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Original Article

Assessing the characteristics of 110 low- and middle-income countries' noncommunicable disease national action plans

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ABSTRACT

Noncommunicable diseases (NCDs) are a leading contributor to preventable mortality and impoverishment in low- and middle-income countries (LMICs). To support countries in developing holistic and integrated NCD plans, the World Health Organization (WHO) has produced get rid of this a NCD Multisectoral Action Plan (MSAP) guidance. To date, over 160 countries have produced MSAPs and uploaded them to the WHO's NCD document repository. We examined the content and comprehensiveness of the MSAPs uploaded by all 110 LMICs, with reference to the WHO guidance. Overall, the MSAPs included 71% of the elements recommended by the WHO, however, there was a tendency to present situational analyses and recommended actions without providing costings or an overall funding plan. We found no correlation between MSAP comprehensiveness (alignment with the WHO guidance) and policy implementation. There were no significant differences in MSAP alignment by region or income group. Countries with higher universal health coverage indices had lower MSAP alignment score. We concluded that the existence of a comprehensive MSAP is not enough to guarantee policy implementation, and that the WHO should focus its support on helping countries to translate plans and policies into concrete actions to address NCDs.

Keywords: Global health, noncommunicable diseases, policy analysis

Summary

Noncommunicable diseases (NCDs) are a leading contributor to preventable mortality and impoverishment in low- and middle-income countries (LMICs). To support countries in developing holistic and integrated NCD plans, the World Health Organization (WHO) has produced aberrant NCD Multisectoral Action Plan (MSAP) guidance. To date, over 160 countries have produced MSAPs and uploaded them to the WHO's NCD document repository. We examined the content and comprehensiveness of the MSAPs uploaded by all 110 LMICs, with reference to the WHO guidance. Overall, the MSAPs included 71% of the elements recommended by the WHO, however, there was a tendency to present situational analyses and recommended actions without providing costings or an overall funding plan. We found no correlation between MSAP comprehensiveness (alignment with the WHO guidance) and policy implementation. There were no significant differences in MSAP alignment by region or income group. Countries with higher universal health

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coverage (UHC) indices had lower MSAP alignment score. We concluded that the existence of a comprehensive MSAP is not enough to guarantee policy implementation, and that the WHO should focus its support on helping countries to translate plans and policies into concrete actions to address NCDs.

Background

Globally, NCDs are responsible for 63% of disability-adjusted life years and 71% of all deaths. Both of these proportions are rising over time.[1-5] Whereas the proportion of deaths caused by NCDs is high but relatively stable in high-income countries at >80% of all deaths, the proportion has been rising quickly in LMICs, albeit starting from a low baseline.[5] Findings from Ethiopia, India, Kenya, and Nepal suggest that NCDs are the leading cause of impoverishing out-of-pocket health expenditure.[6]

The WHO has committed to support Member States in tackling NCDs via the 2030 Agenda for Action and the 13th General Programme of Work.[7,8] The organization already provides technical assistance using policy dialog platforms, technical packages, practical tools, analysis work, and NCDs emergency kits.[9,10] Acknowledging that strong MSAPs are an important element for national NCD responses, the WHO has also produced an MSAP toolkit that is based on a multifaceted NCD planning logic model considering the inputs, processes, and outcomes required to integrate effective policies and deliver high-quality NCD services.

The WHO recommends that each country's MSAP covers five main areas: assessment, engagement, strategic agenda setting, implementation, and monitoring and evaluation (M and E), as well as aligning with the WHO NCD Global Action Plan and the menu of unanimously adopted NCD policy options and interventions (including the "Best Buys").[11,12] The guidance follows the classic "4 × 4" conceptualization of NCDs which focuses on cancer, diabetes, cardiovascular diseases and chronic respiratory diseases, and the four major risk factors: tobacco, alcohol, unhealthy diet, and physical inactivity.

Over 160 countries have produced national NCD MSAPs and uploaded them to the WHO online NCD document repository, including 80% of all LMICs. The aim of this study was to assess the content of all LMIC plans and their alignment with the WHO guidance, highlighting policy areas that are absent from NCD plans, and identifying countries that may need additional support in developing strong plans and tackling NCDs. Traditional proxies used to direct technical NCD support include gross domestic product (GDP), UHC indices, and the underlying risk of premature NCD mortality.[13,14] We sought to assess the extent to which these markers correlated with MSAP alignment. We hypothesized that countries with weakly aligned MSAPs would not necessarily be resource-constrained countries, nor those with developing health systems or the highest NCD burden. Finally, we aimed to test whether MSAP alignment correlated with implementation of the NCD policies listed in the Global Action Plan.

Study Data and Methods

Study design and data sources

We conducted a systematic document analysis of publicly available MSAPs. To date, 110 LMICs have uploaded documents labeled "integrated NCD policies" within the "NCD policies, strategies, and action plans" section of the WHO online NCD document repository.[15] We used the official WHO "MSAP Checklist and Guidance" to develop our data extraction checklist.[16]

Development of the data extraction checklist

We used a three-stage approach to develop a robust extraction form. In Stage 1, the core content areas in the WHO guidance were mapped by the authors. These researchers then developed a pilot extraction form with 43 items [Appendix 1] and a codebook to define each item, detail the scoring criteria, and reference the appropriate WHO source.

This initial form was piloted on one non-English language MSAP by seven different researchers, who then met to debrief on initial inter-rater agreement and the degree to which the pilot form adequately captured the core domains presented in the WHO documents. One item was dropped ("Does the MSAP provide global key process indicators?") on the basis that it was poorly defined; two additional items were added; and one item was redefined to bring additional clarity, producing a modified extraction form of 44 items [Appendix 1]. A non-English language MSAP was selected in order to test the feasibility of using online translation software (Google Translate) for non-English MSAPs.[17] All reviewers agreed that the translation performed well but that a greater range of languages should be tested before settling on this particular software.

In Stage 2, pairs of researchers independently used the modified extraction form to extract data from

two non-English language MSAPS from each of the six WHO world regions. Reviewer dyads met to discuss any discrepancies before the wider research group met to discuss their experiences with the modified extraction form. Inter-reviewer agreement was calculated for each item using Cohen's kappa. The items with the lowest level of agreement were discussed further, in order to tighten the codebook definitions.

At this stage, six items were dropped from the modified extraction form as the researchers felt that they did not capture core content. Eight items that were felt to overlap were condensed into three new items. Appendix 1 summarizes these amendments. All reviewers agreed that Google Translate performed sufficiently well for the purposes of assessing the presence or absence of our predefined MSAP components of interest, and to continue using it for non-English MSAPs.

The final data extraction form had 31 items, split into five domains that mirror the WHO template: Assessment, Engagement, Strategic Agenda, Implementation, and M&E. In the third stage, any queries or ambiguities that arose from reviewing the remaining MSAPs were raised with the entire research team at regular meetings in order to refine the codebook and ensure a consistent approach.

Multisectoral action plan evaluation

Dual independent review was used to extract data from each MSAP. The final version of the checklist was used to re-extract data from the 13 MSAPs already assessed in the pilot stages. All MSAPs were divided into ten deciles using computer randomization. The wider team met after each decile had been completed to discuss coding issues and to calculate inter-rater agreement. Once the *a priori* Cohen's kappa threshold >0.75 was exceeded ("excellent agreement"),[18] the research team completed the remainder of the MSAPs using single review. Any uncertainties, for instance from poor translation or ambiguity, were raised with the corresponding author and discussed at the regular team meetings. Final decisions were made by group consensus. Reviewers recorded all queries, comments, and ambiguities on the shared data extraction spreadsheet, available here.

We used descriptive statistics to summarize the core characteristics of the MSAPs, including languages, dates, and overall alignment with the WHO guidance, assessed by awarding 1 point for each item in our 31-item checklist. These country-level scores should be viewed purely as assessing alignment with the WHO recommendations. It is recognized that MSAP alignment scores do not necessarily reflect MSAP quality or integrity.

We used the most recent document if multiple MSAPs had been uploaded for different years, and when the year designation in the document file title contradicted the year designation stated in the document text, we used the year presented in the document text. Where two or more documents were provided that covered the same year, we treated the collection of uploaded documents as one unified MSAP. If a MSAP did not specify an action but pointed to another document, for example, "For salt reduction targets see the national diet strategy 2015–2025," we only awarded a point if that additional document had been uploaded to the WHO repository under the MSAP designation.

Analytical approaches

During the data extraction pilot phase, the research team noted that a number of policy documents did not seem to be MSAPs: either they referenced other documents (not uploaded in the WHO repository) that appeared to be the national MSAP, or they were broader strategic health sector plans, implying that there was no specific NCD MSAP for the given country. The scores derived from these documents are likely to underestimate the true level of alignment. To negate any artifact error, we removed these countries from the main analysis but included them in a sensitivity analysis.

We used descriptive statistics to assess the prevalence of recommended MSAP components and produced a heat map to visualize the overall alignment of each MSAP with the WHO recommendations.

We used analysis of variance testing to examine whether mean MSAP alignment scores differed significantly between the six WHO world regions and across World Bank income groups. If ANOVA suggested a statistically significant mean difference between the groups, we then used Tukey's multiple pairwise comparisons (Honest Significant Differences).

We assessed the correlation between MSAP score and traditional indices used to target support: GDP per capita, UHC index, and risk of premature NCD mortality. We hypothesized that countries with weaker economies and health systems or a high risk of premature mortality (traditional recipients of the WHO support) would not necessarily have the least well-aligned MSAPs as minimal resources are required to develop a well-aligned

document. We obtained the GDP per capita data from the 2017 Global Burden of Disease covariates and 2015 UHC service coverage index data from the WHO Global Health Observatory.[4,18,19] Risk of premature mortality data was obtained from the WHO Global Health Observatory.[18] We assessed normality using QQ plots and Shapiro–Wilk normality tests, and used Pearson or Spearman correlation depending on whether the data were normally distributed.

Finally, we assessed whether MSAP alignment scores were associated with implementation of the WHO-backed NCD policies. We used 2019 policy implementation data presented in the 2020 WHO NCD Progress Monitor Report.[20] This document reports the country-level implementation status of 19 policies from the WHO NCD Global Action Plan – the same document that informed the development of the WHO MSAP guidance. Allen *et al*. have previously produced overall policy implementation scores for each LMIC that we used to assess the correlation with MSAP alignment scores.[21] Using Spearman and Pearson correlation, we performed two analyses: one assessing all MSAPs published prior to 2019, and a second on all MSAPs published ≤2015.

Sensitivity analyses

We re-ran all analyses on the full set of 110 documents uploaded to the WHO repository with the MSAP designation, even if the documents themselves did not purport to be MSAPs. To test whether the translation software may have artificially raised or lowered MSAP alignment scores, we used a two-sided *t*-test to determine if there were statistically significant differences between the mean scores of English and translated MSAPs. All statistical analyses were performed on R 4.0.3, and all tests of statistical significance were assessed using an alpha level of 0.05.[22]

Ethics and funding

Ethical approval was not required for this study. The research was fully funded by the Government of the Republic of Korea through the WHO.

Study Results

A total of 110 LMICs uploaded MSAP documents to the WHO NCD repository that they designated as "multisectoral action plans." The included MSAPs had a mean start date of 2015, with a date range of 2002–2019. Overall, 12 countries had MSAPs comprising multiple documents. Sixteen countries had uploaded MSAP documents from more than one year.

Sixty of the MSAPs were written in English (54.5%), 20 in French (18.0%), 11 in Spanish (10.0%), 6 in Russian (5.5%), 2 in Portuguese (1.8%), and 11 other national languages were used for the remaining 11 MSAPs.

The mean alignment score was 68.8% (21.3/31.0 items; range: 4.0 to 31.0; standard deviation [SD] =5.7), and there was a left skew to the distribution [Figure 1].

During review, we found that 15 countries had uploaded documents that did not purport to be MSAPs, or had other issues that may have led to systematic underestimation of the national alignment score. For example, El Salvador only uploaded the implementation plan component of their MSAP. These 15 documents were excluded from the subsequent analyses. A full country list and rationale for exclusion is provided in Appendixes 2 and 3.

After removing the 15 non-MSAP documents, the mean alignment score for the remaining 95 MSAPs rose from 68.7% to 71.0% (range: 12.9% to 100.0%). The score distribution retained a left skew (Shapiro–Wilk normality test: $P < 0.001$).

Over 90% of plans included the following six WHO-recommended items: NCD morbidity and mortality data, risk factor data, goals and targets, and actions targeting surveillance and the strengthening of governance and health systems. The least widely included elements were background economic indicators, actions targeting palliative care and chronic respiratory diseases, costs for key actions, and funding plans [Figure 2].

Mean alignment was highest in lower-middle income countries (LMICs) (mean = 23.9), and ANOVA suggested

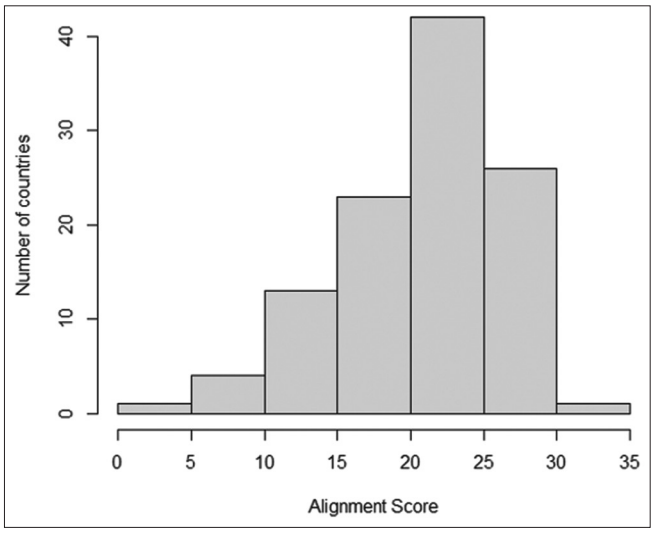

Figure 1: Histogram of MSAP alignment scores across 110 MSAPs

that alignment score differed significantly between the income groups ($P = 0.040$) [Figure 3]. However, Tukey's Honest Significant Difference testing suggested that there were no significant pairwise differences between lower-middle versus low-income countries ($P = 0.075$), nor lower-middle versus upper-middle-income countries ($P = 0.076$).

Mean alignment score was highest in the Eastern Mediterranean and African regions, with approximately three-quarters of the items included in these countries' MSAPs [Figure 4]. The 15 European LMICs had the lowest alignment, with a third of the WHO-recommended items absent [Figure 5]; however, differences between the WHO regions were not statistically significant.

While inclusion of some items was low across the board, such as costings, there was marked regional variation in other areas. For instance, all Eastern Mediterranean MSAPs set goals and targets that were based on a situational analysis and aligned with the Global Action Plan. South East Asian MSAPs tended not to include actions that specifically targeted the prevention and management of named disease groups, and two-thirds of European MSAPs did not include M and E indicators [Figure 5].

Traditional markers that are used to direct financial and technical support correlated poorly with MSAP alignment scores [Table 1 and Figure 6]. All three indices exhibited weak negative associations; however, only UHC index achieved statistical significance at the 0.05 level (rho = −0.25, $P = 0.016$)

Furthermore, alignment score was not associated with NCD policy implementation, irrespective of whether the MSAPs were published pre-2019 or ≤2015.

Sensitivity analyses

When we included all 110 documents uploaded to the WHO repository, the *P* values for all correlation

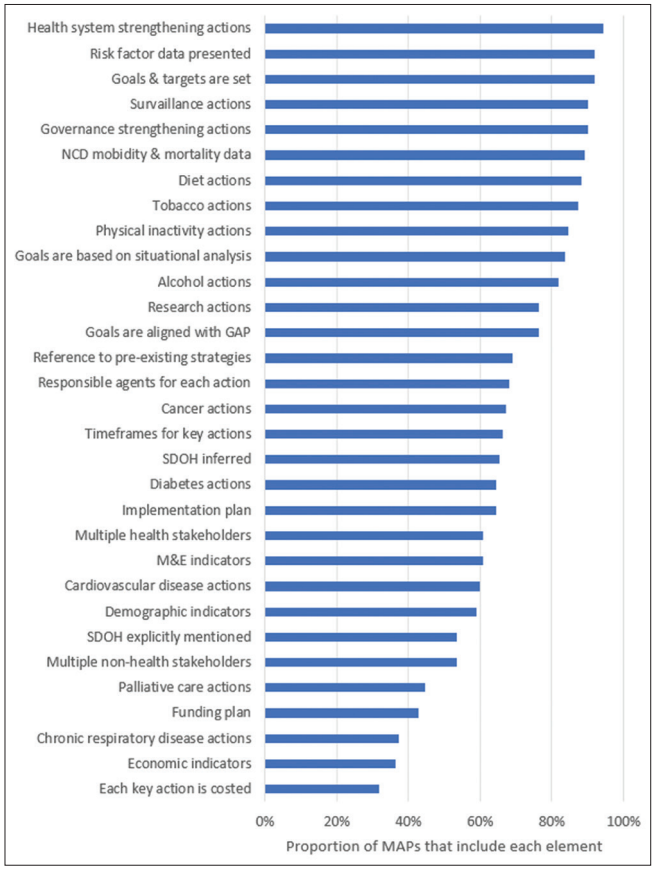

Figure 2: Prevalence of each of the 31 WHO-recommended items among 95 MSAPs. SDOH: Social determinants of health

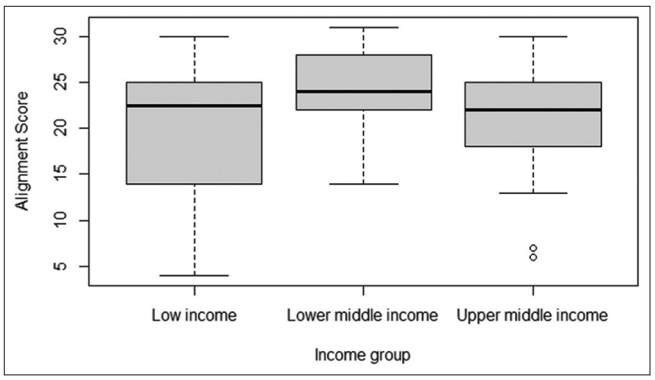

Figure 3: Alignment scores by income group

Table 1: Correlation values of country characteristics versus multisectoral action plan score

	All 110 documents		95 MSAPs		Data availability
	rho	*P*	rho	*P*	
GDP/capita	−0.127	0.195	−0.089	0.403	No data for Cook Islands, Nauru, Niue, Micronesia
UHC index	−0.287	0.003	−0.252	0.016	No data for Cook Islands, Nauru, Niue, Marshall Islands
Risk of premature NCD mortality	−0.066	0.500	−0.0901	0.385	No data for Cook Islands, Nauru, Niue, Marshall Islands
NCD policy implementation (<2019)	−0.109†	0.275	0.03††	0.783	101 countries included† 87 countries included††
NCD policy implementation (≤2015)	−0.018†	0.891	−0.056††	0.686	63 countries included† 55 countries included††

MSAPs - Multisectoral action plans, GDP - Gross domestic product, UHC - Universal Health Coverage, NCD - Noncommunicable diseases

coefficients generally improved, but GDP per capita, risk of premature mortality, and NCD policy implementation all remained statistically nonsignificant at the 0.05 α level α [Table 1].

The mean alignment score for MSAPs written in English was 22.2 and the mean score for non-English MSAPs was 21.6. The mean difference value was 0.8 (95% confidence interval: −1.6–2.9; $P = 0.590$) [Figure 7].

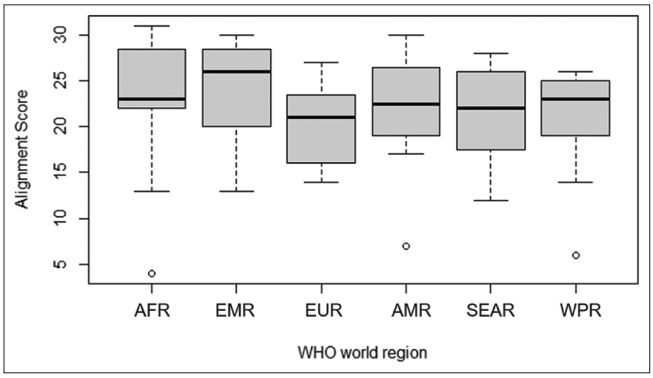

Figure 4: Alignment score by WHO region. AFR - African region, EMR - Eastern Mediterranean region, AMR - American region, SEAR - South East Asian region, WPR - Western Pacific region

Post hoc analysis

Given that MSAP alignment score was not associated with policy implementation, we identified countries with poorly aligned MSAPs and low levels of policy implementation. Five countries had MSAP alignment scores <1 SD below the mean (<16.5) and policy implementation scores <1 SD below the mean (<5.1) [Table 2].

Discussion

Main findings

To date, 110 LMIC documents have been uploaded to the WHO NCD data repository, of which 95 purport to be MSAPs. Among this subset, 71% of the WHO-recommended elements were present in the documents. There was no significant regional variation, and MSAP alignment scores were not correlated with GDP per capita, income group, or risk of premature NCD mortality. There was a weak negative correlation between UHC index and MSAP alignment, suggesting that countries with the least developed health systems may have followed the WHO guidance more closely when developing their MSAPs.

Assessment		Africa (26)	Eastern Med (8)	Europe (15)	Americas (16)	South East Asia (11)	West Pacific (18)	Mean
Situational analysis	NCD mobidity & mortality data	0.889	1.000	0.867	0.938	1.000	0.889	91.6%
	Risk factor data	1.000	1.000	0.800	0.938	1.000	0.944	94.7%
	Demographic indicators	0.852	0.625	0.533	0.563	0.545	0.389	61.1%
	Economic indicators	0.630	0.375	0.267	0.500	0.182	0.056	36.8%
	SDOH explicitly mentioned	0.556	0.875	0.467	0.750	0.545	0.333	55.8%
	SDOH inferred	0.778	0.875	0.467	0.813	0.636	0.389	65.3%
MAP references pre-existing national strategies		0.778	0.625	0.667	0.625	0.727	0.667	69.5%
Engagement								
MAP development	Multiple health stakeholders	0.704	0.625	0.400	0.750	0.545	0.611	62.1%
	Multiple non-health stakeholders	0.519	0.500	0.267	0.688	0.545	0.722	54.7%
Strategic agenda								
Goals & targets	Goals & targets are set	0.926	1.000	0.867	0.875	1.000	1.000	93.7%
	Goals are based on situational analysis	0.926	1.000	0.800	0.813	0.818	0.944	88.4%
	Goals are aligned with GAP	0.815	1.000	0.600	0.688	1.000	0.722	77.9%
Actions	Strengthening governance	0.963	1.000	0.867	0.938	0.909	0.889	92.6%
	Tobacco	0.815	0.750	0.933	0.938	1.000	0.889	88.4%
	Alcohol	0.815	0.625	0.800	0.875	1.000	0.944	85.3%
	Diet	0.852	0.875	0.933	0.938	1.000	0.833	89.5%
	Physical inactivity	0.741	0.875	1.000	0.813	0.909	0.889	85.3%
	Cardiovascular disease	0.667	0.875	0.733	0.563	0.273	0.722	64.2%
	Diabetes	0.667	0.875	0.667	0.563	0.455	0.722	65.3%
	Cancer_actions	0.741	0.875	0.867	0.563	0.455	0.722	70.5%
	Chronic respiratory disease	0.481	0.625	0.400	0.375	0.273	0.278	40.0%
	Palliative care	0.481	0.625	0.333	0.563	0.273	0.611	48.4%
	Health system strengthening	1.000	1.000	1.000	1.000	1.000	0.889	97.9%
	Survaillance	0.926	1.000	0.733	0.938	1.000	0.944	91.6%
	Research	0.889	1.000	0.667	0.813	0.727	0.556	76.8%
Implementation								
Key actions are listed with	Timeframes	0.815	0.500	0.800	0.500	0.727	0.722	70.5%
	Costs	0.593	0.125	0.267	0.188	0.182	0.389	34.7%
	Responsible agents	0.704	0.625	0.733	0.688	0.909	0.778	73.7%
Funding plan		0.481	0.750	0.467	0.313	0.364	0.333	43.2%
Implementation plan		0.704	0.625	0.400	0.688	0.727	0.722	65.3%
M&E								
M&E indicators		0.667	0.875	0.333	0.688	0.545	0.722	63.2%
	Mean	75.4%	77.4%	64.3%	70.6%	68.6%	68.5%	

Figure 5: Heat map showing alignment scores for each WHO region

Table 2: Countries with low multisectoral action plan alignment and policy implementation scores

Countries with low MSAP alignment scores	Countries with low NCD policy implementation scores	Countries with low MSAP alignment and policy implementation scores
Afghanistan	Central African Republic	Central African Republic
Belarus	Comoros	DPR of Korea
Cambodia	Congo	Mali
Central African Republic	Côte d'Ivoire	Marshall Islands
China	DPR of Korea	Sierra Leone
DPR of Korea	Eritrea	
Kyrgyzstan	Grenada	
Mali	Guinea	
Marshall Islands	Lesotho	
Peru	Liberia	
Russian Federation	Mali	
Sierra Leone	Marshall Islands	
Thailand	Mozambique	
Turkey	Nigeria	
Ukraine	Niue	
	Sierra Leone	
	Zambia	

MSAP - Multisectoral action plan, NCD - Noncommunicable diseases

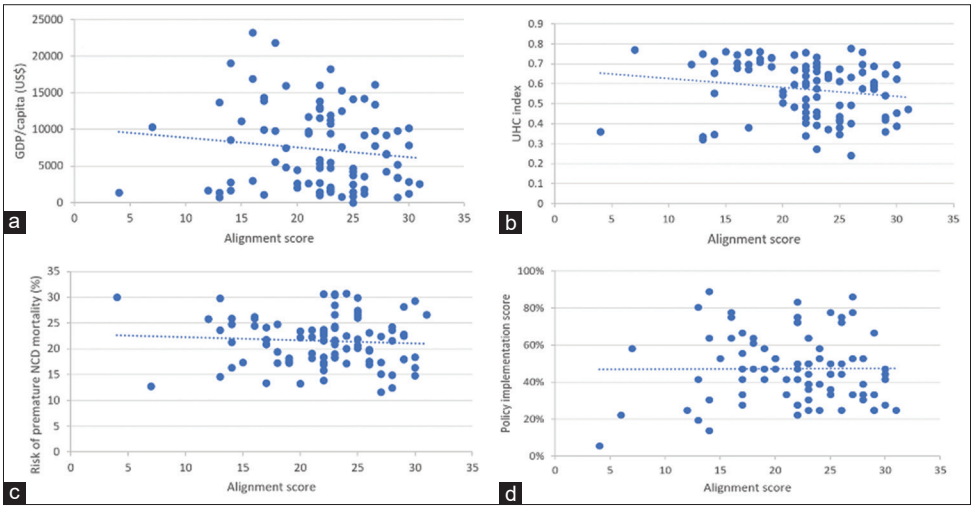

Figure 6: Correlation between MSAP alignment scores and selected indices. Caption: Alignment score plotted against: (a) GDP/capita (91 countries), (b) UHC Index (91 countries), (c) Risk of premature NCD mortality (91 countries), (d) 2019 NCD policy implementation score (88 countries with MSAPs published ≤2015)

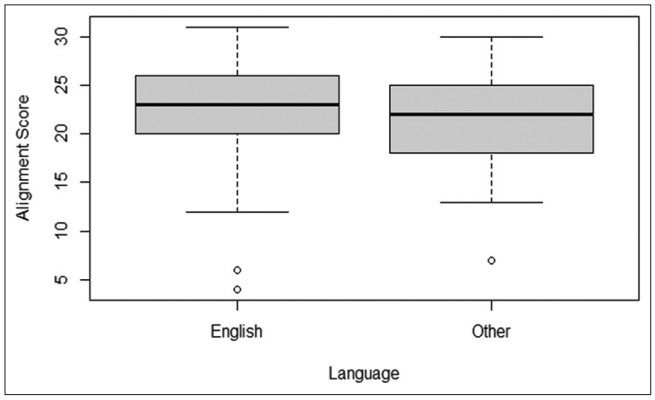

Figure 7: Alignment score by MSAP language

Looking across the WHO-recommended elements, most countries had included background epidemiological data on NCDs, set targets and objectives, and detailed specific actions to address tobacco, alcohol, physical inactivity, and diet. Inclusion of actions to address specific diagnostic conditions – especially chronic respiratory disease – was much lower, suggesting that countries placed a stronger focus on preventive measures. More than a third of all MSAPs did not include M&E indicators or an implementation strategy, and more than half of all MSAPs did not include costs for key actions or an overall funding plan. This suggests a gap in the features designed

to hold countries accountable for implementing the actions planned in the MSAPs. This is furthered by the weak correlation between MSAP scores and NCD policy implementation.

Although alignment scores were high overall, we found that MSAP alignment did not correlate with implementation of NCD policies in 2019.[21] Previous research has also suggested that overall NCD service readiness is low across LMICs, and Bollyky *et al*. have found that low-income countries facing the fastest NCD epidemiological transitions are the least well prepared to tackle these conditions.[13,23]

A number of research teams have examined the relationship between NCD plans and their translation into policy implementation in different world regions. Juma *et al*. found high levels of government engagement with the development of NCD plans and policies across five African countries but a marked implementation gap – aligning with our own findings. The authors cite several barriers that prevent plans from translating into action, including industry interference and inadequate political commitment, resources, local data, and technical capacity.[24] These themes recur in Nyaaba *et al*.'s examination of NCD policy implementation in Ghana.[25] Future actions that build on this assessment of MSAP comprehensiveness could include support to countries to update their MSAPs; MSAP quality appraisal, with a particular focus on actionability and implementation; and retroactive MSAPs assessments to compare intent with attainment.

Murphy *et al*. found that population-level policies in the Caribbean were slow to be ratified and implemented due to lack of personnel trained in policy development and a reliance on foreign consultants.[26] Similarly, Tuangratananon *et al*. found that seven South East Asian countries had well-developed NCD MSAPs, but they did not necessarily translate into action due to low levels of institutional capacity, inadequate funding, weak intersectoral coordination, and lack of standardized monitoring and evaluation processes to track progress.[27] An ASEAN expert review of NCD policy gaps found that surveillance and multisectoral engagement were particular issues for South East Asian countries, requiring a renewed emphasis on "whole-of-government" approaches.[28]

In their analysis of 151 countries, Allen *et al*. found that just under half of all WHO-recommended NCD policies were being implemented worldwide, and that region, GDP, and income group were not significantly associated with implementation in fully adjusted analyses.[21] Isaranuwatchai *et al*.'s "Best Buys, Wasted Buys, and Contestable Buys" provides in-depth analysis of the factors that determine the real-world effectiveness of NCD policies, strongly emphasizing the importance on local context in national planning activities.[29] Ideally, countries should tailor their plans to meet their unique population health needs in combination with their specific geographic, demographic, and economic contexts.

Based on the totality of evidence, while MSAPs are widely perceived as indispensable elements for national NCD strategies, the existence of a comprehensive and well-aligned MSAP is not in itself sufficient to supporting policy implementation. We recommend that the WHO focuses further technical support on the basis of both policy implementation and MSAP alignment, rather than focusing on countries with low MSAP alignment scores. Support for building capacities for implementation is also needed.

Limitations

While our sample included every document uploaded by an LMIC, this sample does not represent all LMICs. Other countries have produced MSAPs but have not uploaded them to the WHO repository. Overall inter-reviewer agreement was 0.77 ("excellent agreement") across the documents subject to dual review, and we had a robust system for identifying areas of inter-reviewer disagreement; however, not every document was subject to dual review.

Points were only awarded if a country had uploaded one or more documents that contained the relevant data. In some instances, MSAPs cited supplementary documents but had not uploaded them to the repository. This will have resulted in an underestimation of alignment score. Moreover, a plan can look good on paper but may be worthless if it does not reflect reality or plan for the correct scenarios. Assessing the MSAPs for comprehensiveness is a start, but future actions should include supporting countries to update their plans, assess the quality of the plan and whether it is rooted in implementation, and retroactively assess plan performance after it is executed.

Inclusion scores were highest when the MSAP domain score could be achieved through only one variable. The prevalence of inclusion was lower when MSAP domains required specific data for multiple linked variables. Unsurprisingly, there were many ways a MSAP could score for health system strengthening actions, while the

multilayered nature of domains like "each assessment action is costed" predispose a lower inclusion prevalence.

Due to resource constraints, documents were not professionally translated. There is a risk that we missed poorly translated elements in documents written in a language not spoken by our team. However, our sensitivity analysis is reassuring in that there was no systematic mean difference in MSAP alignment scores.

The main limitation of our approach is the unintentional but unavoidable normative implication that well-aligned MSAPs are "good" MSAPs. Our findings underline the fact that inclusion of all elements recommended by the WHO does not necessarily translate into policy implementation. Countries may have developed comprehensive and well-thought-out MSAPs but written them in a way that does not align with the current WHO guidance.

Conclusions

Four-fifths of all LMICs have uploaded MSAPs to the WHO portal, and these documents are reasonably well aligned with the WHO recommendations. Countries with less well-aligned MSAPs are not the traditional subset of LMICs that face the greatest resource constraints and epidemiological challenges.

While most countries included situational analyses and listed actions to tackle behavioral risk factors, fewer countries outlined funding, implementation, and M&E strategies. This may partly explain the lack of correlation between MSAP alignment and policy implementation, however, broader research highlights a multitude of additional factors at play.

While MSAPs are a means of supporting the implementation of NCD policies, they are insufficient in themselves, and probably should not be used as process indicators for progress towards NCD outcomes.

We recommend that the WHO tailors its support on a case-by-case basis, ensuring that MSAP development assistance is supplemented with holistic support for the broader policy implementation process.

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Conflicts of interest

There are no conflicts of interest.

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Appendixes

Appendix 1: Development stages for the extraction form

Stage 1: Pilot data extraction form

Stage 1: Pilot data extraction form

	Background
MAP details	Country
	Link to MAP
	Language of MAP
	Does the title suggest that this document is a national multisectoral action plan for NCDs?
	MAP year
	Alignment items
Situational analysis. Does the NCD MAP include specific statistics and relevant sociodemographic information?	1. Population and health indicators
	2. NCD mortality and morbidity
	3. NCD risk factors
	4. Economic and health expenditure indicators
	5. SDOH (impacts of NCDs on development and social burden)
Does the MAP mention preexisting national NCD plans/actions/policies?	6. The MAP identifies preexisting national NCD strategies, or comments on their absence
Is the MAP integrated into the master health plan?	7. The MAP states that the plan is (or will be) aligned with and/or integrated into the overarching national health plan
Does assessment provide recommendations including priorities for action?	8. The MAP moves beyond identifying potential actions to prioritize these actions and/or provide recommendations. In other words, moving beyond describing what could be done to stating what should be done
Was the MAP developed with the input of multiple stakeholders within the health sector?	9. The MAP states that two or more stakeholders from the health sector were involved in the development of the MAP
Was the MAP developed with the input of stakeholders from outside the health sector?	10. The MAP states that two or more stakeholders from outside the health sector were involved in the development of the MAP, e.g., different units, departments, organizations, or individuals representing other groups
Does the MAP identify the roles and responsibilities of all stakeholders?	11. The MAP defines the roles and responsibilities of every stakeholder mentioned. This point is only available if there are two or more stakeholders
Does the MAP set national goals and targets?	12. The MAP sets out goals and targets
Are these based on the results of the situational analysis (i.e., actions mapped to the national context)?	13. The goals and targets reference one or more elements from the situational analysis, or the MAP states that the goals and targets are based on the situational analysis, or the standard WHO goals and targets have been adapted to fit the national context
Are these aligned with the Global Action Plan objectives or voluntary targets?	14. Goals and/or targets are set out using the gap objectives and/or target headings
Is there a "NCD target doc" uploaded for this country?	15. Check the "NCD target docs" tab
If yes, then what year is it from?	16. Check the "NCD target docs" tab
Are there actions pertaining to strengthening governance?	17. Advocacy
	18. Leadership
	19. Coordination
	20. International cooperation
Are there actions pertaining to prevention and health promotion?	21. Tobacco
	22. Alcohol
	23. Unhealthy diet
	24. Physical inactivity
	25. Air pollution
	26. The MAP mentions specific actions for prevention and/or health promotion without specifying a specific risk factor. Can only get this if scored 0 in the preceding 4
Are there actions pertaining to improving management of NCDs?	27. The MAP sets out specific actions to improve the early detection and effective treatment of cardiovascular diseases
	28. The MAP sets out specific actions to improve the early detection and effective treatment of diabetes
	29. The MAP sets out specific actions to improve the early detection and effective treatment of cancer
	30. The MAP sets out specific actions to improve the early detection and effective treatment of chronic respiratory diseases

Contd...

Stage 1: Contd...

	Alignment items
	31. If the MAP mentions specific actions for the early detection and treatment of "NCDs" without specifying a specific disease group. Can only get this if scored 0 in the preceding 4
	32. The MAP sets out specific actions to improve palliative care
	33. The MAP sets out specific actions to strengthen health system for NCDs
Are there actions pertaining to NCD surveillance (e.g., STEPS or national health survey)	34. The MAP includes actions to strengthen national NCD surveillance and monitoring and evaluation of NCD programs. One or more of the below must be mentioned: Include routine collection of NCD data in the national health information system/administer a STEPS or comprehensive health examination survey/any other actions that is described or presented as improving NCD surveillance
Are there actions pertaining to monitoring and evaluation of NCD programs?	35. The MAP outlines one or more action to monitor and evaluate one or more NCD program
Are there actions pertaining to facilitating NCD research?	36. The MAP includes one or more of: develop a prioritized research agenda/capacity building for research/developing a research network/boosting research funding
Does the MAP list key actions, with timeframes, costs, and responsible agents?	37. The map lists the key actions, and for each element provides timeframes
	38. The map lists the key actions, and for each element provides costs
	39. The map lists the key actions, and for each element provides responsible agents
Does the MAP include a plan to raise funding to support implementation?	40. The MAP includes a plan designed to secure funding for implementation of the actions/recommendations outlined in the MAP
Does the MAP include implementation strategies?	41. The MAP provides concrete actions to enhance adoption, implementation, and sustainability of the interventions
Does the MAP define a national M&E framework for monitoring the implementation of the MAP?	42. Definition: The MAP presents a framework that will be used to guide the process of monitoring the national MAP, including three or more of: inputs/process/outputs/impact/outcomes
Does the MAP identify a set of indicators (with data sources) to monitor impact and outcomes on NCDs?	43. The MAP outlines which indicators and data sources are to be used to monitor impact and outcomes

NCD - Noncommunicable diseases, SDOH - Social determinants of health

Final extraction form

Final extraction form

Background	
MAP details	Country
	Link to MAP
	Language of MAP
	Does the title suggest that this document is a national multisectoral action plan for NCDs?
	MAP year
Situational analysis. Does the NCD MAP include specific statistics and relevant sociodemographic information?	1. NCD mortality and morbidity
	2. NCD behavioral risk factors
	3. Any mention of demographic indicators
	4. Any mention of economic indicators
	5. SDOH explicitly mentioned in the text
	6. SDOH addressed in the MAP but not explicitly mentioned in the text
Does the MAP mention preexisting national NCD plans/actions/policies?	7. The MAP identifies preexisting national NCD strategies, or comments on their absence
Was the MAP developed with the input of multiple stakeholders within the health sector?	8. The MAP states that two or more stakeholders from the health sector were involved in the development of the MAP
Was the MAP developed with the input of stakeholders from outside the health sector?	9. The MAP states that two or more stakeholders from outside the health sector were involved in the development of the MAP, e.g., different units, departments, organizations, or individuals representing other groups
Does the MAP set national goals and targets?	10. The MAP sets out goals and targets
Are these based on the results of the situational analysis (i.e., actions mapped to the national context)?	11. The MAP sets goals and targets that are based on a national situational analysis
Are these aligned with the global action plan objectives or voluntary targets?	12. The MAP sets goals and targets that are aligned with the global action plan objectives or voluntary targets
Are there actions pertaining to strengthening governance?	13. The MAP sets out specific actions with the explicitly stated aim of strengthening governance, or advocacy, or coordination, or international cooperation
Are there actions pertaining to prevention and health promotion?	14. The MAP sets out specific actions that target tobacco
	15. The MAP sets out specific actions that target alcohol
	16. The MAP sets out specific actions that target unhealthy diet
	17. The MAP sets out specific actions that target physical inactivity
	18. The MAP sets out specific actions to improve the early detection and effective treatment of cardiovascular diseases
Are there actions pertaining to improving management of NCDs?	19. The MAP sets out specific actions to improve the early detection and effective treatment of diabetes
	20. The MAP sets out specific actions to improve the early detection and effective treatment of cancer
	21. The MAP sets out specific actions to improve the early detection and effective treatment of chronic respiratory diseases
	22. The MAP sets out specific actions to improve palliative (end-of-life) care
	23. The MAP sets out specific actions to strengthen health system for NCD prevention and management
Are there actions pertaining to NCD surveillance?	24. The MAP includes actions to strengthen national NCD surveillance. One or more of the below must be mentioned: Include routine collection of NCD data in the national health information system/administer a STEPS or comprehensive health examination survey/any other action intended to improve NCD surveillance
Are there actions pertaining to NCD surveillance (e.g., STEPS or national health survey)?	25. The MAP includes one or more of: develop a prioritized research agenda/capacity building for research/developing a research network/boosting research funding
The MAP lists timeframes for each key action?	26. The map lists the key actions, and for each element provides timeframes
The MAP lists costs for each key action?	27. The map lists the key actions, and for each element provides costs
Does the MAP list responsible agents for each key actions?	28. For every key action there is a named responsible agent/agency
Does the MAP include a plan to raise funding to support implementation?	29. The MAP includes a plan designed to secure funding for implementation of all the actions/recommendations outlined in the MAP
Does the MAP include implementation strategies?	30. The MAP explicitly states that there is an implementation strategy, and provides detail on actions to enhance adoption, implementation, and sustainability of the interventions
Does the MAP identify a set of indicators to monitor impact and outcomes of NCDs?	31. The MAP outlines which indicators and data sources are to be used to monitor impact and outcomes

NCD - Noncommunicable diseases, SDOH - Social determinants of health

Phase 1:

Phase 1 of the Codebook contained 44 total items and was piloted on 12 MSAPs. The original codebook developed in partnership with the WHO contained domains: Assessment, Engagement, Strategic Agenda, and Implementation. Each domain consisted of specific components, which were further subdivided into specific items. After Phase 1 of MAP data extraction, two additional items were added in the Strategic Agenda domain, increasing the total number of items to 46.

Phase 2 codebook contained 46 items. Upon completion of Phase 2, the reviewers agreed to drop 15 items from the codebook and revised one item, leaving a total of totaling 31 items. The items dropped across the codebook domains include: Assessment (four dropped items), Engagement (one dropped item), Strategic Agenda (eight dropped items, one revised), and Implementation (one dropped item). Thus, the final codebook used in Phase 3 of data extraction contained a total of 31 items.

Evolution of amendments to codebook from Phase 1 to Phase 3

Component	Item	Add or dropped or restructured	Rationale
Phase 1 to Phase 2			
Strategic agenda	The MAP mentions specific actions for prevention and/or health promotion without specifying a specific risk factor	Add	This could only get this a point if the proceeding actions all scored 0
	If the MAP mentions specific actions for the early detection and treatment of "NCDs" without specifying a specific disease group?	Add	This could only get this a point if the proceeding actions all scored 0
Phase 2 to Phase 3			
Assessment	Population health indicators	Dropped	Too broad of interpretation
	Economic and health expenditure indicators	Dropped	Not an essential elimination of NCD and inter-rater agreement was not significant (58%)
	SDOH	Restructured	Challenging to justify elements that should be included, and the definition is hard to consistently define. We opted to add a point if SDOH were specifically mentioned, and a second point if the reviews felt that the MAP addressed SDOH without explicitly naming it
	MAP states that the plan aligned with overarching national health plan	Dropped	Low validity as a number of plans were integrated into national health plans but not specified in MSAPs
	MAP moves beyond identifying potential action to prioritize these actions and/or provides recommendations	Dropped	Duplication with item 8%-100% alignments between item 8 during first round of scoring
Engagement	Does MAP identify the roles and responsibilities of all stakeholders?	Dropped	Overlap with Item 17
Strategic agenda	Is there a target doc uploaded for this country?	Dropped	WHO advises that countries present goals in MAP style?
	If yes (10.1), what year	Dropped	See above
	Are there actions pertaining to strengthening governance, consisting of four separate items (1 point for containing actions for each) (a) advocacy, (b) leadership, (c) coordination, and (d) international cooperation	Restructured	Difficulty identifying these actions. The four items were restricted into one item "The MAP sets out specific actions with the explicitly stated aim of strengthening governance, or advocacy, or coordination, or international cooperation"
	The MAP mentions specific actions for prevention and/or health promotion without specifying a risk factor	Dropped	Too vague in data extraction
	The MAP mentions specific actions for the early detection and treatment of "NCDs" without specifying a specific disease group	Dropped	All items fit under the "Health System Strengthening" item
	The MAP outlines one or more actions to monitor and evaluate one or more NCD programs	Dropped	Overlap with component 21, and hard to define planning compared to actual action
Implementation	The MAP presents a framework that will be used to guide the process of monitoring the national MAP, including three or more of: inputs/process/outputs/ impact/outcomes	Dropped	The definition was poorly defined, inhibiting robust and reproducible data extraction. MSAPs may well have used a well-established M&E framework that does not align with the five elements above. Most MSAPs did not explicitly state that they were or were not using a framework, so it was difficult to reliably determine. There was also overlap with component 21

Phase 3=Total of 31 items. NCD - Noncommunicable diseases, SDOH - Social determinants of health, MSAPs - Multisectoral action plans

Appendix 2: LMICs that had not submitted MSAPs

We used the World Bank 2019 Analytic Classification. We included all 110 LMICs that had submitted documents to the WHO data repository. The 29 LMICs that had not submitted MSAPs were:

American Samoa, Angola, Bolivia, Cameroon, Cuba, Djibouti, Dominica, Equatorial, Guinea, Gabon, The Gambia, Ghana, Guinea-Bissau, Haiti, Honduras, Kosovo, Libya, Malawi, Nicaragua, North Macedonia, Pakistan, São Tomé and Principe, Somalia, South Sudan, Syrian Arab Republic, Tuvalu, Uganda, West Bank and Gaza, Yemen, Rep., Zimbabwe.

Note that Nauru and Romain have both graduated to high-income countries since 2019.

Source: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519

Appendix 3: Reason for excluding 15 MSAPs from the main analysis

Algeria

https://extranet.who.int/ncdccs/Data/DZA_B3_plan%20strat%C3%A9gique_MNT2015-2019.pdf

The MAP appears to be written as a summary/framework document that is accompanied by more detailed plans for communications, monitoring and evaluation (not yet developed), financing, and operations/implementation.

Argentina

https://extranet.who.int/ncdccs/Data/ARG_B3_estrategia%20nacional%20de%20prevencion%20y%20control%20de%20ENT.pdf

Appears to be a resolution for the creation of such a MAP rather than a MAP itself.

Armenia

https://extranet.who.int/ncdccs/Data/ARM_B3_NCD Strategy and Action Plan 2016-2020.pdf

Appears to be a policy document signaling the decision to implement a MAP, rather than a MAP itself.

DR Congo

https://extranet.who.int/ncdccs/Data/COD_B3_PLAN STRATEGIQUE MULTISECTORIEL MNT 2016-2020.docx

Draft version of a document replete with editorial comments. Clearly not the final version, but also references multiple other documents that might represent the MAP.

El Salvador

https://extranet.who.int/ncdccs/Data/SLV_B3_Plan_implementacion%20de%20la%20politica%20ENT_ELS2019.pdf

This document is one element of the broader MAP; the implementation plan. The broader MAP has not been uploaded.

Eswatini

https://extranet.who.int/ncdccs/Data/SWZ_B3_Swaziland National NCD Policy 2016.docx

This is a policy document rather than a MAP.

Georgia

https://extranet.who.int/ncdccs/Data/GEO_B3_NCD%20strategy%202017-2020-Geo.pdf

Poor translation. Removed as MAP alignment score may be artificially low.

Indonesia

https://extranet.who.int/ncdccs/Data/IDN_B3_STRATEGIC ACTIONS FOR THE PREVENTION AND CONTROL OF NCD [English].docx

This is the isolated implementation plan with an overview of actions and goals. It is chapter 5 of a larger document.

Kazakhstan

https://extranet.who.int/ncdccs/Data/KAZ_B3_%D0%B4%D0%B5%D0%BD%D1%81%D0%B0%D1%83%D0%BB%D1%8B%D0%BA.pdf

Poor translation. Removed as MAP alignment score may be artificially low.

Lebanon

https://extranet.who.int/ncdccs/Data/LBN_B3_Final%20plan%202014.pdf

This appears to be a broader strategic objective document rather than a MAP.

Mexico

https://extranet.who.int/ncdccs/Data/MEX_B3_Estrategia%20Nacional%20para%20la%20Prevenci%C3%B3n%20SOD.pdf

A number of the tables could not be translated. Removed as MAP alignment score may be artificially low.

Philippines

https://extranet.who.int/ncdccs/Data/PHL_B3_ao2011-0003%20-%20National%20Policy%20on%20Strengthening%20the%20Prevention%20and%20Control%20of%20Chronic%20Lifestyle%20Related%20Non-Communicable%20Diseases.pdf

Unclear whether this is a MAP or a preliminary policy framework.

Tajikistan

https://extranet.who.int/ncdccs/Data/TJK_B3_NCD%20Strategy_Eng.pdf

The document references a wide range of other plans and strategy documents that have not been uploaded but seem to collectively represent the overall national MAP.

Togo

https://extranet.who.int/ncdccs/Data/TGO_B3_togo_annex 2_ncd_strategy_2012_2015.pdf

Poor translation. Removed as MAP alignment score may be artificially low.

United Republic of Tanzania

https://extranet.who.int/ncdccs/Data/TZA_B3_NCD%20Stategic%20Plan%202016%20-%202020v0.3.pdf

The document mentions many related documents that have more specific details for strategies for tobacco control, mental health, nutrition, cancer, palea took care, breast cancer, cervical cancer, and alcohol. These have not been uploaded but appear to collectively represent the national MAP.