolition of optional care, decrease in screening and transfer of staff was reported [27]. Many CRD and coronary heart disease patients were also at greater risk of serious complications [28,29].

As the epidemic began disturbances in critical NCDs services, such as diagnosis and treatment, have been recorded [30-32]. By mid-2021, 70% of Member States observed disorganizations of NCDs-related services. Well over 50% of Member States observed disintegration of hypertension management (58%), screening of cancer (59%) and diabetes-care (62%).

Disturbances in coronary heart diseases emergency services were also extensively reported by 48% of Member States [31]. Changes in the management assessments demonstrated decline in accomplishment during the COVID-19 pandemic only in LMIC. World health statistics 2024 demonstrated tendencies of the risk of death at the age 30-69 years from one of the four major NCDs according to World Bank income group, from 2000 to 2019. While for all income groups we see trends of decreasing mortality, for LMIC it increases [4]. We can assume that for the COVID-19 period this trend has remained and is associated with accomplishments of the NCDs management implementation. Regretfully only for 60 countries good vital registration data during the 2020-2021 are available. Some countries demonstrated reduction of NCDs mortality, while other Member States reported accelerated increase of NCDs premature mortality. Further analysis is needed to exclude overlapping mortality from COVID-19 since NCDs patients are at greater risk of acquiring this infection.

Nevertheless, based on the current information we received LMIC need more attention to achieve SDG 3.4. New and redirected obligations and capacities at national, regional and global levels are crucial to speed up advances and turn back bothering tendencies. For instance, increase of political commitments and investing in better management of NCDs are critical since inequalities in essential health services exist both within countries and between countries. They remain, with deprived people with limited access to health care but greater risk of NCDs and related mortality. According to our assessment accomplishment of NCDs management in LIC was only 8% in 2015 and raised to 34% in 2022. It was 5 time less than in HIC in 2015 (40%) and 2.1 time less in 2022 34% and 72%. Despite visible improvement it remains still low to successfully achieve SDG 3.4 by the year 2030.

## Conclusion

To match the SDG and adequately react to the challenges, it's critical to increase efforts and speed up progress. Based on the experience received global, regional and national priorities should be set and interventions should be targeted to further postpone NCDs deaths increasing equitable access to essential health services. It is critical to have timely, reliable and disaggregated data, estimates and forecasts to inform policy and guide actions at all levels in order to monitor interventions and maximize health gains.

### Conflict of Interest

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### Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

### Ethical Statement

The project did not meet the definition of human subject research under the preview of the IRB according to federal regulations and therefore was exempt.

### Informed Consent Statement

Informed consent was obtained from all participants included in the study.

### Authors' Contributions

All authors contributed equally to this paper.

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