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Supplementary appendix 2

This appendix formed part of the original submission and has been peer reviewed. We post it as supplied by the authors.

Supplement to: Marcus ME, Manne-Goehler J, Theilmann M, et al. Use of statins for the prevention of cardiovascular disease in 41 low-income and middle-income countries: a cross-sectional study of nationally representative, individual-level data. *Lancet Glob Health* 2022; **10:** e369–79.

Supplementary data

Appendix 1: Supplemental methods

The following material supplements the methods section in the main paper.

Inclusion criteria for surveys

1. The survey was conducted during or after 2013; in cases where two surveys were available for a particular country, the most recent survey was used;
2. The survey contained a biomarker for diabetes (either a glucose measurement or HbA1c);
3. The survey data were made available at the individual level;
4. The survey was nationally representative;
5. The survey was conducted in an upper-middle, lower-middle or low-income country according to the World Bank in the year the survey was conducted;

Search process

The following is our comprehensive, two-step methodology for identifying, accessing, and pooling available national health surveys:

1. We identified all LMICs in which a World Health Organization (WHO) Stepwise Approach to Surveillance (STEPS) survey had been conducted.[1] We preferred STEPS surveys as they use a standardized questionnaire template and represent the WHO's official framework for conducting surveillance for noncommunicable diseases (NCDs) at the population level.[2,3] Prior to 2019, we requested each STEPS survey from a list maintained on the WHO website. The research team contacted the responsible party for each survey based on the information provided on this website. If the contact information was outdated or unavailable, the authors relied on publications utilizing STEPS data and electronic searches of the survey or contact name. For the Caribbean region, country involvement was facilitated by the Caribbean Public Health Agency (CARPHA). Beginning in 2019, we downloaded STEPS surveys from the WHO Central Data Catalog. The final search date for STEPS surveys was April 1, 2021.

2. For countries in which no eligible STEPS survey was available, we conducted a systematic Google search in to identify additional potentially eligible surveys. Our search strategy is described below:

   Search engine: Google

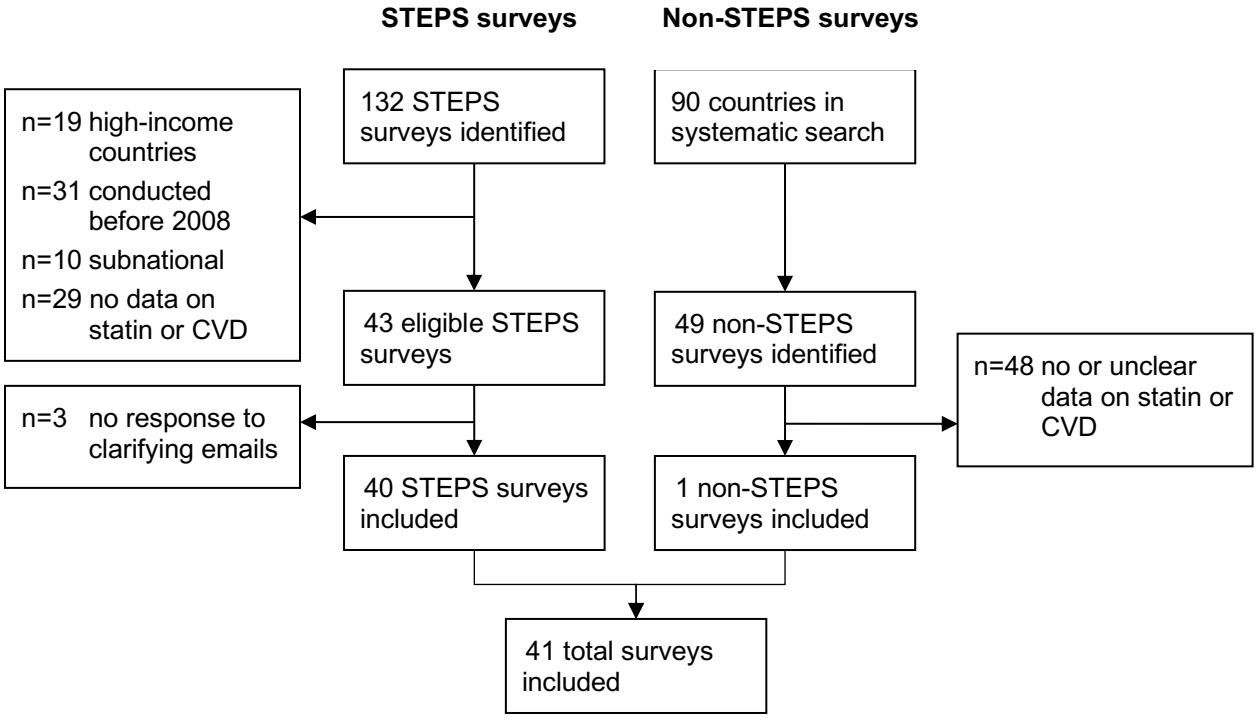
   Search terms: "[country name]" AND ("population-based" OR household) AND ("blood glucose" OR "plasma glucose" OR "blood sugar" OR hemoglobin OR haemoglobin OR A1c OR HbA1c OR A1C OR Hb1c OR Hba1c OR HGBA1C OR "blood pressure" OR hypertension OR hypertensive OR cholesterol OR LDL OR HDL OR lipoprotein OR triglycerides OR triglyceride OR lipid OR lipids)

   Number of hits reviewed: Hits reviewed until eligible survey identified, or, in the case of no eligible survey identified, first 50 hits (10 hits per page/5 pages reviewed)

   Search date: April 8, 2020

In total, we included STEPS surveys from 40 countries and non-STEPS surveys from one country (the 2018-19 Mexico National Survey on Health and Nutrition [ENSANUT][4]). All surveys included the full age range with the exception of those conducted in Burkina Faso, Kyrgyzstan, Myanmar, and Tokelau, which had an upper age limit of 64 years.

Figure: Survey inclusion flow chart



Country classification and characteristics

We grouped countries by geographic region as defined by the World Health Organization[5] and income group as defined by the World Bank in the year the survey was conducted.[6] We classified Nauru[7] and Tokelau[8] as upper-middle-income countries based on our review of per-capita income, as World Bank classifications were not available in the year the survey was conducted.

Survey questions

The generic version (v3.2) of the World Health Organization STEPwise approach to noncommunicable disease surveillance (WHO STEPS) instrument are available online (accessed May 1, 2021):

https://www.who.int/ncds/surveillance/steps/instrument/STEPS_Instrument_V3.2.pdf

The 2018-19 Mexico National Survey on Health and Nutrition (ENSANUT, accessed May 1, 2021):[4]

https://ensanut.insp.mx/encuestas/ensanut2018/descargas.php

Table: Text of relevant questions in the underlying surveys

Variable	STEPS surveys	ENSANUT 2018 (Mexico survey)*
Statin use	Are you currently taking statins (Lovastatin/Simvastatin/Atorvastatin or any other statin) regularly to prevent or treat heart disease?	Do you take any of the following medications: pravastatin, atorvastatin, simvastatin, rosuvastatin, pitavastatin, ezetimibe?
Prior CVD history	Have you ever had a heart attack or chest pain from heart disease (angina) or a stroke (cerebrovascular accident or incident)?	Has your doctor told you that you have (or had): a) a myocardial infarction or heart attack? b) angina pectoris (chest pain or discomfort, which usually goes away with rest or with medicines)?

*Questions translated from the original Spanish by the authors.

As shown above, the question on statin use in the 2018-19 Mexico ENSANUT survey specifically mentioned five statins by name as well as a single non-statin cholesterol-lowering medication (ezetimibe, which is a cholesterol absorption inhibitor).

The survey in Iraq only asked participants about statin use conditional on a respondent self-reporting a history of heart disease/stroke. Thus, the Iraq data was only included in the secondary prevention outcome.

As observed above, the underlying surveys did not permit us to differentiate among respondents who had heart disease versus strokes (and whether a stroke was ischemic or hemorrhagic) or whether the ischemic heart disease reflected a prior myocardial infarction and/or chronic angina.

Outcomes

The numerator and denominator for the outcomes are defined below. The numerator was the same for each of the outcomes. The denominator varied depending on whether the outcome was primary or secondary CVD. As described in the methods, we defined these outcomes to be consistent with the monitoring indicator recommended in the WHO NCD Global Monitoring Framework,[3] WHO HEARTS Technical Package for CVD Management in Primary Health Care,[2] and the WHO-PEN clinical guidelines.[9]

Table: Definitions of outcome denominators

Numerator	Outcome	Denominator
Self-reported statin use	Secondary prevention	Number of non-pregnant adults ages 40-69 years who self report prior CVD
	Primary prevention	Number of non-pregnant adults ages 40-69 years without a history of self-reported CVD and either (1) a history of self-reported diabetes or (2) 10-year CVD risk >20% using the 2019 WHO laboratory-based risk equations[10]

For the primary prevention outcome in the main analysis that included a universal indication for a statin among non-pregnant adults 40 years and older with diabetes, we defined diabetes as both (1) an individual's self-reported prior diagnosis of diabetes in the survey and (2) use of either a glucose-lowering medication (oral glucose-lowering medication or insulin) or biochemical evidence of diabetes as defined by the WHO as detailed below.[11,12]

As described in the methods, we explored drivers of statin use across countries by plotting statin use against several country-level characteristics. The data on each country's per-capita health spending was imported from the World Bank,[13] which uses the WHO Global Health Expenditure Database as its data source.[14] The definition of health expenditure is:

> "[A]ll activities with the primary purpose of improving, maintaining and preventing the deterioration of the health status of persons and mitigating the consequences of ill-health through the application of qualified health knowledge [medical, paramedical and nursing knowledge, including technology, and traditional, complementary and alternative medicine (TCAM)]."[15]

We chose to use per-capita gross national income[16] rather than per-capita gross domestic product as this is the economic measure used by the World Bank in country income group classifications.[6]

For the NCD policy score, we used the method reported by Allen and colleagues[17] with updated data from the 2020 WHO NCD Progress Monitor[18]:

> "Following the approach used in an internal WHO memo (unpublished), we accorded a value of one point for each fully implemented intervention, half a point for partially implemented interventions, and zero for interventions that had not been implemented or for which there were no data available. We generated national aggregate scores … and transformed these into percentages so that full implementation of every policy was equal to 100%."[17]

Statistical analysis

To calculate CVD risk scores using the 2019 WHO laboratory-based risk equations,[10] we used the *whocvdrisk* package in Stata.[19] To calculate the 2007 WHO/International Society of Hypertension (WHO/ISH) CVD risk scores,[20,21] we used the *whoishRisk* package in R.[22] Both of these CVD risk equations use diabetes status and systolic blood pressure, among other variables, as inputs. As in our prior work,[23-26] we defined diabetes status by self-reported use of a glucose-lowering medication (oral glucose-lowering medication or insulin) or biochemical evidence of diabetes using the WHO definition: fasting plasma glucose (FPG) ≥7.0 mmol/l (126 mg/dl), random plasma glucose ≥11.1 mmol/l (200 mg/dl), or an HbA1c measurement ≥6.5%.[11,12] We averaged systolic blood pressure blood pressure measurements over multiple readings.

For the within-country regressions of statin use for the secondary prevention of CVD, we limited the models to countries with at least 5 respondents in the survey who self-reported statin use. All regressions were adjusted for sex and age. Age was included in three categories (40-49 years, 50-59 years, and 60-69 years) for all the regressions except for panel B in which it was dichotomized as ≥ 55 years or ≤ 55 years.

For the regression models using the pooled sample, we only included countries with the full suite of individual-level covariates (n=27 countries). Age was included in three categories (40-49 years, 50-59 years, and 60-69 years). The education variable was not available in Tokelau, and the rural residence variable was not available in n=14 countries (Botswana, Ecuador, Eswatini, Kiribati, Lebanon, Myanmar, Nauru, Solomon Islands, Sri Lanka, St. Vincent and the Grenadines, Tajikistan, Timor-Leste, Tokelau, and Tuvalu). We opted to include rural versus urban residence in the main analysis as the variable was available in most of the large countries in our sample that together represent approximately 90% of the underlying population of individuals ages 40-69 years of age.

As described in the methods section, in all analyses, we used sampling weights and adjusted for stratification and clustering at the level of the primary sampling unit. We used demographic or risk factor weights (i.e., Step 1 weights in STEP surveys[1]) for the secondary prevention outcome. We used subsample weights (i.e., biomarker-based or Step 3 weights in STEPS surveys[1]) for the primary prevention outcome as availability of biochemical measurements including total cholesterol was required for the calculation of the laboratory-based CVD risk scores. All weights are adjusted for the probability of selection, non-response, and differences between the sample population and the target population. Whenever sampling weights were missing, the average weight was assigned to observations with missing weight values. We rescaled weights such that the sum of weights within each country reflects its population size in relation to the other countries using 2019 population estimates of people 40-69 years produced by the Global Burden of Disease project.[27] Whenever observations had to be dropped from the sample because of missingness in covariates, survey weights were rescaled such that the overall relative population weighting across countries remained valid.

We ran the following analyses in R version 4.0.5: (1) WHO ISH risk scores using the *whoishRisk* package[22] and (2) construction of Figure 2 and Figure 3 using the *ggplot2* package. All other analyses were carried out in Stata version 16.1. The statistical code was reviewed by two authors within the study team (MEM and DF) and is available at the Harvard Dataverse (https://doi.org/10.7910/DVN/BTSHNR). Country-specific contact information regarding data access is provided in Appendix 3.

Appendix 2: Country-specific sampling methods

Note: In order to ensure accuracy in reporting, sampling methods are pasted verbatim from specified sources.

Afghanistan STEPS 2018
In the sampling methodology districts are used as primary sampling units (PSUs), villages/blocks are the SSUs, and households within districts serves as TSUs. Based on the guidelines of the WHO, the total number of the PSUs within a sampling frame should be greater than 100 among which 50-100 PSUs should be randomly selected. The total number of districts in 34 provinces of Afghanistan is 417. From 417 districts 55districts were selected based on the available resources using Stepwise-Approach XLs form.

The total sample size was distributed proportionate to the size of the districts, then the sample size of the districts was divided by 15 (maximum number of the household to interviewed within an EA) and number of EAs within each district was calculated. Using the EPI sampling frame EAs were selected within each district. Within each EA the total number of the households were calculated and it was divided to calculate the sampling interval. The household with each randomly selected, within each household interview with a randomly selected male or female members was conducted.
Age range of participants included: 18-69 years
Source: Afghanistan STEPS 2018 Report. Available at: https://extranet.who.int/ncdsmicrodata/index.php/catalog/782

Algeria: STEPS 2016-2017
A multi-stage cluster sample of households. One individual within the age range of the survey was selected per household. Analysis weights were calculated by taking the inverse of the probability of selection of each participant. These weights were adjusted for differences in the age-sex composition of the sample population as compared to the target population.
Different weight variables are available per Step:
wStep1 - for interview data
wStep2 - for physical measures
wStep3 - for biochemical measures
This allows for differences in the weight calculation for each Step of the survey as the age-sex composition of the respondents to each Step can differ slightly due to refusal or drop out. Additionally, some countries perform subsampling for Step 2 and/or Step 3. When no subsampling is done and response rates do not differ across Steps of the survey, the 3 weight variables will be the same.
Age range of participants included: 18-69 years
Source: no report or fact sheet available. Sampling information obtained from: https://extranet.who.int/ncdsmicrodata/index.php/catalog/91/study-description

Armenia: STEPS 2016
The STEPS survey of non-communicable disease (NCD) risk factors in Republic of Armenia was carried out from September 2016to December 2016. The Republic of Armenia carried out Step 1, Step 2, and Step3. Socio demographic and behavioral information was collected in Step 1. Physical measurements such as height, weight and blood pressure were collected in Step 2. Biochemical measurements were collected to assess blood glucose and cholesterol levels and urine analyze to assess salt intake levels in Step 3. The survey was a population-based survey of adults aged 18-69A cluster sample design was used to produce representative data for that

age range in Armenia. A total of2349adults participated in the survey. The overall response rate was42%.
Age range of participants included: 18-69 years
Source: Armenia STEPS Fact Sheet. Available at: https://extranet.who.int/ncdsmicrodata/index.php/catalog/102

Azerbaijan: STEPS 2017
A multi-stage cluster sample of households. One individual within the age range of the survey was selected per household. Analysis weights were calculated by taking the inverse of the probability of selection of each participant. These weights were adjusted for differences in the age-sex composition of the sample population as compared to the target population.
Different weight variables are available per Step:
wStep1 - for interview data
wStep2 - for physical measures
wStep3 - for biochemical measures
This allows for differences in the weight calculation for each Step of the survey as the age-sex composition of the respondents to each Step can differ slightly due to refusal or drop out. Additionally, some countries perform subsampling for Step 2 and/or Step 3. When no subsampling is done and response rates do not differ across Steps of the survey, the 3 weight variables will be the same.
Age range of participants included: 18-69 years
Source: no report or fact sheet available. Sampling information obtained from: https://extranet.who.int/ncdsmicrodata/index.php/catalog/127/studydescription#page=overview&tab=study-desc

Bangladesh: STEPS 2018
Sampling Procedure
A multistage complex sampling design was used to produce representative data for that age range in Bangladesh.
Response Rate
The overall response rate was 83.8%.
Weighting

Analysis weights were calculated by taking the inverse of the probability of selection of each participant. These weights were adjusted for differences in the age-sex composition of the sample population as compared to the target population.
Different weight variables are available per Step:
wStep1 - for interview data
wStep2 - for physical measures
wStep3 - for biochemical measures
This allows for differences in the weight calculation for each Step of the survey as the age-sex composition of the respondents to each Step can differ slightly due to refusal or drop out. Additionally, some countries perform subsampling for Step 2 and/or Step 3. When no subsampling is done and response rates do not differ across Steps of the survey, the 3 weight variables will be the same."Age range of participants included: 25 to 69 years
Source: https://extranet.who.int/ncdsmicrodata/index.php/catalog/770/study-description#page=overview&tab=study-desc
Source: National Institute of Population Research and Training (NIPORT), Mitra and Associates, and ICF International. 2013. Bangladesh Demographic and Health Survey 2011. Dhaka, Bangladesh and Calverton, Maryland, USA: NIPORT, Mitra and Associates, and ICF International.

Belarus: STEPS 2015
The sampling frame is a collection of data and materials from which are selected for the survey. The optimal sampling frame should be complete, accurate and current. Best of all, the above criteria are met by the results of the population census, which became the basis for constructing the sample for the STEPS study. Census population represents a representative territorial sampling frame in the form a hierarchical set of parcels grouped in a certain way. Plots censuses are, on average, about the same size. For each site there is a schematic map that provides a clear, non-overlapping demarcation of geographic districts, as well as information on the population and the number of households.
The largest in size is the census area, which includes several instructor sites. The smallest unit in the hierarchical structure of parcels by censuses - enumeration areas.A positive aspect of using enumeration areas as primary sampling units (PSUs) is that they have a small and approximately the same size (each includes about 100 HHs on average). Consequently this, the PSU is a territory within which it is possible to effectively organize field work. To conduct a population census, the territory of the Republic of Belarus was divided into almost 32 thousand enumeration areas. Due to the fact that the last population census in the Republic of Belarus was carried out in 2009, to update the sample, the current data of polyclinics were used, medical outpatient clinics, FAPs and rural Soviet accounting in rural areas.
Age range of participants included: 18-69 years
Source: Translated directly from the Belarus STEPS 2016 report. Available at: https://extranet.who.int/ncdsmicrodata/index.php/catalog/100/related_materials

Benin: STEPS 2015
"The STEPS survey on risk factors for non-communicable diseases in Benin was conducted from October to December 2015. It was a population-based survey of adults aged 18 to 69 years. A 3-stage sampling frame was used to produce representative data for this age group in Benin. The information required for the investigation was collected electronically using a manual device. The survey was implemented by the National Program for the Fight against Non-Communicable Diseases (PNLMNT) of the Ministry of Health of Benin. A total of 5,126 adults participated in the STEPS survey conducted in Benin. The overall response rate was 98.6%. The 1st survey took place in 2008. A third survey is planned for 2020 if the financial situation allows it."
Age range of participants included: 18-69 years
Source: Translated directly from the Benin STEPS 2015 report. Available at: https://extranet.who.int/ncdsmicrodata/index.php/catalog/107/download/1044

Bhutan: STEPS 2014
Sampling procedure
To achieve a nationally representative sample, a multistage sampling method was used to select enumeration areas, households and eligible participants at each of the selected households in three stages. The 2005 National Census was chosen as the basis for the sampling frame, with "Geogs" (blocks) in rural areas and towns in urban areas forming the primary sampling units (PSUs). Since the population distribution for urbanicity is 70:30 (rural:urban), 63 PSUs in rural and 14 PSUs in urban areas were chosen. PSUs were selected through the probability proportionate to size (PPS) sampling using the number of households in each PSU. Two secondary sampling units (SSUs) for every rural PSU and 4 SSUs for every urban PSU were selected. This led to the selection of 126 SSUs from rural and 56 SSUs from urban areas. This was also carried out by PPS sampling, using the number of households in each SSU. A total of 16 households from each SSU (both rural and urban) were selected using systematic random sampling. The sampling frame for this was the list of households with a

unique identification number (ID) developed by the enumerators for the survey. At the household level, the Kish sampling method was used to randomly select one eligible member (aged 18–69 years) of the household for the survey. The Kish method ranks eligible household members in order of decreasing age, starting with males and then females, and randomly selects a respondent using the automated program for Kish selection in the handheld personal digital assistant (PDA).
Age range of participants included: 18-69 years
Source: Bhutan STEPS report. Available at: https://www.who.int/ncds/surveillance/steps/bhutan/en/

Botswana: STEPS 2014
Botswana has a population of over 2 million with 27 districts and 4,845 enumeration areas and sample size of 300 enumeration areas with a target population of 6,400 people was systematically drawn from a pool of the whole enumeration areas. Against the identified enumeration areas numbers of households were listed and proportion of participants was calculated from the total sample size required for the country. Finally a computer generated random number was drawn to go into specific households in that specific enumeration area and at the end eligible participants residing in the household were listed into the electronic hand held data assistant (PDA) and at the end a name was picked automatically to participate in the survey.
Age range of participants included: 15-69 years
Source: Botswana STEPS report. Available at: https://extranet.who.int/ncdsmicrodata/index.php/catalog/318

Burkina Faso: STEPS 2013
"Sampling methodology: The study was conducted on a sample obtained from a three-stage cluster stratified as recommended by the WHO for STEPS screening surveys. risk factors for noncommunicable diseases. The sampling frame used was that derived from the general census of the population and habitat 2006 (RGPH 2006) and updated in 2010 during the survey Demographic and Health Survey of Burkina Faso (EDS-BF, 2010). This update concerned the enumeration areas (EAs) that correspond to the cluster as part of this study.
Selection of clusters: The choice of clusters was made according to a systematic random selection proportional to their size (in number of households) within strata (regions). To do this clusters were organized by stratum and place of residence (urban / rural). A total of 240 clusters of which 185 were in rural areas and 55 in urban areas were selected for the investigation.
Selection of households: Households were randomly drawn after an enumeration exhaustive list of all households in the cluster. A draw tool designed on Excel by the team. The technique was used in the field for selecting households to investigate. In total, 20 households in clusters were selected to participate in the study.
Selection of individuals: The choice of individuals was made randomly using Kish's method. In total, an individual aged 25 to 64 living in a selected household was fired for participate in the survey."
Age range of participants included: 25-64 years
Source, translated from: Rapport de l'enquete national sur la prevalence des principaux facteurs de risques communs aux maladies non transmissibles au Burkina Faso Enquete STEPS 2013. Available at: http://www.who.int/chp/steps/burkina_faso/en/.

Ecuador STEPS 2018
Type and stages of the sample design. The STEPS sample was selected following an element probability sampling scheme with the following three stages of selection: i) first stage: selection of Primary Sampling Units (PSU) per stratum; ii) second stage: selection of 12 occupied

households within each PSU selected in the first stage; and, iii) third stage: selection of 1 person between 18 and 69 years old per household. Study domains. Men and women between 18 and 69 years of age at the national level, with the exception of Galapagos.

Sample selection. The selection of the PSUs, according to the established size, was carried out independently in a random manner in each of the strata. Twelve households were also randomly selected from each previously selected cluster. From the second survey period onwards, given the high rates of occupancy change, 16 dwellings per conglomerate were selected to counteract this effect. The change affected the remaining 230 clusters, giving a total of 6,680 dwellings to be surveyed. Finally, a list was made of the persons eligible for selection within each dwelling, randomly selecting one of them.
Age range of participants included: 18-69 years
Source: Ecuador STEPS 2019 Report [Translated]. Available at: https://extranet.who.int/ncdsmicrodata/index.php/catalog/774/study-description#page=sampling&tab=study-desc

Eswatini: STEPS 2014
"A Multi-stage cluster sampling design was applied. The survey covered all the four regions of the country. The size of the country and the distances between the regions and communities made it possible for the survey to sample a population representing all the 4 regions. The Multi-stage sampling procedure was implemented in the following procedural steps:
Stage 1: All four regions were included as a sampling frame of our Primary Sampling Unit (PSU).The number of the PSUs at this stage ensured precision in the survey estimates and as a result 216 PSUs were selected using probability proportional to size sampling.
Stage 2: The second stage of cluster sampling procedure entailed listing, sorting and random systematic sampling of the Secondary Sampling Units (Households) within the PSUs selected in stage1 where 20 households were selected from each PSU. Based on census data, only households with eligible participants were systematically sampled through random systematic sampling.
Stage 3: At this level, all the eligible participants within a household were sequentially listed into the PDAs and only one participant per household was randomly sampled using KISH method built into the PDAs. The KISH method is a widely used technique that uses a pre-assigned table of random numbers to identify the person to be interviewed."
Age range of participants included: 15 to 69 years
Source: WHO STEPS: Noncommunicable Disease Risk Factor Surveillance Report Swaziland 2014. Available at: http://www.who.int/chp/steps/swaziland/en/.

Ethiopia STEPS 2015:
According to the WHO step-wise approach to the surveillance of NCD risk factors, a community-based cross sectional study was carried out.
The target population for this survey included all men and women age15-69 years old who have been living at their place of residence for at least six months. This target population included all people who consider Ethiopia to be their primary place of residence. This definition included those individuals residing in Ethiopia regardless of their citizenship status. . People with the following characteristics were not included: those who were not a permanent resident of Ethiopia, and those who were institutionalized including people residing in hospitals, prisons, nursing homes, and other similar institutions or residents whose primary residences are military camps or dormitories. Furthermore, critically ill, mentally disabled and those with some type of physical disability that is not suitable for physical measurement were excluded from this study. In general, the target population of the study included individuals 15-69 years old and residing in all geographic areas of the country.

Age range of participants included: 15 to 69 years
Source: Ethiopia STEPS 2015 Report. Available at: https://extranet.who.int/ncdsmicrodata/index.php/catalog/794

Georgia: STEPS 2016
"The STEPS survey of noncommunicable disease (NCD) risk factors in Georgia was carried out from June 2016 to September 2016. Georgia carried out Step 1, Step 2 and Step 3. Socio demographic and behavioural information was collected in Step 1. Physical measurements such as height, weight and blood pressure were collected in Step 2. Biochemical measurements were collected to assess blood glucose and cholesterol levels in Step 3. The survey was a population-based survey of adults aged 18-69. A Multi-stage cluster sampling design was used to produce representative data for that age range in Georgia. A total of 5554 adults participated in the survey. The overall response rate was 75.7%."
Age range of participants included: 18 to 69 years
Source: Georgia STEPS Survey 2016 Fact Sheet. Available at: http://www.who.int/chp/steps/georgia/en/.

Guyana: STEPS 2016
"A response rate of 66.68% will be selected based on the experience and response rates of other surveys over the years such as the recent Demographic Health Survey 2009. [...] STEPS 3 involve taking blood samples from a proportion of the sample, in this case 50% of the sample, in order to measure raised blood glucose levels and abnormal blood lipids. [...] The STEPS sample will be prepared by the Bureau of Statistics Guyana following the recommended STEPS sample methodology. A multi-stage cluster sampling design will be used. Guyana is divided into 10 administrative regions and within the administrative regions there are seven towns and each region is further divided into enumeration districts. For the STEPS survey 288 enumeration districts will be selected using the population probability sampling method and from each enumeration district 12 households will be selected giving a total sample size of 3456. Further at the household level each participant will be randomly selected by the electronic tablet. For STEP 3 50% of the sample will be randomly selected to participate. A re-listing of some households may also be necessary, such as those interior region locations, in which case in addition to household listings, enumeration districts maps will also be provided so that a re-listing can be done where required."
Age range of participants included: 18 to 69 years
Source: STEPwise Approach to Chronic Disease risk factor surveillance (STEPS): Guyana's Implementation Plan. June 20, 2016. Ministry of Public Health, Guyana.

Iran: STEPS 2016
"The sampling part, which includes determining the sample size and the cluster head, belongs to the pre-study phase and was planned in the form of a specific protocol for sample size and statistical sampling. All experts in the quality control team supervised the finding of samples and cluster heads.
In order to estimate the prevalence rate of the risk factors for non-communicable diseases in the country in 1395, a sampling method proportionate to the population was used, which is a common approach in survey studies. Therefore, the selected sample size was proportionated to the population of that province. On the other hand, for estimating the prevalence of the risk factors in the province, in order to be on the safe side, the smallest sample size for achieving the predicted rates was calculated at 95%. This rate was equal to 384 samples, which was selected as the smallest sample size in the least populated province, Ilam. The required sample size for other provinces was therefore calculated according to the population of that province proportionate to the population of the reference province, Ilam. Besides, to control the non-

response error, 10% was added to the calculated sample size in each province. In order to decrease costs and increase efficiency, for provinces with 800 samples or more, weights were given to their samples. Weight-giving is an effective method used in surveys in order to decrease the sample size. This was achieved in the selected provinces by considering the calculated sample size as half and the sampling weight as double. The total sample size was calculated to be 30150 and to achieve this sample size, sampling from 3015 clusters was required."
Age range of participants included: 18 and older
Source: Iran STEPS 2015 report.
Available at: https://www.who.int/ncds/surveillance/steps/STEPS_2016_Atlas_EN.pdf?ua=1

Iraq: STEPS 2015
"The sample frame consisted of the population of Iraq of (18+) years for both sexes residing in the urban and rural area. It was based on the results of listing and numbering operation for the year 2009 that covered all governorates. Due to the unstable conditions at the time of the survey three governorates (Naynawa, Salahaddin and Al-Anbar) were excluded. A major challenge confronted was the late demographic change due to population movement, displacement and migration. All permanent residents of (18+) years of age, who were resident in Iraq within one month at the time of implementation of the survey were considered eligible. A cross-sectional community based survey covering 15 governorates in Iraq. A Multi-stage cluster sampling technique was depended to select the minimum representative sample size to estimate the prevalence of the risk factors of noncommunicable disease through direct interview, physical examination and laboratory examination of blood samples of study participants. A total of 412 clusters were randomly selected each contain ten households. One subject from each household was randomly selected using KISH table to participate in the survey with a total sample size of 4120. The Sample was designed to provide estimates on a number of indicators on the situation of Noncommunicable diseases risk factors in Iraq at the national level. A national based rather than a governorate based sample is selected. A multi stage cluster sampling was used with stratification to urban and rural areas. Primary sampling units (PSUs) were the blocks, which consisted of 70 households or more before selection."
Age range of participants included: 18 years and older
Source: Iraq STEPS 2015 report.
Available at: https://www.who.int/ncds/surveillance/steps/Iraq_2015_STEPS_Report.pdf

Jordan STEPS 2019
A national cross-sectional survey was conducted adopting a two-stage stratified-cluster sampling design. The margin error was (5%) and the confidence level was set at 95%. The Jordan Population and Housing Census 2015 was used as a sampling frame for Jordanians. A sample of 3000 households was randomly drawn to represent the Jordanian population. It was designed in a probability proportional to size (PPS) way to provide valid and reliable survey estimates across the entire Kingdom of Jordan - rural and urban areas, the twelve governorates and the smaller communities within. The sample also ensured reliable estimates in terms of geographical distribution, where Jordan was divided into three regions; north, centre, and south, also at governorate level. The north of Jordan covered Ajloun, Irbid, Jerash, and Mafraq, the centre region covered Amman, Balqa, Madaba, and Zarqa, and the south region covered Aqaba, Karak, Ma'an, and Tafieleh. Furthermore, each governorate was subdivided into area units called census blocks, which were the Primary Sampling Units (PSU-Blocks) for this survey (on average a PSU comprises 50-70 households). The PSU-Blocks were then regrouped to form clusters. From each PSU, eight households were randomly drawn with an equal probability systematic selection. A household was defined as a group of people living in the same dwelling space who eat meals together, acknowledging the authority of a man or a woman as the head

of the household. After the household selection and obtaining the permission of household residents to participate in the survey, all the eligible household members were entered into the STEPS program, which ran a random selection to choose one member household.
Age range of participants included: 18 to 69 years
Source: Jordan STEPS 2019 Report. Available at: https://extranet.who.int/ncdsmicrodata/index.php/catalog/853

Kenya: STEPS 2015
"The 2015 Kenya STEPs survey was a national cross-sectional household survey designed to provide estimates for indicators on risk factors for non-communicable diseases for persons age 18 – 69 years. The sample was designed with a sample size of 6,000 individuals to allow national estimates by sex (male and female) and residence (urban and rural areas). The survey used the fifth National Sample Surveys and Evaluation Programme (NASSEP V) master sample frame that was developed and maintained by KNBS. The frame was developed using the Enumeration Areas (EAs) generated from the 2009 Kenya Population and Housing Census to form 5,360 clusters split into four equal sub-samples. A three-stage cluster sample design was adopted for the survey involving selection of clusters, households and eligible individuals. In the first stage, 200 clusters (100 urban and 100 rural) were selected from one sub-sample of NASSEP V frame. A uniform sample of 30 households from the listed households in each cluster was selected in the second stage of sampling. The last stage of sampling was done using Personal Digital Assistants (PDAs) at the time of survey, where one individual was randomly selected from all eligible listed household members using a programmed KISH method of sampling."
Age range of participants included: 18 to 69 years
Source: WHO: Kenya STEPwise Survey for Non Communicable Diseases Risk Factors 2015 Report. Available at: http://www.who.int/chp/steps/Kenya_2015_STEPS_Report.pdf?ua=1.

Kiribati: STEPS 2015
The second Kiribati STEPS Survey was a population-based survey of 18-69 year olds. The decision was to use three age groups: 18-29, 30-44, 45-69 years for men and women using the following corrections:

- Design Effect of 1.0 (clustering at village and household level)
- 95% confidence interval; p value .05
- 0.7% response rate
- Baseline prevalence percentage indicator: 0.5
- FPC – not applicable
- 6 age-sex groups (18-29 years, 30-44 years, 45-69 years)

As STEPS is intended to be nationally representative, a multi-stage cluster sampling method was used. The STEPS sampling spreadsheet was completed using the most recent census information (2012). The sample was selected in two stages assuming no replacement. At the first stage, a sample of Enumeration Areas (Islands and villages) from each stratum using probability proportional to size (PPS) sampling was selected. In the second stage, a fixed number of households from each selected Enumeration Area using systematic sampling was selected. The third stage of sampling selection was done at the household level using the KISH method.
The sampling identified that data collection would be needed on the following islands: Makin, Butaritari, Marakei, Abaiang, North Tarawa, South Tarawa,Betio, Maiana, Abemama, Kuria, Aranuka, Nonouti, Tabiteuea North, Tabiteuea South, Arorae, Tabuaeran and Kiritimati. Further

details in Annex 3."
Age range of participants included: 18 to 69 years

Source: Kiribati STEPS 2015 report. Available at: https://extranet.who.int/ncdsmicrodata/index.php/catalog/724

Kyrgyzstan: STEPS 2013
A multi-stage cluster sample of households. One individual within the age range of the survey was selected per household.
Analysis weights were calculated by taking the inverse of the probability of selection of each participant. These weights were adjusted for differences in the age-sex composition of the sample population as compared to the target population.
Different weight variables are available per Step:
wStep1 - for interview data
wStep2 - for physical measures
wStep3 - for biochemical measures
This allows for differences in the weight calculation for each Step of the survey as the age-sex composition of the respondents to each Step can differ slightly due to refusal or drop out.
Age range of participants included: 25 to 64 years
Source: no report or fact sheet available. Sampling information obtained from: https://extranet.who.int/ncdsmicrodata/index.php/catalog/271/study-description#page=overview&tab=study-desc

Lebanon: STEPS 2017
"A national cross-sectional survey adopting a two-stage cluster sampling design was conducted for Steps 1, 2 and 3. The sampling frames references used were the population distribution in Lebanon 2014, retrieved from the Central Administration for Statistics (CAS) and the Syrian population distribution data 2015, retrieved from UNHCR. 144 clusters were selected for the Lebanese sample and 144 clusters for the Syrian sample. The Primary Sampling Units (PSUs) were cadastral areas (cadasters) and the Secondary Sampling Units (SSUs) were the households. Twenty participants were recruited from each cluster. The latest available population estimates (cadastral data) were used, to randomly recruit PSUs by Probability Proportionate to Size (PPS). To account for the issue of the variability in the cadasters' sizes, very small cadasters (<200 individuals) were combined with neighboring PSUs before selecting the sample, to enhance the likelihood of finding 20 target participants. On the other hand, cadasters with a large population size that were guaranteed to be sampled at least twice were handled as strata and each stratum were assigned a fixed number of random starting points based on how often it was selected with certainty. This was done using satellite images divided into grids, previously obtained from the Centers for Disease Control and Prevention (CDC) for all Lebanese cadasters.

For the Lebanese sample, the research team relied on the standard Expanded Program for Immunization (EPI) method for a systematic random selection of the households. Accordingly, within each selected PSU, households were identified using a systematic random approach following the WHO-UNICEF-EPI cluster method. The fieldworkers started with the highest floor on the right side of a building. If the household hosted an eligible participant, they proceeded with data collection, if not, they visited a second household which is selected by skipping 5 households. If during sampling, non-Lebanese households were selected, the fieldworker skipped them in a straight line until a Lebanese household was identified. This method has been previously used for national surveys in Lebanon. One participant was randomly selected within

each household, using the eSTEPS application. Households were chosen until the target of 20 participants was reached.

The PSUs for the Syrian refugees' sample were identified, using the most recent available refugee estimates to randomly recruit PSUs by PPS. The same measures aforementioned were done to account for the variation in the cadasters' sizes. The WHO-UNICEF- EPI cluster method was employed to select households. The fieldworkers targeted Syrian households; accordingly, when during sampling, non-Syrian households were selected, the fieldworker skipped them in a straight line until a Syrian household was identified. One participant was randomly selected within each household, using the eSTEPS application.

For both samples, following STEPS' team recommendations, sampling of participants was done without replacement, i.e. once a person was selected that person was not replaced with another one. Efforts were made to include all selected households. If the house was unoccupied at the time of the visit or if an adult was not available for an interview at the time of the visit, that house was revisited up to 4 times, with different visiting times. The number of refusals and non-responses was recorded."
Age range of participants included: 18 to 69 years
Source: Lebanon STEPS 2016-2017 report. Available at: https://www.who.int/ncds/surveillance/steps/Lebanon_STEPS_report_2016-2017.pdf?ua=1

Mexico: ENSANUT 2018
The ENSANUT 2018-19 is a national, urban and rural probabilistic survey. The units of analysis defined for the survey are the following: - Household is the set of people related by some kinship or not who usually sleep in a dwelling under the same roof, benefiting from a common income contributed by one or more of the household members. - Population aged 0 to 4 years (preschoolers)- Population aged 5 to 9 years (schoolchildren)- Population aged 10 to 19 years (adolescents)- Population aged 20 years and older (adults)- Utilizers

Once the PSUs and strata were constructed, the PSUs for the 2018-19 ENSANUT were selected in two stages: first, INEGI selected a master sample of PSUs with probability proportional to their number of dwellings in the year 2012, then, for the 2018-19 ENSANUT, a subsample of PSUs with equal probability was selected within each stratum. Finally, in each PSU, dwellings were selected with equal probability; on average, five dwellings were selected in each PSU of the high urban stratum and 20 dwellings were selected in the PSUs of the rural and urban complement strata.

Whenever possible, one adult, one adolescent, one schoolchild and one preschooler were selected from each household with equal probability. Also, whenever possible, up to two users of medical services during the last 15 days were selected in 40% of the dwellings, and in the remaining 60% of the dwellings, up to one user was selected.
Age range of participants included: All ages
Source: ENSANUT Report. Available at: https://ensanut.insp.mx/encuestas/ensanut2018/informes.php [Translated]

Moldova: STEPS 2013
"A total of 4807 randomly selected respondents participated in the survey. They were all aged 18–69 years, and the group comprised both sexes, as well as residents of all districts and the territorial administrative unit "Gagauz-Yeri", along with Chişinău and Balti municipalities. The survey did not cover the districts from the left bank of the Nistru River and the municipality of Bender. A two-stage cluster sampling procedure was carried out to select randomly participants

from among the target population. Cluster sectors from the 2004 Moldova Population Census were used as a basic unit. Given the differences in lifestyle and disease status between populations in urban and rural areas, the target population was stratified into urban and rural areas of residence for the STEPS survey. At the first stage, within each stratum, primary sampling units (PSUs) (enumeration areas (EAs)) were selected systematically with probability proportional to the 2004 Population Census EAs (measure of size equal to the number of population in the EAs, provided by the census). Before selection, the census sectors were sorted geographically from north to south within each stratum, in order to ensure additional implicit stratification according to geographical criteria. A total of 400 clusters representing 400 EAs were selected from the 10 991 census EAs. These probabilistically selected clusters were used also in Moldova's DHS conducted in 2005, and the Multiple Indicator Cluster Surveys (MICS) conducted in 2012. Cartographic materials from the Population Census conducted in Moldova in 2004 were not available, thus it was not possible to use them for the STEPS survey. Therefore, for the first stage the probabilistic samples from the abovementioned surveys were used.

Out of the 400 selected clusters, 167 were rural and 233 were urban. The distribution of the sample of 400 PSUs (EAs) for the DHS/MICS surveys was inversely proportional to the number of population within each stratum, taking into account that the response rate is lower in urban areas than rural owing to the smaller average size of the households in urban areas compared with rural areas. Thus, disproportional allocation with oversampling for urban areas was applied in the STEPS survey. A final weighting adjustment procedure was carried out to enable estimates at national and urban/rural levels.

At the second stage, 15 households (secondary sampling units (SSUs)) were selected within each of the 400 PSUs. From the updated list of households used for the MICS 2012 survey, 15 households were selected randomly per cluster, using the Microsoft Excel® random sample tool. A total of 6000 individuals were selected from among the 400 clusters. The Kish method *(17)* was applied for the random selection of one individual aged 18–69 years from each household.
Age of participants included: 18-69 years
Source: Republic of Moldova STEPS 2013 report. Available at: https://www.who.int/ncds/surveillance/steps/Moldova_2013_STEPS_Report.pdf

Mongolia: STEPS 2019
A multistage stratified sampling design was used to produce representative data for that age range in Mongolia. A total of 6654 adults participated in the survey. Analysis weights were calculated by taking the inverse of the probability of selection of each participant. These weights were adjusted for differences in the age-sex composition of the sample population as compared to the target population.
Different weight variables are available per Step:
wStep1 - for interview data
wStep2 - for physical measures
wStep3 - for biochemical measures
This allows for differences in the weight calculation for each Step of the survey as the age-sex composition of the respondents to each Step can differ slightly due to refusal or drop out. Additionally, some countries perform subsampling for Step 2 and/or Step 3. When no subsampling is done and response rates do not differ across Steps of the survey, the 3 weight variables will be the same.

Source: No report available. Sampling information obtained from https://extranet.who.int/ncdsmicrodata/index.php/catalog/836/study-description#page=sampling&tab=study-desc

Morocco: STEPS 2017

One of the essential elements for establishing a probability sampling plan is the constitution an adequate sampling frame. For the purpose of the STEPS survey, the sampling frame used to meet the sampling need was the 2014 master sample, developed by the HCP based on data from the 2014 population and housing census. It has the advantage extrapolate the sample results to the target population and estimate the accuracy desired. The stratification of observation units belonging to any sampling frame makes it possible to design sampling plans ensuring optimal sample size; a significant reduction in costs and a substantial improvement in the accuracy of expected estimators. However, the choice of criteria allowing the population to be divided into homogeneous groups (strata) and having recent and reliable data on these criteria is a task that requires generally considerable efforts (updating the sampling frame) both in terms of methodological than that of data collection.

In Morocco, the particularity of cities containing several social categories for which, synthesizing the vector of heterogeneous demographic and socioeconomic behavior into a representative characteristic makes stratification a difficult task. The stratification adopted was geographical for the two environments according to the weight in terms of households, each of which has a specific stratification: For urban units, the criteria used were the administrative division into regions, provinces / prefectures and the dominant habitat type. As for the rural environment, the primary units were stratified according to the geographical criterion, and the type of relief dominant at the municipal level.

Age range of participants included: 18 years and older

Source: Morocco STEPS report [translated online]: https://extranet.who.int/ncdsmicrodata/index.php/catalog/544/study-description

Myanmar: STEPS 2014

To achieve a nationally representative sample, a multi-stage sampling method was used to select townships, wards and villages, households and eligible participants at each of the selected households.

Stage 1: Selection of primary sampling units (PSUs)

Administratively, Myanmar is divided into 330 townships. A township is subdivided into wards for urban settings and village tracts and then villages for rural settings. The list of townships has been used as the sampling frame at the first stage of sampling. Townships form the Primary Sampling Units (PSUs). Out of the total 330 PSUs, 52 PSUs were selected using Probability Proportionate to Size of population in each PSU (PPS).

Stage 2: Selection of Secondary Sampling Units (SSUs)

From each selected PSU (township), 6 SSUs (wards and villages) were chosen using probability proportionate to population size, totaling 312 SSUs for the whole country.

Stage 3: Selection of eligible participants at household level

From each selected SSU (ward/village), 30 households were selected using systematic random sampling. The sampling frame for this sampling is the list of households with unique identification number (ID) developed from a recent listing of households available from the Basic Health Staff.

Stage 4: Selection of eligible participants at household level

One eligible participant (aged between 25 and 64 years) in the selected households was recruited for the survey. The Kish sampling method was used to randomly select one eligible member of the household. Using the Kish Method, eligible participants (adults

aged 25 to 64 years) in each household were ranked in order of 8 decreasing age, starting with males then females, then randomly selected using the automated program for Kish selection in the handheld PDA. Each PSU (township) was estimated to contribute 180 participants, totaling **9,360** participants for 52 selected townships for the whole country. In actual study, the total sample size was 8757 participants.
Age range of participants included: 18 years and older
Source: STEPwise approach to chronic disease risk factor surveillance report 2014. Available at: https://www.who.int/ncds/surveillance/steps/myanmar/en/

Nauru STEPS 2015
As STEPS is intended to be nationally representative, a simple random sample of individuals was identified, based on the most recent census survey. As STEPS is intended to be nationally representative, a simple random sample of individuals was identified, based on the most recent census survey.
Source: No report available. Sampling information obtained from https://extranet.who.int/ncdsmicrodata/index.php/catalog/836/study-description#page=sampling&tab=study-desc

Nepal: STEPS 2019
STEPS-2019 is national cross-sectional population-based household survey that used multi-stage cluster sampling design to sample households and eligible adult men and women (15-69 years of age) for questionnaire interview and physical examination (anthropometry, blood pressure measurement, blood glucose and cholesterol and urine sample for salt).

Survey population included men and women aged 15-69 years who have been the usual residents of the household for at least six months and have stayed in the household the night before the survey. People with the follow characteristics were not included: Those whose primary place of residence was in military base or group quarters, Those residing in hospitals, prisons, nursing homes and other institutions, Those too frail and mentally unfit to participate in the study, Those with any physical disability, Those unable or unwilling to give informed consent.

Sampling of Primary units (clusters):

This national representative sample was selected through multistage cluster sampling. Sampling frame consisting of the distribution of oldwards as in census 2011 was obtained from Central Bureau of Statistics (CBS). Then, in each of the province, the oldwards were compared with current classification of metropolitan, sub metropolitan, municipality, and rural municipalities and recorded as per new classification which has been recently updated by the government of Nepal. The location of the new classifications were matched with the oldwards and, finally, used as the sampling frame for selecting Primary Sampling Units (PSUs) for 2019 STEPS survey.

As a trade-off between survey costs and reducing the standard error, it was decided to sample 25 survey participants from each cluster, requiring sampling of 36.12 ~37 clusters in each of 7 provinces i.e. 259 clusters at national level.

Within each Province, the numbers of clusters were assigned to the three sub-strata in metropolitan, sub-metropolitan, municipality and rural municipality in proportion to the share of population in each of these 3 substrata in the total Province population.

Sampling of households and individuals from clusters:

A total of 25 households were sampled from each of the cluster. A sampling frame of the all households in the sampled PSUs was obtained through a complete household listing and mapping carried out in the sampled PSUs in September 6 to December 6 2018.

Sampling frame for selection of households from each PSU was prepared by conducting household listing and mapping. The team of enumerators visited the sampling PSUs and carried out a complete mapping of all the households in the PSU. If the sampled cluster were large, (if the population exceeds 300), cluster was segmented. In that case, field team started from northeast corner of each PSU and prepared an enumeration area of 300 household's with at least one person aged 15 years or more. Household listing questionnaire was used to list all of the household's members in selected PSUs. The listing was carried out electronically using Android ODK software. Mapping was done along with household listing. Drawing a location map of the cluster as well a detailed sketch map of all structures residing in the cluster was done These materials guided the interviewers to return to the pre-selected households for interview.

This lists of the households so prepared from all sampled PSUs served as the sampling frame for the selection of households in the next stage. From the prepare list, 25 households per PSU were sampled using equal systematic random sampling after determining the sampling interval by dividing the number of listed household by 25 and by randomly selecting the starting number between 0 and the sampling interval. From each of the selected, one adult member was sampled randomly for participation in the survey using the android tablet.
Age range of participants included: 15 to 69 years
Source: Nepal STEPS 2019 Report. Available at: https://extranet.who.int/ncdsmicrodata/index.php/catalog/771

Solomon Islands: STEPS 2015
A multi-stage cluster sample design was used to produce representative data. Analysis weights were calculated by taking the inverse of the probability of selection of each participant. These weights were adjusted for differences in the age-sex composition of the sample population as compared to the target population.
Different weight variables are available per Step:
wStep1 - for interview data
wStep2 - for physical measures
wStep3 - for biochemical measures
This allows for differences in the weight calculation for each Step of the survey as the age-sex composition of the respondents to each Step can differ slightly due to refusal or drop out."
Age range of participants included: 18 to 69 years
Source: no report or fact sheet available. Sampling information obtained from: https://extranet.who.int/ncdsmicrodata/index.php/catalog/710/study-description#page=overview&tab=study-desc

Sri Lanka STEPS 2014
A multi stage cluster sampling method was used to select a nationally representative sample from the total population. Department of Census and Statistics of Sri Lanka performed the selection of the study sample. Population of each divisional secretariat (DS) divisions as per the preliminary results of the Census done in 2012 was used for sampling.Sri Lanka is administratively divided in to 9 provinces and 25 districts. Each district is divided to Divisional Secretariat (DS) areas. Each DS area is divided to many Census Blocks, and each Census Block consists of many households.

The primary sampling unit (PSU) was a Divisional Secretariat (DS) area. Out of 331 DS areas available, 80 DS divisions were selected using proportionate to the size (PPS) sampling.
A census block was considered as a SSU. From each DS division (PSU), six secondary sampling units (SSU) were selected using the proportionate to the size (PPS) sampling technique. Therefore, a total of 480 SSUs or census blocks were selected from 80 PSUs.

Number of houses in each census block depends on the area density and the population density in each DS division. Tertiary sampling unit (TSU) was the household and 15 households from each CB by random systematic sampling by the Department Census and Statistics. Therefore, a sample of 7200 (80x6x15) households were selected. In some instances, there were more than one household living in one house. People who are cooking and eating together were considered as one household. Whenever there were more than one household in a house, one household was selected randomly to be included in the study.
Only one participant from each household was included in the survey. All the eligible members in the selected family were listed in descending order according to the age. Once this was done, these data was fed to the personal digital assistants (PDAs). The PDAs then automatically selected the eligible participant using the Kish method.
Age range of participants included: 18 to 69 years
Source: Sri Lanka STEPS 2014 Report. Available at:
https://extranet.who.int/ncdsmicrodata/index.php/catalog/614/study-description#page=overview&tab=study-desc

St. Vincent & the Grenadines: STEPS 2013
"The survey covered the entire island St. Vincent and the Grenadines, and was conducted using the following zoning categories:
1) Mainland (St. Vincent)
2) Northern Grenadines (Bequia and Mustique)
3) Southern Grenadines (Canouan and Union Island)

The sample size was proportionately divided between the three main reporting strata (St.Vincent/Northern Grenadines/Southern Grenadines). The country's most recent age breakdown based on the 2001 national census by St. Vincent was used to approximate the adult population 18-69 years by Island grouping. The survey was stratified by sex, age groups 18-29, 30-44 and 45-69 years and by geographical location – St. Vincent, Northern Grenadines and Southern Grenadines.

A three-stage cluster sampling approach was used. Enumeration districts were randomly selected using Probability Proportional to Size (PPS) from the sampling frame. A total of 199 enumeration districts were selected. The sampling frame was developed using the number of households per enumeration district taken from the 2012 preliminary census report; enumeration districts had been subsequently revised (2010-2011) so that no enumeration district containing more than 150 Households would be randomly selected from the selected enumeration districts. The number of households per enumeration district to be selected was 26. Where an enumeration district had been split into 2 or more new enumeration districts the number of households in the previously defined enumeration district was divided equally between the newly revised enumeration districts. The household list for each selected enumeration district was updated prior to selection of households during a re-listing exercise. This was necessary as the existing household listing for each enumeration district was outdated.

Eligible persons at the household level were randomly selected using the Kish method. If no one was present in the selected household, a notification of visit card was left and the interviewer revisited. There was a total of three visits to the household before it was listed as non-response (one initial recruitment visit and two call backs). The interviewer then moved on to the next house on the list in the original order. Although the person selected for interview were to be at least 18 years and not older than 69 years on the last birthday, there were a few instances where some participants were turning 18 or 70 years; those cases were addressed during data cleaning.

Biological samples, testing and Nutrition intake (24 hour recall):
Fifty percent (50%) of the survey participants were asked to provide a biological specimen (finger prick) for Glucose and cholesterol testing using Glucose and Lipid Sampling Kits and respond to the nutrition intake (24 hour recall). The biological sample was only collected with participants' explicit consent; the samples were not stored or used for additional undetermined or undisclosed future testing to which respondents did not agree at the time of participation."
Age range of participants included: 18 to 69 years
Source: WHO STEPS: Noncommunicable Disease Risk Factor Surveillance. Report for St. Vincent & the Grenadines 2015. Available at: http://www.who.int/ncds/surveillance/steps/stvincent/en/

Sudan: STEPS 2016
A four-stage cluster sampling design was implemented. The four sampling stages were; 1) selection of states from the six regions 2) selection of clusters (a cluster was a Popular Administrative unit), 3) selection of households and 4) selection of eligible individuals. First Stage (State): Administratively Sudan is divided into 18 states which are grouped in six regions, (North, East, Khartoum, Central, Kordofan and Darfur region (Table 1). States were randomly selected from each region. No geographical areas or populations were excluded from the sampling frame. Thus 11 states were selected, probability proportional to the size, to represent the six regions. A list of the selected states is shown in Table 2.1. Second Stage (Cluster PAU): The Popular Administrative Units (PAU) is the smallest geographically border unit. These were defined as the 'cluster' in the region. Clusters were randomly sampled from all PAUs, from both urban and rural strata, according to probability proportional to size in each state, and urban/rural distribution. The PAUs inaccessible due to security conditions were not excluded from the sampling frame, because within certain areas the security status was continuously changing. However, it was planned that if a PAU was found to be inaccessible at survey time, it should be replaced. However, no replacement was required during this survey. Third Stage (Household): Within the selected PAUs, all households (HH) were included in the sampling frame. Accordingly (HH) were selected using systematic random methods.
Fourth Stage (Individual): The members of the household were first listed in the mobile application (customized software). The inclusion criteria for the listed members were: all individuals aged between 18 to 69 years, from both sexes, irrespective of his health status and living in the selected household for a minimum of 6 weeks. The application was then run and it randomly selected the individual who will be selected to participate in the study.
Age of participants included: 18-69 years.
Source: Sudan STEPS 2016 report. Available at: https://www.who.int/ncds/surveillance/steps/Sudan_STEPwise_SURVEY_final_2016.pdf?ua=1

Tajikistan: STEPS 2016
A multi-stage cluster sample of households. One individual within the age range of the survey was selected per household.

Analysis weights were calculated by taking the inverse of the probability of selection of each participant. These weights were adjusted for differences in the age-sex composition of the sample population as compared to the target population.

Different weight variables are available per Step:
wStep1 - for interview data
wStep2 - for physical measures
wStep3 - for biochemical measures
This allows for differences in the weight calculation for each Step of the survey as the age-sex composition of the respondents to each Step can differ slightly due to refusal or drop out.
Age range of participants included: 18-69 years
Source: report not available. Sampling information obtained from: https://extranet.who.int/ncdsmicrodata/index.php/catalog/270/study-description#page=sampling&tab=study-desc

Timor-Leste: STEPS 2014
"Note: Data from Census 2010 were used for all sampling considerations. Even though planning and mapping for 2015 Census is ongoing, data from the Census will only be available after July 2015.
STEP 1: Selection of Enumeration Area
(1) List of EA with number of HH by district for Census 2010 was obtained from the Directorate of Statistics. There are 1826 EAs in Timor-Leste. Out of these, 150 EAs were selected.
(2) The number of EAs to be selected from each district was based on their proportion in the country's population as per Census 2010.
(3) The numbers of Households (HH) per EAs varied from 0 to more than 300. Therefore, probability proportion to size (PPS) was used.
(4) For each district, the EAs were arranged in ascending order of HH size.
(5) Sampling interval was obtained by dividing the total number of HH in the district by the number of EA to be selected from that district.
(6) A random number was generated between one and the sampling interval for that district, using tools available at random.org.
(7) The EA where that random number fell was the first EA to be selected.
(8) Subsequently, the sampling interval was added to the random number and the EA where this new number fell was selected. For the next number, the sampling interval was added to the number and so on, till the population of HH was exhausted or target number of EA achieved.
(9) This was done separately for each district.
(10) The final list was compiled and had 150 EAs. These are spread over about 125 sucos.
STEP 2. Selection of Households in an Enumeration Area
Listing the house numbers to be visited
(1) It was decided to use the 2010 HH size of each EA. Based on past experience, it was expected that the increase would be on an average about 4–5%.
(2) The list of households to be selected by enumerators was decided centrally.
(3) Sampling interval was calculated by dividing the total number of households in the EA by 18.
(4) The first HH number was selected randomly by reading the last two digits of a currency note. If the number represented by the two digits was more than 18, the last digit was taken into consideration. For each EA, a different currency note was used. This could also be done it by using the tool at random.org. or by draw of lots.
(5) The subsequent HH are identified by adding the sampling interval as was done for selection of EA."

Age range of participants included: 18 to 69 years
Source: Timor-Leste STEPS Survey Report, [online]
at http://www.who.int/entity/chp/steps/Timor-Leste_2014_STEPS_Report.pdf?ua=1

Tokelau STEPS 2014
A whole population-based (census) survey was used to produce representative data for that age range in Tokelau. Analysis weights contain adjustments for differences in the age-sex composition of the sample population as compared to the target population.
Different weight variables are available per Step:
wStep1 - for interview data
wStep2 - for physical measures
wStep3 - for biochemical measures
This allows for differences in the weight calculation for each Step of the survey as the age-sex composition of the respondents to each Step can differ slightly due to refusal or drop out.
Source: Report unavailable. Sampling information obtained from:
https://extranet.who.int/ncdsmicrodata/index.php/catalog/638/overview#page=sampling&tab=study-desc

Turkmenistan: STEPS 2018
Sample
The main purpose of the sample design for STEPS research in Turkmenistan - nationwide coverage and reflection of the situation in the country as a whole for measurable indicators. The survey was conducted among adults in Turkmenistan aged 18-69 years. (target population), who gave written informed consent, for exceptions: persons in the ranks of the National Armed Forces; population WHO STEPS Non-communicable disease risk assessment 26 www.who.int/chp/steps permanently residing (staying) in specialized institutions social and rehabilitation assistance, hospitals and other institutions health care, correctional facilities.

Method of sampling and stratification
The STEPS study was used to generate a sample set two-stage probability sampling method using stratification procedures and selection at each of the sampling stages. Geographical coverage - all regions of Turkmenistan: Akhal, Balkan, Dashoguz, Lebap and Mary provinces and the city of Ashgabat (the capital), which corresponds national administrative-territorial division. To ensure the uniformity of the distribution of the sample set across the country was stratification. Taking into account the division of each province into urban and rural
The total population was determined by 11 streets (the city of Ashgabat - only the city street, in velayatakh - 10 strat). The total sample size was distributed in proportion to the number households on the streets.

Age range of participants included: 18 to 69 years
Source: Translated from 2018 STEPS Survey Report. Available at:
https://www.who.int/ncds/surveillance/steps/turkmenistan/en/

Tuvalu: STEPS 2015
“The Tuvalu STEPS Survey was a population based cross-sectional survey of 18-69 year olds. Analysis weights were calculated by taking the inverse of the probability of selection of each participant. These weights were adjusted for differences in the age-sex composition of the sample population as compared to the target population.

Different weight variables are available per Step:

wStep1 - for interview data
wStep2 - for physical measures
wStep3 - for biochemical measures
This allows for differences in the weight calculation for each Step of the survey as the age-sex composition of the respondents to each Step can differ slightly due to refusal or drop out. Additionally, some countries perform subsampling for Step 2 and/or Step 3. When no subsampling is done and response rates do not differ across Steps of the survey, the 3 weight variables will be the same."
Age range of participants included: 18 to 69 years
Source: no report or fact sheet available. Sampling information obtained from: https://extranet.who.int/ncdsmicrodata/index.php/catalog/639/study-description#page=overview&tab=study-desc

Uganda: STEPS 2014
Sample Design
The study methodology followed the World Health Organization's (WHO) STEP wise approach to surveillance (STEPS) which provides a standardized method for analyzing and disseminating data on risk factors for non-communicable diseases (NCDs). The sample for the Uganda NCDs was designed to provide Cardiovascular Diseases (CVD) prevalence's, smoking and tobacco use and alcohol consumption estimates for the country as a whole and for urban and rural areas separately. A two stage sampling design was used to draw the sample. At the first stage, Enumeration Areas (EAs) were drawn with Probability Proportional to Size (PPS), and at the second stage, households which were the ultimate sampling units were drawn using Simple Random Sampling (SRS). A total of 350EAs were selected from 2014 Uganda Population and Housing Census Mapping Frame. At the EA level, the target was 14 households.

Sample frame
The 2014 Uganda NCD survey used a sampling frame of the 2014 Population Census Mapping listing provided by the Uganda Bureau of Statistics (UBOS). The UBOS has an electronic file consisting of 78,950 Enumeration Areas (EAs) created for the 2014 Population and Housing Census. An EA is a geographic area consisting of a convenient number of dwelling units that serve as counting units for the census. Tables A.1 provides information on the distribution of EAs and households in the sampling frame by region and residence. The table shows that among the 78,950 EAs, 13,087 (22%) are in urban areas and 65,863 (78%) are in rural areas. The average size of an EA, measured in number of households, is 95 in an urban EA and 77 in a rural EA, with an overall average of 79.

Age range of participants included: 18 to 69 years
Source: Ministry of Health. Non-Communicable Disease Risk Factor Baseline Survey: Uganda 2014 Report. Available at: https://www.who.int/ncds/surveillance/steps/Uganda_2014_STEPS_Report.pdf

Vietnam: STEPS 2015
At the same time of STEP survey, MOH also conduct the Global Adult Tobacco Survey (GATS) at the same scale, location, and study subjects (>15 years for GATS and 18-69 for STEPS). The sampling of STEPS was done in as part of the sampling for the (GATS) conducted in combination manner to save time and resources for these two surveys. Applied the multi-stages complex sampling process, the sampling process done by GSO was as follow: • Sampling of clusters (EA) In the first stage of sampling, the primary sampling unit (PSU) was an enumeration area (EA). There are about 170,000 EAs in the whole Viet Nam and the average number of

households in each EA is different between urban and rural areas. An average number of households in an urban EA and a rural EA is 133 households and 120 households, respectively. Sample of EAs were selected from the master sample frame. The master sample frame was a cluster frame made by the GSO based on the frame of Population and Housing Census 2009 and updated with data of 2014. Based on the Population and Housing Census data 2009, GSO prepared a 15% of master sample to serve as a national survey sampling frame. The master sample frame contains 25,500 enumeration areas (EAs) from 706/708 districts of Viet Nam (2 island districts were excluded from the GSO master sample frame). The master sample frame of GSO was divided by two stratification variables: urbanization (1 = urban; 2 = rural) and district group (1 = district/town/city of province; 2 = plain and coastal district; 3 = mountainous, island district). It means that the master sample frame was divided into 6 sample frames or 6 strata. The probability proportional to size (PPS) sampling method was used to select sample of EAs from 6 strata of master sample frame. The final sample of GATS included 315 EAs in the urban and 342 EAs for the rural. From these 657 EAs, 315 EAs were systematically selected for STEPS.
Sampling of households At the second stage of sampling, 10% households in each EA were selected. Thus, 15 households from the selected urban EA and 14 households from the selected rural EA were chosen using simple systematic random sampling. The total households for STEPS 2015 were 4,651 households.
Sampling of individuals: One eligible person is then randomly selected from each selected household for the STEPS 1 interview. The selection of individual is automatically done by the PDA program after eligible household members are entered into the PDA. The selection probability of an eligible individual was calculated as a product of selection probability for each stage. The sampling base weight for an eligible individual was the inverse of the selection probability shown above.
Age range of participants included: 18 to 69 years
Source: National Survey on the Risk Factors of Non-communicable diseases (STEPS) Viet Nam Report 2015. Available at: https://www.who.int/ncds/surveillance/steps/viet_nam/en/

Zambia: STEPS 2017
To ensure that the sample reflected the entire country of Zambia, a multi-stage cluster sampling technique was used to select a nationally representative sample of adults in Zambia aged 18 to 69 years. It was decided to utilize the household listing from the Zambia PopulationBased HIV Impact Assessment (ZAMPHIA) - a household-based national survey that was conducted between March and August 2016 in order to measure the status of Zambia's national HIV response. ZAMPHIA offered the most pragmatic up to date and accessible national household listing to be used as the sampling frame for this survey. The ZAMPHIA survey included 60,581 households drawn from 1,103 clusters referred to in this report as standard enumeration area (SEA) (Table 2.4.1). Thus the sample drawn for the STEPS survey was a subsample of the households selected for the ZAMPHIA survey. In the first stage of sampling, SEAs were selected from each province using probability proportional to size (PPS). In the second stage, 15 households in rural SEAs and 20 households in urban SEAs were selected systematically using appropriate sampling interval based on the number of households in that SEA. These households constituted the final list of households for the STEPS survey prepared for the field investigators (FI). In the third stage, while the FI approached the household and sought consent, all eligible members in the household were entered into the Android-based devise used for the survey. The device then selected one member from the eligible members using a simple random sampling technique. The selected member was then interviewed having gone through the ethical process of consent after being provided with information on the survey. If the selected member was not available, a scheduled visit was made. If the selected member could not be reached after two scheduled visits he or she was considered as non-response. There

was no replacement strategy so as to maintain the integrity and representativeness of the sample.
Age range of participants included: 18 to 69 years
Source: STEPS 2017 Report. Available at:
https://extranet.who.int/ncdsmicrodata/index.php/catalog/620

Appendix 3: Data sharing

Data included in this study are publicly available for 38 of the 41 included country surveys. Survey documents, codebooks, and deidentified microdata can be downloaded at the following links:

Mexico National Survey on Health and Nutrition (ENSANUT): https://ensanut.insp.mx/encuestas/ensanut2018/descargas.php

STEPS Microdata repository: https://extranet.who.int/ncdsmicrodata/index.php/catalog/STEPS)

For countries without publicly available microdata (Burkina Faso, Iran, and St. Vincent & the Grenadines) and for which we have arranged data use agreements, please contact ghp@hsph.harvard.edu for further information on requesting microdata from the owners of these data.

Statistical replication code is available at the Harvard Dataverse (https://doi.org/10.7910/DVN/BTSHNR).

Appendix 4: Diabetes biomarker devices by country

Diabetes Biomarker	Country	Post Hoc Adjustment*
Point-of-care fasting capillary glucose		
Accu-check	Tuvalu	None
Accutrend® Plus (Roche, Basel, Switzerland)	Guyana	Multiplied by 1.11
CardioCheck® PA (pts Diagnostics, Indianapolis, Indiana, USA)	Afghanistan, Belarus, Benin, Bhutan, Burkina Faso, Eswatini, Kenya, Kiribati, Moldova, Morocco, Nauru, Nepal, Solomon Islands, St. Vincent & The Grenadines, Sudan, Sri Lanka, Timor-Leste, Tokelau, Turkmenistan, Uganda, Vietnam, Zambia	None
MultiCare-in© (Biochemical Systems International, Arezzo, Italy)	Georgia	None
SD LipidoCare Analyzer (automatic plasma equivalent)	Myanmar	None
Prima home test	Mongolia	None
Unknown	Algeria, Azerbaijan, Botswana, Ecuador, Kyrgyzstan, Tajikistan	None
Laboratory-based Assessment of Fasting Plasma Glucose		
Central laboratory was used for processing	Bangladesh, Lebanon, Mexico	N/A
Cobas 6000 and C311 analyzer (Roche Diagnostics, Indianapolis, Indiana, USA)	Iran	N/A
Enzymatic assay (glucose oxidase)	Iraq	N/A
CardioCheck PA Analyser	Ethiopia, Jordan	N/A
Hemoglobin A1c (HbA1c)		
Dried blood spots using the Hemocue system	Indonesia	N/A
Plasma sample by Cobas C311 auto-analyzer (Roche kits)	Iran	N/A
Central laboratory	Mexico	N/A
Unknown	Guyana	N/A
Unknown	Armenia	N/A

*Post hoc adjustment to convert from capillary to plasma equivalents. N/A=Not available.[28,29]

Appendix 5: Blood pressure measurement devices by country

Country	Measurement device	Number of measurements	Interval between measurements
Afghanistan	Calibrated sphygmomanometer	3	3 minutes
Algeria	No report available	No report available	No report available
Armenia	No report available	No report available	No report available
Azerbaijan	Riester Ri-Champion Automatic Digital Monitor-1715	3	10 minutes
Bangladesh	Life Source UA-767 Plus Digital Monitor	3	10 minutes
Belarus	Boso-Medicus Uno	3	3 minutes
Benin	Boso Medicus Uno	3	3 minutes
Bhutan	Omron digital upper arm meter (model not specified)	3	5 minutes
Botswana	Not specified	Not specified	Not specified
Burkina Faso	Omron Digital Monitor HEM-705CP	3	10 minutes
Ecuador	Not specified	Not specified	Not specified
Eswatini	Boso Medicus PC (model not specified)	3	3-5 minutes
Ethiopia	Boso-Medicus Uno	3	3 minutes
Georgia	Boso Medicus Uno	3	3 minutes
Guyana	Omron digital upper arm meter (model not specified)	3	3 minutes
Iran	Beurer BM 20	3	5
Iraq	Not specified	Not specified	Not specified
Jordan	Omron M3	Not specified	Not specified
Kenya	Omron M2 Digital Monitor	3	3-5 minutes
Kiribati	OMRON M4 Digital Automatic Blood Pressure Monitor	3	2-3 minutes
Kyrgyzstan	No report available	No report available	No report available
Lebanon	Manual mercury sphygmomanometer	2	5 minutes
Mexico	Omron HEM-907 XL	“AHA protocol”	“AHA protocol”
Moldova	Boso-Medicus Uno	3	3 minutes
Mongolia	Not specified	Not specified	Not specified
Morocco	Spengler® ES 60	3	“a few minutes”

Country	Measurement device	Number of measurements	Interval between measurements
Myanmar	Boso-Medicus automatic digital blood pressure monitor (model not specified)	3	3 minutes
Nauru	No report available	No report available	No report available
Nepal	Omron digital upper arm meter (model not specified)	3	3 minutes
Solomon Islands	No report available	No report available	No report available
Sri Lanka	Not specified	Not specified	Not specified
St. Vincent & the Grenadines	Omron Digital Monitor M4 - I	3	3 minutes
Sudan	Boso-Medicus Uno	3	3 minutes
Tajikistan	No report available	No report available	No report available
Timor-Leste	Omron digital upper arm meter (model not specified)	3	2 minutes
Tokelau	No report available	No report available	No report available
Turkmenistan	OMRON device	No report available	No report available
Tuvalu	No report available	No report available	No report available
Uganda	Boso Medicus Uno	3	3-5 minutes
Vietnam	BOSO Device	Not specified	Not Specified
Zambia	Not specified	3	3-5 minutes

N/A=Not available.

Appendix 6: Cholesterol measurement devices by country

Measurement	Country
Accutrend GCT	Tokelau
Accutrend Plus	Tuvalu
CardioCheck PA	Afghanistan, Belarus, Benin, Bhutan, Burkina Faso, Ecuador, Eswatini, Ethiopia, Jordan, Kenya, Kiribati, Malawi, Moldova, Mongolia, Morocco, Nauru, Nepal, Solomon Islands, Sri Lanka, St. Vincent & the Grenadines, Sudan, Sri Lanka, Timor-Leste, Tokelau, Turkmenistan, Uganda, Vietnam, Zambia
Laboratory	Bangladesh, Belize, Guyana, Iran, Iraq, Lebanon, Mexico
SD LipidoCare Analyzer	Mongolia, Myanmar
Unknown	Algeria, Armenia, Azerbaijan, Botswana, Ecuador, Georgia, Kyrgyzstan, Tajikistan

Appendix 7: Country-specific external data used in analyses

Country	Per capita income (2017 constant international $)	Health spending per capita (current international $)	DALYS attributable to ischemic heart disease and stroke (per 100,000)	NCD policy implementation score, 2020 (%)	2019 population ages 40-69 years (thousands)
Afghanistan	2,230	186	3,158	42	5,452
Algeria	11,706	994	3,681	17	11,361
Armenia	11,571	877	6,285	56	1,072
Azerbaijan	13,513	655	6,229	61	3,357
Bangladesh	4,643	110	2,595	53	40,442
Belarus	17,004	1,076	11,835	81	3,874
Benin	2,922	85	1,052	42	1,799
Bhutan	8,896	272	2,319	39	180
Botswana	16,823	957	2,079	47	526
Burkina Faso	1,835	101	1,148	44	3,371
Ecuador	11,256	955	1,511	56	4,502
Eswatini	7,857	694	1,678	33	203
Ethiopia	1,772	62	780	47	15,248
Georgia	12,382	778	8,399	81	1,383
Guyana	11,976	404	4,176	50	211
Iran	14,245	1,727	3,196	89	24,820
Iraq	10,891	502	3,429	53	8,699
Jordan	10,074	738	1,782	53	2,626
Kenya	3,776	156	930	47	8,514
Kiribati	4,488	169	5,007	50	26
Kyrgyzstan	4,380	264	4,042	64	1,603

Country	Per capita income (2017 constant international $)	Health spending per capita (current international $)	DALYS attributable to ischemic heart disease and stroke (per 100,000)	NCD policy implementation score, 2020 (%)	2019 population ages 40-69 years (thousands)
Lebanon	15,942	1,081	5,108	39	1,417
Mexico	19,451	1,066	1,923	53	36,102
Moldova	10,736	489	8,636	83	1,477
Mongolia	10,844	519	3,902	64	937
Morocco	7,171	440	5,570	58	10,514
Myanmar	3,843	208	2,766	39	15,495
Nauru	14,932	1,498	4,850	33	2
Nepal	3,457	180	2,200	53	7,027
Solomon Islands	2,613	116	6,679	33	125
Sri Lanka	11,181	406	3,053	72	7,368
St. Vincent & the Grenadines	12,158	486	3,460	33	39
Sudan	4,206	325	3,244	44	6,912
Tajikistan	3,614	211	3,424	53	2,042
Timor-Leste	7,134	186	2,386	50	253
Tokelau	6,275	443	4,366		0
Turkmenistan	13,615	1,275	5,939	89	1,382
Tuvalu	5,575	601	5,661	28	3
Uganda	1,984	133	768	47	5,287
Vietnam	6,130	339	2,777	64	31,480
Zambia	3,331	180	1,018	25	2,641
Overall[b]	7,857 (3,843-11,976)	440 (186-778)	3,244 (2,079-5,007)	50 (40-60)	2,626 (526-7,368)

[a]No NCD Policy Score is available for Tokelau. [b] This is the median value and interquartile range with each country having the same weight.

Appendix 8: Additional details on study sample by country

Country	Secondary prevention sample, n	Secondary prevention sample, weighted % among total sample	Primary prevention sample, n	Primary prevention sample, % among total sample	Median (IQR) 10-year CVD risk among primary prevention sample[b]
Afghanistan	185	14.2 (10.0-19.8)	159	11.9 (7.9-17.6)	21.3 (13.8-26.8)
Algeria	273	7.4 (6.3-8.6)	497	16.7 (15.2-18.3)	20.7 (13.5-25.1)
Armenia	219	14.5 (12.3-17.0)	116	14.4 (11.5-17.8)	25.6 (20.5-33.4)
Azerbaijan	230	11.4 (9.4-13.6)	221	12.1 (10.2-14.2)	25.3 (19.9-34.9)
Bangladesh	505	14.7 (12.6-17.0)	233	7.3 (6.1-8.7)	8.3 (5.4-12.6)
Belarus	381	11.1 (9.3-13.3)	494	16.1 (14.5-17.8)	24.5 (21.7-29.9)
Benin	131	5.6 (4.0-7.7)	37	1.7 (1.0-2.6)	20.1 (8.2-22.6)
Bhutan	11	0.8 (0.4-1.7)	30	2.5 (1.5-4.0)	6.7 (4.1-10.8)
Botswana	109	8.3 (5.9-11.4)	52	3.7 (2.4-5.7)	10.2 (7.3-17.3)
Burkina Faso	133	6.8 (5.4-8.5)	4	0.2 (0.1-0.5)	18.0 (10.4-25.8)
Ecuador	235	10.5 (9.0-12.2)	126	7.3 (5.9-9.0)	6.4 (4.8-9.2)
Eswatini	67	6.9 (4.7-10.2)	54	7.0 (4.8-10.1)	11.2 (8.0-17.1)
Ethiopia	140	4.5 (3.5-5.8)	49	1.2 (0.8-1.9)	8.9 (5.3-13.8)
Georgia	810	26.6 (24.1-29.1)	235	13.1 (11.2-15.2)	24.7 (19.8-34.5)
Guyana	148	11.9 (9.4-14.8)	67	17.8 (13.3-23.4)	9.8 (6.9-15.0)
Iran	348	2.5 (2.2-2.8)	1,349	14.0 (13.1-14.9)	20.3 (14.0-24.6)
Iraq	180	10.2 (8.6-12.1)	352	25.5 (22.5-28.7)	21.0 (14.2-25.9)
Jordan	323	11.3 (9.8-13.1)	339	20.7 (17.8-24.0)	18.1 (12.3-22.8)
Kenya	118	6.6 (4.9-8.9)	37	1.7 (1.0-3.1)	8.8 (5.8-15.8)
Kiribati	92	10.4 (6.4-16.5)	51	16.4 (11.0-23.6)	9.9 (6.1-14.8)
Kyrgyzstan	309	16.4 (13.8-19.4)	98	9.4 (6.5-13.6)	23.9 (15.6-30.1)

Country	Secondary prevention sample, n	Secondary prevention sample, weighted % among total sample	Primary prevention sample, n	Primary prevention sample, % among total sample	Median (IQR) 10-year CVD risk among primary prevention sample[b]
Lebanon	67	5.9 (4.3-8.0)	146	18.4 (13.6-24.3)	23.3 (20.5-29.2)
Mexico	519	2.4 (2.1-2.8)	1,082	15.5 (14.2-17.0)	9.4 (5.8-15.4)
Moldova	672	19.1 (17.2-21.3)	314	13.5 (11.7-15.6)	24.6 (21.9-30.7)
Mongolia	643	18.1 (16.4-20.0)	252	9.1 (7.9-10.4)	24.7 (19.1-32.2)
Morocco	108	3.8 (3.1-4.6)	384	14.7 (13.3-16.2)	20.6 (13.8-25.4)
Myanmar	617	8.3 (6.7-10.3)	307	5.5 (4.5-6.8)	8.7 (5.6-13.1)
Nauru	119	25.7 (21.6-30.3)	62	24.1 (16.0-34.6)	8.9 (6.0-11.8)
Nepal	59	1.7 (1.1-2.5)	101	4.4 (3.0-6.3)	11.7 (6.7-20.4)
Solomon Islands	92	7.6 (5.0-11.2)	16	1.6 (0.9-3.0)	20.6 (12.8-23.4)
Sri Lanka	234	7.5 (6.4-8.6)	322	13.7 (12.2-15.4)	8.8 (6.0-12.8)
St. Vincent & the Grenadines	118	5.4 (3.5-8.0)	76	13.8 (10.9-17.3)	10.3 (6.3-13.4)
Sudan	76	2.1 (1.6-2.8)	371	12.0 (10.5-13.9)	20.0 (11.9-25.3)
Tajikistan	115	8.4 (6.1-11.6)	84	8.2 (6.2-11.0)	23.9 (20.0-29.8)
Timor-Leste	20	1.5 (0.9-2.5)	12	1.0 (0.6-1.8)	20.3 (13.3-22.7)
Tokelau	22	8.8 (5.8-13.1)	69	30.3 (27.2-33.6)	12.9 (9.8-17.4)
Turkmenistan	277	12.4 (10.3-15.0)	81	5.3 (4.0-7.0)	24.6 (21.1-32.3)
Tuvalu	64	13.2 (8.9-19.2)	63	14.8 (9.9-21.5)	11.6 (7.9-19.4)
Uganda	148	11.1 (9.0-13.7)	10	0.8 (0.4-1.8)	8.7 (4.8-12.0)
Vietnam	241	10.0 (8.7-11.6)	61	3.3 (2.4-4.5)	11.7 (7.8-21.9)
Zambia	71	4.2 (3.1-5.6)	40	3.3 (2.2-4.8)	13.0 (7.9-22.7)
Overall[a]	**9,229**	**7.9 (7.4-8.3)**	**8,453**	**9.7 (9.3-10.1)**	**18.4 (9.9-24.6)**

[a]Estimates account for survey design and weighting by each country's 2019 population of individuals 40-69 years of age. [b]As the need for statin therapy for primary prevention includes those with diabetes, not all individuals had >20% or greater 10-year CVD risk.

Appendix 9: Sample characteristics

Characteristic	Total sample		Secondary prevention sample		Primary prevention sample	
Age	**n**	**Weighted % (95% CI)**	**n**	**Weighted % (95% CI)**	**n**	**Weighted % (95% CI)**
<50 years	49,466	44.9 (44.3-45.5)	2,777	33.1 (31.1-35.1)	1,440	22.8 (20.2-25.7)
50-59 years	39,829	33.0 (32.5-33.6)	3,378	35.3 (33.4-37.4)	2,917	37.6 (34.6-40.7)
60-69 years	27,154	22.1 (21.5-22.7)	3,074	31.6 (29.6-33.6)	4,096	39.6 (36.6-42.6)
Sex						
Male	50,383	49.6 (49.0-50.2)	3,586	47.0 (44.7-49.2)	3,923	50.8 (47.7-53.9)
Female	66,066	50.4 (49.8-51.0)	5,643	53.0 (50.8-55.3)	4,530	49.2 (46.1-52.3)
Education						
No schooling	24,387	28.3 (27.5-29.1)	1,425	28.1 (26.0-30.3)	1,695	20.6 (18.3-23.0)
Primary education	36,980	32.8 (32.1-33.5)	2,640	36.1 (34.0-38.3)	2,767	34.7 (31.9-37.6)
Secondary or above	53,443	38.9 (38.1-39.6)	5,058	35.8 (33.8-37.8)	3,834	44.7 (41.8-47.7)
Rural vs. urban residence						
Urban	53,489	47.4 (46.6-48.2)	4,158	50.7 (48.5-52.8)	4,536	63.5 (61.0-65.9)
Rural	39,713	52.6 (51.8-53.4)	3,100	49.3 (47.2-51.5)	2,477	36.5 (34.1-39.0)
Overall	**116,449**	**100**	**9,229**	**100**	**8,453**	**100**

Appendix 10: Details on missing data by country

Country	Missing data on self-reported prior CVD among total sample (unweighted %)	Missing data on statin use among total sample (unweighted %)	Missing data to calculate CVD risk among sample without prior CVD (unweighted %)[a]
Afghanistan	<0.1	<0.1	0.5
Algeria	0.5	0.5	2.2
Armenia	<0.1	<0.1	7.3
Azerbaijan	<0.1	<0.1	1.8
Bangladesh	<0.1	<0.1	0.5
Belarus	<0.1	<0.1	1.3
Benin	0.1	0.1	1.7
Bhutan	<0.1	<0.1	0.2
Botswana	<0.1	<0.1	2.3
Burkina Faso	0.1	0.1	0.9
Ecuador	<0.1	<0.1	1.6
Eswatini	7.7	7.7	2.9
Ethiopia	<0.1	<0.1	0.4
Georgia	<0.1	<0.1	3.0
Guyana	<0.1	<0.1	4.6
Iran	1.8	1.8	1.3
Iraq	0.1	0.2	3.5
Jordan	<0.1	<0.1	2.1
Kenya	0.1	<0.1	2.7
Kiribati	1.4	1.4	6.0
Kyrgyzstan	<0.1	<0.1	1.0
Lebanon	<0.1	<0.1	10.7
Mexico	<0.1	<0.1	4.3
Moldova	1.2	1.2	2.6
Mongolia	<0.1	<0.1	2.0
Morocco	<0.1	<0.1	2.0
Myanmar	<0.1	<0.1	1.3
Nauru	0.4	0.4	2.7
Nepal	<0.1	<0.1	0.4
Solomon Islands	0.4	0.4	2.7
Sri Lanka	0.3	0.3	1.4

Country	Missing data on self-reported prior CVD among total sample (unweighted %)	Missing data on statin use among total sample (unweighted %)	Missing data to calculate CVD risk among sample without prior CVD (unweighted %)[a]
St. Vincent & the Grenadines	<0.1	<0.1	3.8
Sudan	<0.1	<0.1	1.2
Tajikistan	<0.1	<0.1	1.1
Timor-Leste	0.5	0.5	0.7
Tokelau	<0.1	<0.1	6.8
Turkmenistan	<0.1	<0.1	2.0
Tuvalu	0.2	0.2	2.8
Uganda	0.7	0.7	2.4
Vietnam	0.2	0.2	3.0
Zambia	<0.1	<0.1	1.8
Overall	**0.4**	**0.4**	**2.0**

[a]Denominator refers to all people with biochemical measurements in the total sample.

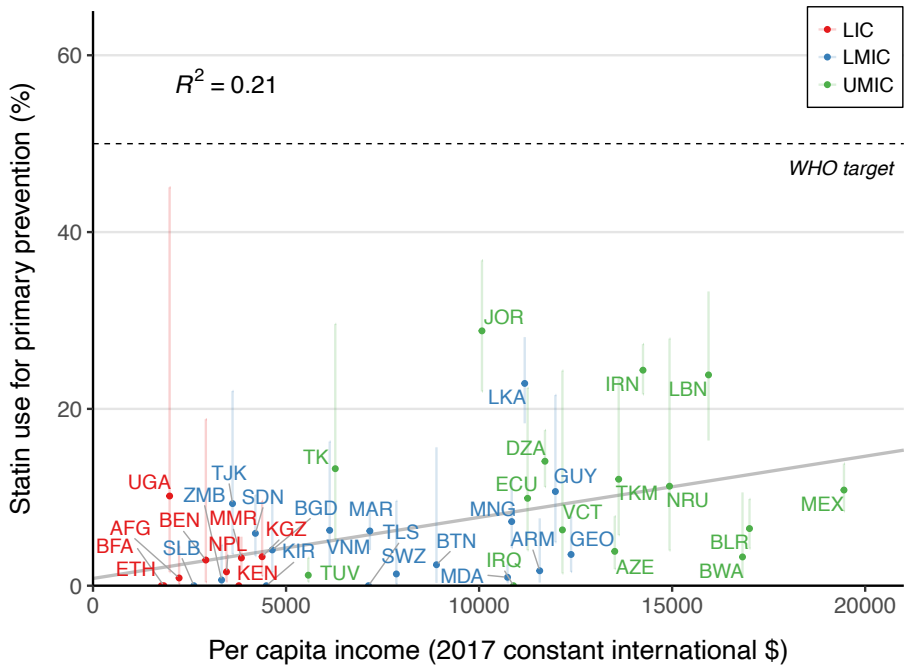
Appendix 11: Proportion of statin use by country

Country	Proportion (95% CI) using statins for secondary prevention of CVD	Proportion (95% CI) using statins for primary prevention of CVD
Afghanistan	28.6 (13.1-51.4)	0.9 (0.2-4.5)
Algeria	28.4 (23.2-34.3)	14.1 (11.2-17.6)
Armenia	11.7 (7.2-18.6)	1.7 (0.4-7.8)
Azerbaijan	19.4 (13.1-27.6)	3.9 (1.9-7.9)
Bangladesh	24.7 (16.8-34.6)	6.4 (2.0-18.6)
Belarus	19.8 (14.9-25.8)	6.5 (4.2-9.8)
Benin	5.1 (1.7-14.4)	2.8 (0.4-18.2)
Bhutan	0.8 (0.1-6.5)	2.4 (0.3-15.7)
Botswana	3.5 (0.7-15.2)	3.3 (1.0-10.7)
Burkina Faso	3.8 (1.5-9.1)	0
Ecuador	16.1 (10.9-23.3)	8.7 (3.7-19.1)
Eswatini	4.3 (0.8-19.1)	1.3 (0.2-9.6)
Ethiopia	6.3 (3.0-12.7)	0
Georgia	7.0 (5.0-9.7)	3.6 (1.6-8.0)
Guyana	13.0 (7.9-20.6)	10.7 (4.9-21.6)
Iran	59.1 (53.7-64.3)	24.7 (22.3-27.1)
Iraq	35.0 (26.9-44.0)	N/A
Jordan	40.5 (32.5-49.0)	29.0 (22.3-36.7)
Kenya	2.2 (0.7-7.0)	0
Kiribati	8.6 (3.1-21.4)	0
Kyrgyzstan	6.3 (3.5-10.8)	3.3 (1.1-9.6)
Lebanon	46.5 (27.8-66.2)	25.4 (17.7-35.2)
Mexico	16.6 (11.5-23.2)	11.3 (9.0-14.1)
Moldova	15.5 (11.5-20.6)	1.0 (0.4-2.4)
Mongolia	9.0 (6.9-11.6)	7.3 (4.3-12.0)
Morocco	15.2 (9.5-23.5)	6.0 (3.9-9.1)
Myanmar	8.9 (6.3-12.4)	3.2 (1.8-5.6)
Nauru	12.9 (9.0-18.1)	11.3 (4.0-27.9)
Nepal	8.4 (2.1-28.0)	1.5 (0.5-5.0)
Solomon Islands	2.2 (0.7-6.4)	0
Sri Lanka	48.0 (40.5-55.7)	23.0 (18.5-28.2)

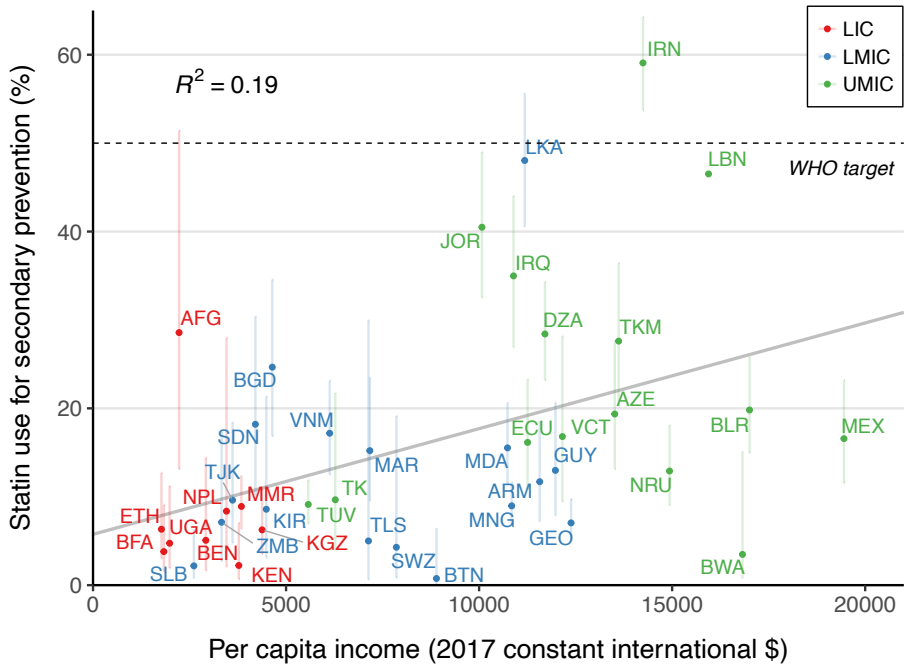
Country	Proportion (95% CI) using statins for secondary prevention of CVD	Proportion (95% CI) using statins for primary prevention of CVD
St. Vincent & the Grenadines	16.8 (9.4-28.2)	6.3 (1.4-24.3)
Sudan	18.2 (10.2-30.4)	5.9 (3.3-10.2)
Tajikistan	9.6 (4.8-18.4)	9.3 (3.6-22.0)
Timor-Leste	5.0 (0.6-30.0)	0
Tokelau	9.7 (4.0-21.7)	13.2 (5.2-29.6)
Turkmenistan	27.6 (20.2-36.5)	12.1 (5.8-23.8)
Tuvalu	9.1 (6.9-11.9)	1.3 (0.5-3.5)
Uganda	4.7 (1.9-11.2)	10.1 (1.5-45.1)
Vietnam	17.2 (12.5-23.1)	6.3 (2.2-16.4)
Zambia	7.1 (2.7-17.3)	0.6 (0.1-4.6)

Appendix 12: Statin use by per-capita income

A. Primary prevention



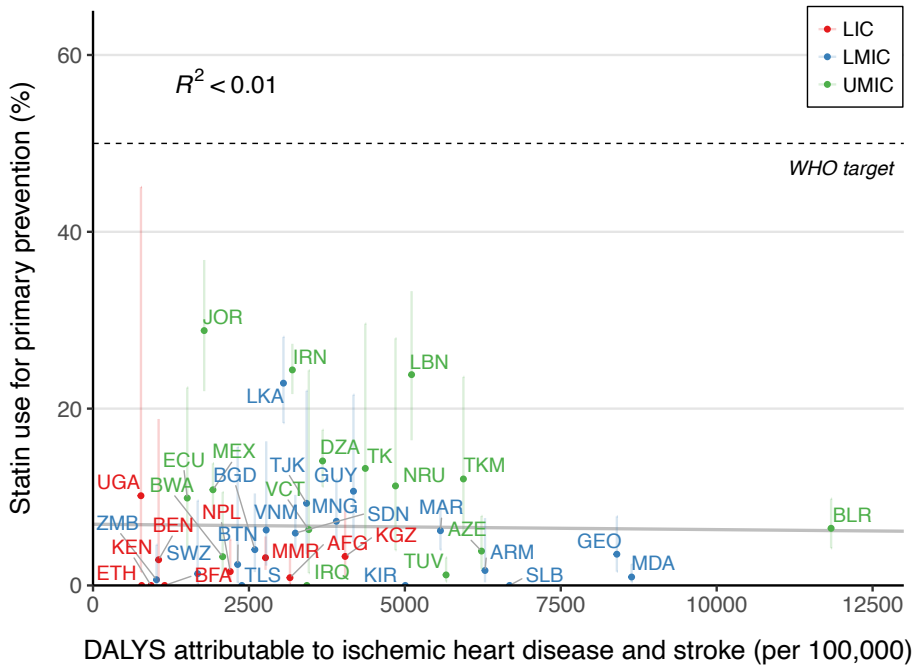
B. Secondary prevention



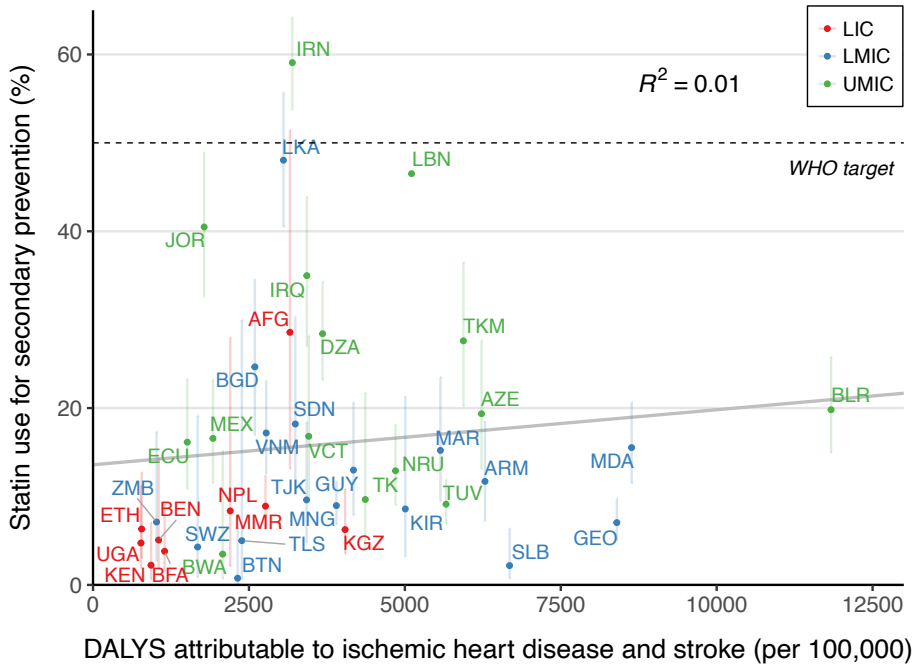
The standardized regression coefficients were 0.46 (95% CI, 0.18 to 0.75) for primary prevention and 0.43 (95% CI, 0.14 to 0.73) for secondary prevention.

Appendix 13: Statin use by CVD burden

A. Primary prevention



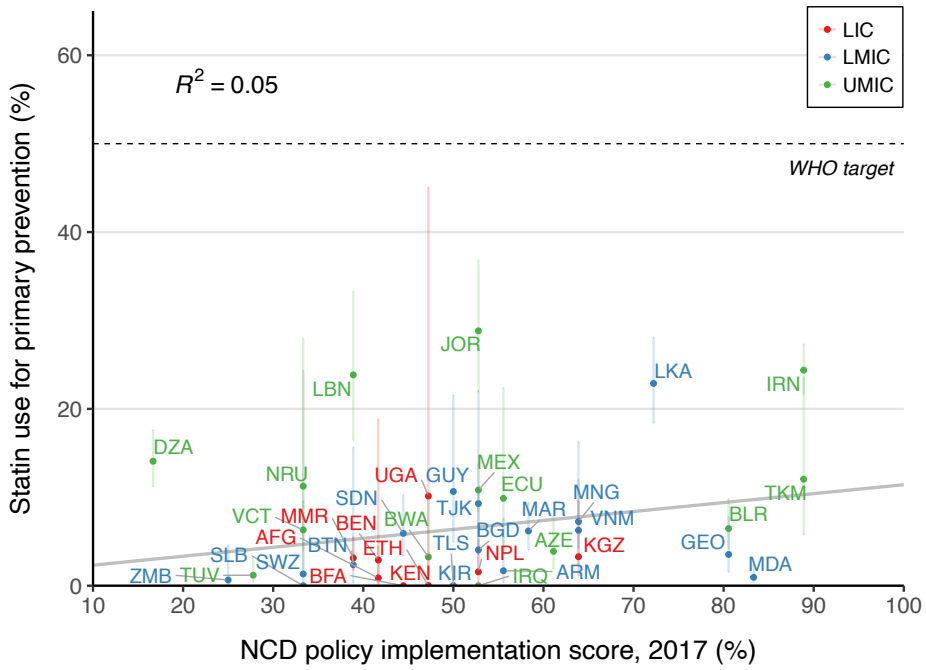
B. Secondary prevention



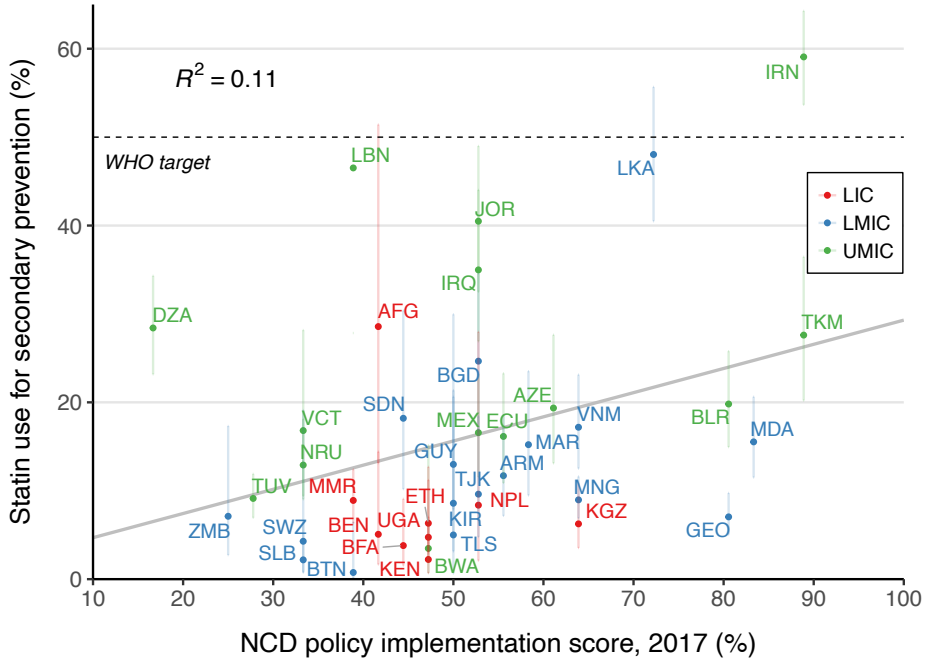
The standardized regression coefficients were -0.02 (95% CI, -0.34 to 0.30) for primary prevention and 0.11 (95% CI, -0.21 to 0.43) for secondary prevention.

Appendix 14: Statin use by NCD policy commitment

A. Primary prevention



B. Secondary prevention



The standardized regression coefficients were 0.23 (95% CI, -0.09 to 0.55) for primary prevention and 0.34 (95% CI, 0.03 to 0.65) for secondary prevention.

Appendix 15: Risk ratios and average marginal effects from country-level Poisson regression of statin use for secondary prevention between female vs. male sex (reference category)

Country	Risk ratio (95% CI)	Average marginal effect, % (95% CI)
Afghanistan	1.26 (0.42-3.73)	6.4 (-25.2 to 38.1)
Algeria	0.75 (0.54-1.04)	-8.1 (-17.4 to 1.3)
Armenia	0.33 (0.15-0.77)	-11.3 (-21.2 to -1.3)
Azerbaijan	0.76 (0.44-1.33)	-5.3 (-16.1 to 5.5)
Bangladesh	0.87 (0.51-1.51)	-3.3 (-16.5 to 9.8)
Belarus	1.15 (0.69-1.93)	2.8 (-7.2 to 12.8)
Benin	0.55 (0.08-3.89)	-2.9 (-13.5 to 7.7)
Bhutan	N/A	N/A
Botswana	N/A	N/A
Burkina Faso	1.62 (0.27-9.69)	1.7 (-4.5 to 8.0)
Ecuador	0.63 (0.32-1.23)	-7.4 (-18.9 to 4.1)
Eswatini	N/A	N/A
Ethiopia	0.71 (0.19-2.70)	-2.1 (-11.1 to 6.9)
Georgia	0.46 (0.25-0.88)	-5.3 (-10.1 to -0.5)
Guyana	1.31 (0.52-3.31)	3.4 (-8.2 to 15.0)
Iran	0.94 (0.79-1.12)	-3.5 (-13.7 to 6.7)
Iraq	1.05 (0.64-1.73)	1.7 (-16.0 to 19.3)
Jordan	0.61 (0.41-0.90)	-18.3 (-31.7 to -4.9)
Kenya	N/A	N/A
Kiribati	0.19 (0.07-0.54)	-16.1 (-31.3 to -0.8)
Kyrgyzstan	0.56 (0.23-1.34)	-3.7 (-9.8 to 2.4)
Lebanon	1.10 (0.54-2.22)	4.4 (-28.4 to 37.1)
Mexico	0.66 (0.34-1.30)	-6.7 (-17.9 to 4.4)
Moldova	0.85 (0.47-1.54)	-2.6 (-12.6 to 7.3)
Mongolia	1.52 (0.85-2.73)	3.6 (-1.3 to 8.5)
Morocco	0.88 (0.35-2.22)	-2.0 (-16.6 to 12.6)
Myanmar	1.23 (0.63-2.38)	1.8 (-3.7 to 7.3)
Nauru	0.67 (0.29-1.55)	-5.4 (-16.3 to 5.4)
Nepal	N/A	N/A
Solomon Islands	N/A	N/A
Sri Lanka	0.83 (0.62-1.12)	-8.6 (-22.6 to 5.5)

Country	Risk ratio (95% CI)	Average marginal effect, % (95% CI)
St. Vincent & the Grenadines	1.16 (0.46-2.90)	2.5 (-12.0 to 17.0)
Sudan	0.42 (0.16-1.13)	-15.3 (-34.9 to 4.3)
Tajikistan	3.48 (0.96-12.67)	12.0 (-2.6 to 26.6)
Timor-Leste	N/A	N/A
Tokelau	N/A	N/A
Turkmenistan	0.81 (0.50-1.31)	-5.9 (-19.8 to 8.0)
Tuvalu	2.48 (0.55-11.21)	6.9 (-3.0 to 16.8)
Uganda	0.11 (0.01-0.95)	-10.3 (-21.4 to 0.8)
Vietnam	1.33 (0.69-2.56)	4.8 (-6.0 to 15.6)
Zambia	1.29 (0.16-10.41)	1.8 (-11.8 to 15.4)

Appendix 16: Risk ratios and average marginal effects from country-level Poisson regression of statin use for secondary prevention between ≥ 55 years vs. ≤ 55 years of age (reference category)

Country	Risk ratio (95% CI)	Average marginal effect, % (95% CI)
Afghanistan	0.47 (0.19-1.12)	-19.8 (-40.0 to 0.4)
Algeria	2.51 (1.70-3.72)	26.7 (15.5 to 37.9)
Armenia	4.38 (1.04-18.40)	13.9 (3.4 to 24.5)
Azerbaijan	1.49 (0.80-2.76)	7.5 (-4.0 to 19.1)
Bangladesh	2.10 (1.36-3.24)	17.4 (5.5 to 29.3)
Belarus	1.23 (0.63-2.39)	3.9 (-8.0 to 15.7)
Benin	1.76 (0.28-10.94)	3.0 (-9.0 to 15.0)
Bhutan	N/A	N/A
Botswana	N/A	N/A
Burkina Faso	1.43 (0.29-7.08)	1.4 (-5.1 to 8.0)
Ecuador	2.88 (1.37-6.08)	16.2 (4.6 to 27.9)
Eswatini	N/A	N/A
Ethiopia	3.10 (0.75-12.75)	8.4 (-3.7 to 20.5)
Georgia	2.39 (1.16-4.96)	5.5 (1.3 to 9.7)
Guyana	3.78 (1.19-12.02)	15.3 (1.1 to 29.5)
Iran	1.36 (1.07-1.73)	17.1 (5.0 to 29.2)
Iraq	2.12 (1.03-4.37)	22.2 (4.3 to 40.1)
Jordan	2.34 (1.51-3.64)	30.0 (16.6 to 43.5)
Kenya	N/A	N/A
Kiribati	4.07 (0.83-19.82)	12.0 (-5.7 to 29.7)
Kyrgyzstan	2.41 (0.99-5.88)	5.4 (-0.5 to 11.2)
Lebanon	1.72 (0.70-4.27)	24.9 (-16.7 to 66.6)
Mexico	0.86 (0.43-1.72)	-2.4 (-14.2 to 9.3)
Moldova	1.02 (0.63-1.63)	0.3 (-7.0 to 7.5)
Mongolia	1.72 (1.00-2.96)	5.2 (-0.2 to 10.6)
Morocco	2.19 (0.72-6.67)	11.3 (-2.9 to 25.4)
Myanmar	0.72 (0.36-1.45)	-2.8 (-8.5 to 2.9)
Nauru	1.41 (0.43-4.55)	4.5 (-10.9 to 20.0)
Nepal	N/A	N/A
Solomon Islands	N/A	N/A
Sri Lanka	2.34 (1.59-3.44)	35.9 (22.8 to 49.0)

Country	Risk ratio (95% CI)	Average marginal effect, % (95% CI)
St. Vincent & the Grenadines	5.26 (1.63-16.96)	22.8 (4.7 to 40.9)
Sudan	0.70 (0.22-2.17)	-6.3 (-25.9 to 13.4)
Tajikistan	1.53 (0.38-6.15)	4.2 (-8.7 to 17.1)
Timor-Leste	N/A	N/A
Tokelau	N/A	N/A
Turkmenistan	1.23 (0.75-2.02)	5.7 (-7.5 to 18.8)
Tuvalu	0.15 (0.01-1.96)	-15.9 (-41.8 to 10.0)
Uganda	0.59 (0.10-3.41)	-2.3 (-9.7 to 5.2)
Vietnam	3.13 (1.50-6.55)	18.1 (7.0 to 29.3)
Zambia	3.88 (0.68-22.27)	9.4 (-4.6 to 23.4)

Appendix 17: Risk ratios and average marginal effects from country-level Poisson regression of statin use for secondary prevention between ≥ secondary education vs ≤ primary school (reference category)

Country	Risk ratio (95% CI)	Average marginal effect, % (95% CI)
Afghanistan	2.05 (1.03-4.08)	27.3 (1.3 to 53.2)
Algeria	0.93 (0.58-1.50)	-2.0 (-15.0 to 10.9)
Armenia	0.46 (0.09-2.39)	-13.6 (-54.1 to 26.9)
Azerbaijan	N/A	N/A
Bangladesh	1.31 (0.72-2.40)	7.4 (-9.7 to 24.5)
Belarus	1.28 (0.74-2.21)	4.7 (-5.1 to 14.4)
Benin	N/A	N/A
Bhutan	N/A	N/A
Botswana	N/A	N/A
Burkina Faso	10.03 (2.86-35.13)	21.8 (-6.7 to 50.4)
Ecuador	1.86 (0.92-3.75)	10.4 (-2.0 to 22.9)
Eswatini	N/A	N/A
Ethiopia	0.33 (0.03-3.46)	-4.4 (-11.4 to 2.6)
Georgia	0.39 (0.11-1.42)	-11.1 (-34.0 to 11.9)
Guyana	0.98 (0.36-2.68)	-0.2 (-13.2 to 12.8)
Iran	1.12 (0.93-1.36)	7.0 (-4.5 to 18.5)
Iraq	1.02 (0.55-1.89)	0.7 (-21.1 to 22.4)
Jordan	1.36 (0.87-2.13)	13.8 (-8.4 to 36.0)
Kenya	N/A	N/A
Kiribati	1.45 (0.26-8.04)	3.6 (-14.6 to 21.8)
Kyrgyzstan	0.26 (0.05-1.21)	-17.0 (-51.0 to 17.0)
Lebanon	1.11 (0.49-2.53)	4.8 (-34.0 to 43.6)
Mexico	1.52 (0.82-2.81)	6.9 (-3.1 to 16.8)
Moldova	3.26 (0.42-25.39)	10.8 (0.6 to 21.0)
Mongolia	1.68 (0.65-4.32)	3.8 (-1.9 to 9.4)
Morocco	2.76 (1.19-6.41)	17.8 (-1.1 to 36.6)
Myanmar	2.54 (1.05-6.16)	9.3 (0.3 to 18.3)
Nauru	1.83 (0.52-6.47)	6.8 (-5.8 to 19.4)
Nepal	N/A	N/A
Solomon Islands	N/A	N/A
Sri Lanka	1.64 (1.17-2.31)	21.7 (8.6 to 34.9)

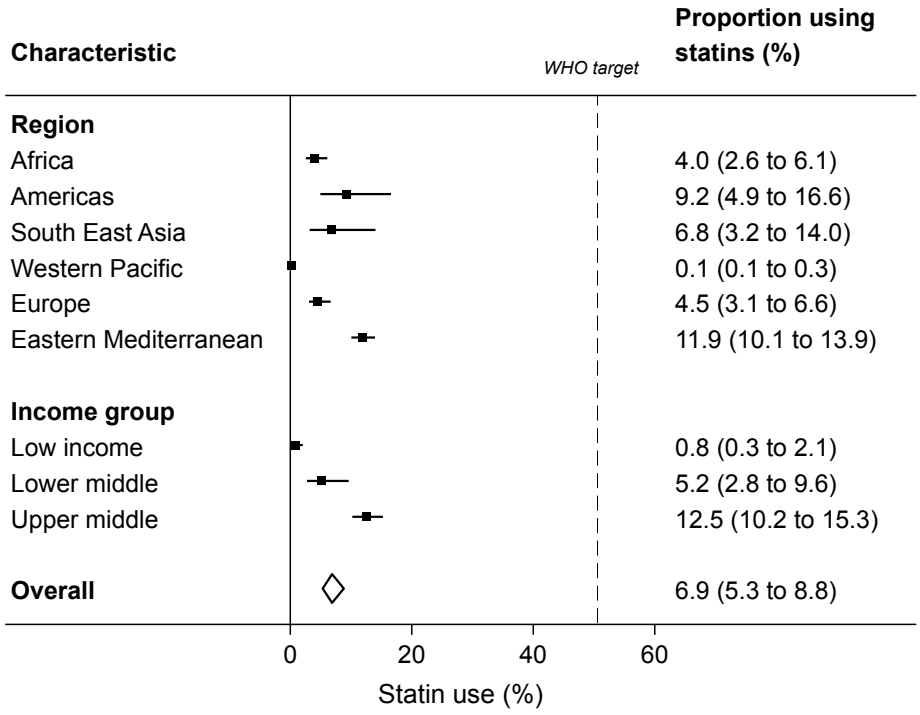
Country	Risk ratio (95% CI)	Average marginal effect, % (95% CI)
St. Vincent & the Grenadines	1.67 (0.44-6.28)	9.9 (-16.8 to 36.7)
Sudan	6.21 (1.91-20.14)	38.9 (10.9 to 67.0)
Tajikistan	4.17 (1.31-13.30)	17.0 (-2.7 to 36.7)
Timor-Leste	N/A	N/A
Tokelau	N/A	N/A
Turkmenistan	N/A	N/A
Tuvalu	5.71 (0.62-52.29)	12.8 (-1.7 to 27.3)
Uganda	1.25 (0.22-7.22)	1.1 (-7.4 to 9.6)
Vietnam	1.20 (0.61-2.36)	2.6 (-6.7 to 11.9)
Zambia	3.55 (0.84-15.01)	11.6 (-8.7 to 31.8)

Appendix 18: Risk ratios and average marginal effects from country-level Poisson regression of statin use for secondary prevention between rural vs. urban residence (reference category)

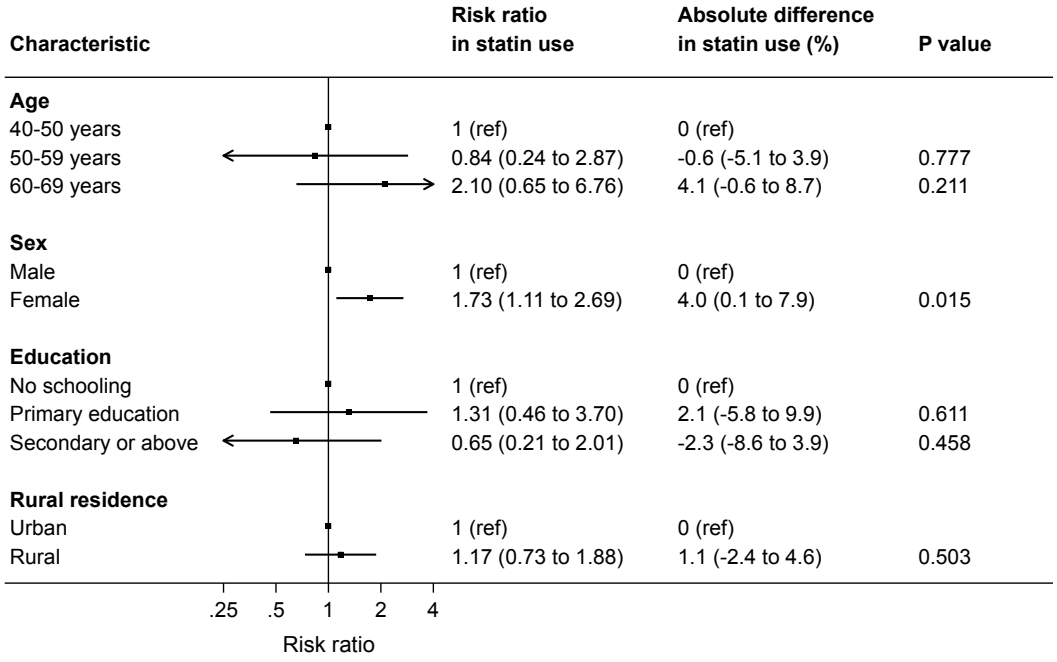
Country	Risk ratio (95% CI)	Average marginal effect, % (95% CI)
Afghanistan	1.41 (0.46-4.37)	9.5 (-21.6 to 40.6)
Algeria	0.54 (0.30-0.95)	-15.2 (-26.5 to -4.0)
Armenia	1.07 (0.44-2.56)	0.7 (-9.7 to 11.2)
Azerbaijan	1.44 (0.69-3.00)	7.1 (-7.0 to 21.2)
Bangladesh	0.96 (0.55-1.67)	-1.1 (-15.0 to 12.7)
Belarus	0.56 (0.32-0.99)	-11.0 (-22.1 to 0.2)
Benin	0.13 (0.03-0.70)	-9.9 (-24.9 to 5.0)
Bhutan	N/A	N/A
Botswana	N/A	N/A
Burkina Faso	0.59 (0.09-3.82)	-2.2 (-10.4 to 6.1)
Ecuador	N/A	N/A
Eswatini	N/A	N/A
Ethiopia	0.37 (0.11-1.21)	-7.2 (-17.0 to 2.7)
Georgia	0.98 (0.50-1.95)	-0.1 (-4.9 to 4.7)
Guyana	1.08 (0.33-3.52)	0.9 (-13.8 to 15.7)
Iran	0.93 (0.75-1.16)	-4.1 (-16.5 to 8.3)
Iraq	1.09 (0.53-2.22)	2.9 (-23.5 to 29.4)
Jordan	1.24 (0.80-1.91)	9.2 (-10.9 to 29.3)
Kenya	N/A	N/A
Kiribati	N/A	N/A
Kyrgyzstan	0.48 (0.15-1.51)	-5.1 (-14.1 to 3.9)
Lebanon	N/A	N/A
Mexico	0.69 (0.35-1.37)	-5.3 (-15.0 to 4.3)
Moldova	0.66 (0.37-1.20)	-6.5 (-14.9 to 1.9)
Mongolia	0.80 (0.46-1.40)	-1.9 (-6.6 to 2.8)
Morocco	0.16 (0.02-1.19)	-15.9 (-26.4 to -5.4)
Myanmar	N/A	N/A
Nauru	N/A	N/A
Nepal	N/A	N/A
Solomon Islands	N/A	N/A
Sri Lanka	N/A	N/A

Country	Risk ratio (95% CI)	Average marginal effect, % (95% CI)
St. Vincent & the Grenadines	N/A	N/A
Sudan	0.28 (0.08-1.03)	-20.3 (-41.1 to 0.5)
Tajikistan	N/A	N/A
Timor-Leste	N/A	N/A
Tokelau	N/A	N/A
Turkmenistan	0.96 (0.54-1.71)	-1.1 (-16.8 to 14.6)
Tuvalu	N/A	N/A
Uganda	0.92 (0.15-5.51)	-0.4 (-9.3 to 8.5)
Vietnam	0.44 (0.22-0.88)	-14.1 (-24.6 to -3.5)
Zambia	0.10 (0.02-0.57)	-15.9 (-33.4 to 1.6)

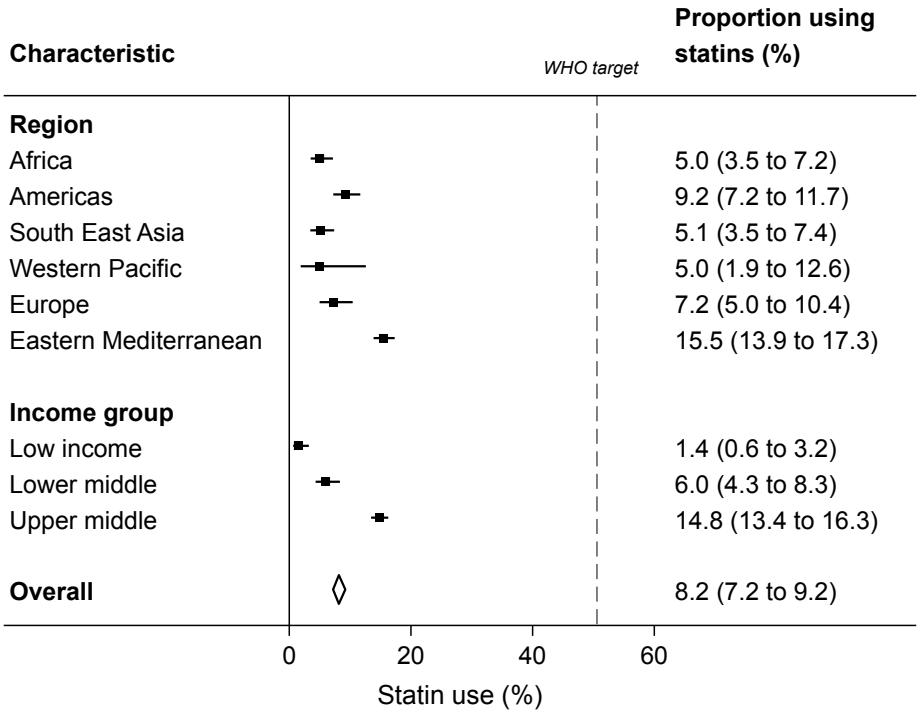
Appendix 19: Forest plot of statin use for primary prevention by region, income group, and overall among individuals aged ≥40 years with 10-year CVD risk >20% (sensitivity analysis 1)



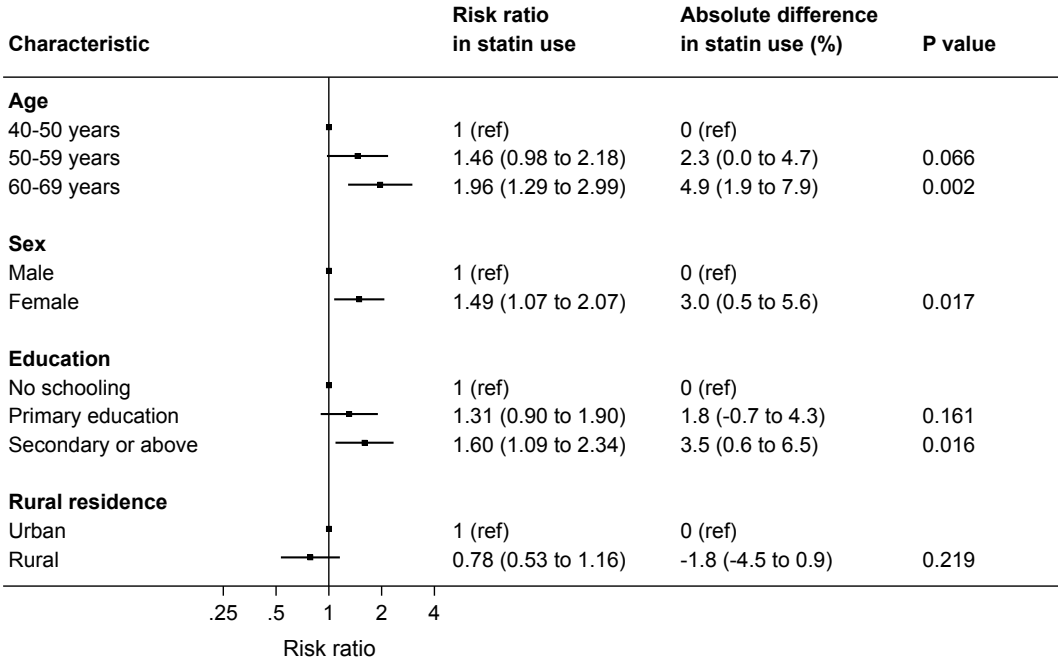
Appendix 20: Forest plot from multivariable regression of statin use for primary prevention among individuals aged ≥40 years with 10-year CVD risk >20% (sensitivity analysis 1)



Appendix 21: Forest plot of statin use for primary CVD prevention by region, income group, and overall using the 2007 WHO/ISH CVD risk charts and a 10-year CVD risk threshold of ≥30% (sensitivity analysis 2)



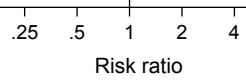
Appendix 22: Forest plot from multivariable regression of statin use for primary CVD prevention using the 2007 WHO/ISH CVD risk charts and a 10-year CVD risk threshold of ≥30% (sensitivity analysis 2)



Appendix 23: Forest plot from multivariable regression of statin use excluding rural vs. urban residence (sensitivity analysis 3)

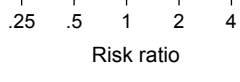
A. Primary prevention

Characteristic	Risk ratio in statin use	Absolute difference in statin use (%)	P value
Age			
40-50 years	1 (ref)	0 (ref)	
50-59 years	1.37 (0.87 to 2.18)	2.0 (-0.7 to 4.7)	0.177
60-69 years	1.90 (1.18 to 3.06)	4.8 (1.4 to 8.1)	0.008
Sex			
Male	1 (ref)	0 (ref)	
Female	1.88 (1.34 to 2.63)	5.0 (2.1 to 7.8)	<0.0001
Education			
No schooling	1 (ref)	0 (ref)	
Primary education	1.28 (0.91 to 1.80)	1.6 (-0.7 to 3.8)	0.164
Secondary or above	1.83 (1.34 to 2.50)	4.7 (2.1 to 7.2)	<0.0001



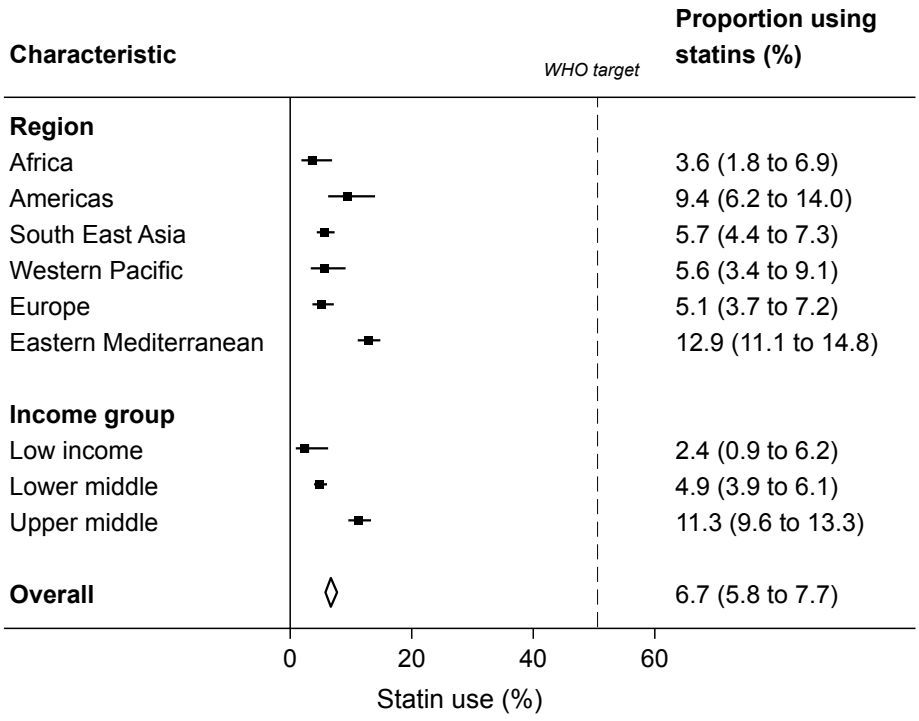
B. Secondary prevention

Characteristic	Risk ratio in statin use	Absolute difference in statin use (%)	P value
Age			
40-50 years	1 (ref)	0 (ref)	
50-59 years	1.79 (1.44 to 2.23)	10.1 (6.5 to 13.7)	<0.0001
60-69 years	2.18 (1.76 to 2.71)	15.1 (11.1 to 19.2)	<0.0001
Sex			
Male	1 (ref)	0 (ref)	
Female	0.97 (0.83 to 1.13)	-0.6 (-4.0 to 2.7)	0.712
Education			
No schooling	1 (ref)	0 (ref)	
Primary education	1.10 (0.84 to 1.44)	1.8 (-3.1 to 6.8)	0.482
Secondary or above	1.44 (1.12 to 1.86)	8.0 (2.9 to 13.1)	0.005

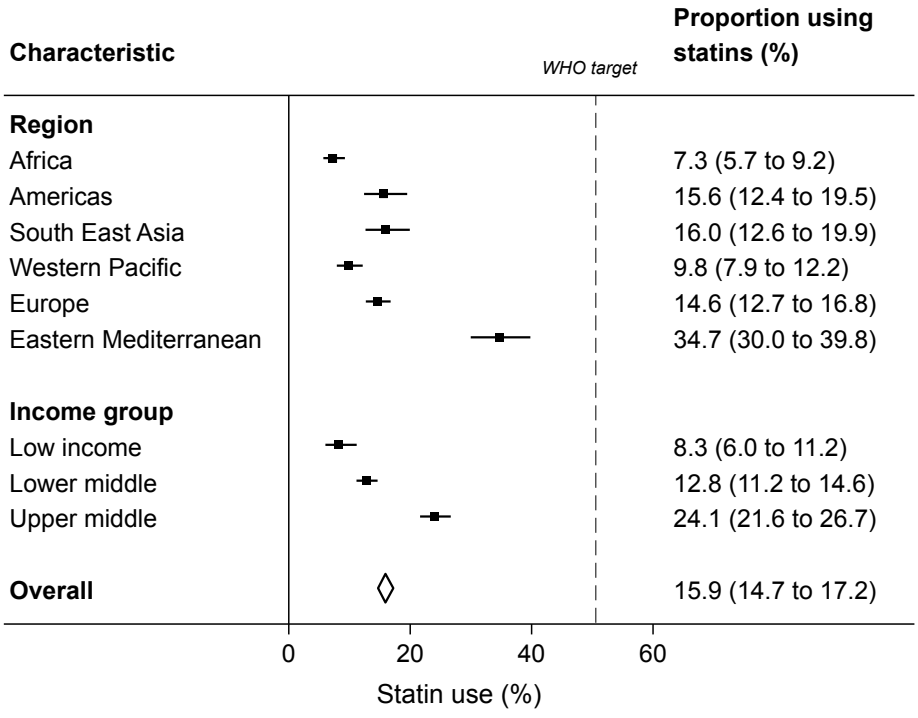


Appendix 24: Forest plot of statin use by region, income group, and overall using equal country weights (sensitivity analysis 4)

A. Primary prevention



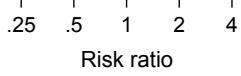
B. Secondary prevention



Appendix 25: Forest plot from multivariable regression of statin use using equal country weights (sensitivity analysis 5)

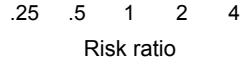
A. Primary prevention

Characteristic	Risk ratio in statin use	Absolute difference in statin use (%)	P value
Age			
40-50 years	1 (ref)	0 (ref)	
50-59 years	0.84 (0.46 to 1.55)	-1.1 (-5.2 to 3.0)	0.580
60-69 years	0.90 (0.54 to 1.51)	-0.7 (-4.2 to 2.9)	0.702
Sex			
Male	1 (ref)	0 (ref)	
Female	1.34 (0.90 to 2.00)	1.8 (-0.6 to 4.2)	0.155
Education			
No schooling	1 (ref)	0 (ref)	
Primary education	1.12 (0.73 to 1.71)	0.6 (-1.7 to 2.9)	0.613
Secondary or above	1.38 (0.90 to 2.10)	1.9 (-0.5 to 4.4)	0.135
Rural residence			
Urban	1 (ref)	0 (ref)	
Rural	0.86 (0.63 to 1.17)	-0.9 (-2.8 to 0.9)	0.332



B. Secondary prevention

Characteristic	Risk ratio in statin use	Absolute difference in statin use (%)	P value
Age			
40-50 years	1 (ref)	0 (ref)	
50-59 years	1.65 (1.29 to 2.09)	7.0 (3.8 to 10.1)	<0.0001
60-69 years	1.92 (1.54 to 2.40)	9.9 (7.0 to 12.9)	<0.0001
Sex			
Male	1 (ref)	0 (ref)	
Female	0.93 (0.79 to 1.10)	-1.2 (-3.9 to 1.5)	0.380
Education			
No schooling	1 (ref)	0 (ref)	
Primary education	1.20 (0.90 to 1.61)	2.6 (-1.5 to 6.7)	0.212
Secondary or above	1.53 (1.17 to 2.00)	6.9 (2.8 to 11.0)	0.002
Rural residence			
Urban	1 (ref)	0 (ref)	
Rural	0.88 (0.73 to 1.08)	-2.0 (-5.2 to 1.2)	0.224



Appendix 26: STROBE checklist

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **This information is provided in the Title and Abstract.**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **This information is provided throughout the Abstract.**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **This information is provided throughout the Introduction.**
Objectives	3	State specific objectives, including any prespecified hypotheses **This information is stated in the final paragraph of the Introduction.**
Methods		
Study design	4	Present key elements of study design early in the paper **Study design is presented throughout the Methods section and Appendix 1-8.**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **This information is provided in the first paragraph of the Methods section, and in Appendix 1.**
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants **This information is provided in the second and third paragraph of the Methods section, and in Appendix 1-3.**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **This information is provided in the Methods under the Outcomes and Statistical Analysis subsections, and in Appendix 1.**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **This information is provided in the Methods under the Outcomes subsection, and in Appendix 1-8.**
Bias	9	Describe any efforts to address potential sources of bias **This information is described in the Methods under the Statistical Analysis subsection.**
Study size	10	Explain how the study size was arrived at **This information is provided in the Methods under the Sample subsection, and in Appendix 1.**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why **This information is described in the Methods under the Statistical Analysis subsection and in Appendix 1.**

Statistical methods	12	*a*) Describe all statistical methods, including those used to control for confounding **This information is provided in the Methods, throughout the Statistical Analysis subsection.**
		(*b*) Describe any methods used to examine subgroups and interactions **This information is provided in the Methods, throughout the Statistical Analysis subsection.**
		(*c*) Explain how missing data were addressed **This information is provided in the Methods, in the penultimate paragraph of the Statistical Analysis subsection.**
		(*d*) If applicable, describe analytical methods taking account of sampling strategy **This information is provided in the Methods under the Sample subsection, and in Appendix 1.**
		(*e*) Describe any sensitivity analyses **This information is provided in the Methods, in the penultimate paragraph of the Statistical Analysis subsection.**
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **This information is reported in the Results under the Sample characteristics subsection, and in Appendix 1.**
		(b) Give reasons for non-participation at each stage **This information is reported in Appendix 1.**
		(c) Consider use of a flow diagram **This information is reported in Appendix 1.**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **This information is provided in Table 1, in the Results under the Sample characteristics subsection, and in Appendix 8-10.**
		(b) Indicate number of participants with missing data for each variable of interest **This information is provided in the Results under the Sample characteristics subsection, and in Appendix 10.**
Outcome data	15*	Report numbers of outcome events or summary measures **This information is provided in Figure 1, in the Results under the Estimates of statin use subsection, and in Appendix 11.**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **This information is provided in Table 2, Figures 1-4, and throughout the Results section.**
		(*b*) Report category boundaries when continuous variables were categorized **This information is provided in Table 2, Figures 1-3, Appendix 12-20, and throughout the Results section.**
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period **Throughout the manuscript we use both risk ratios and average marginal effects.**

Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **This information is provided in the Results section under the Sensitivity analyses subsection, and in Appendix 19-25.**
Discussion		
Key results	18	Summarise key results with reference to study objectives **This information is provided throughout the Discussion.**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **This information is provided in the final paragraph the Discussion.**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **This information is provided throughout the Discussion.**
Generalisability	21	Discuss the generalisability (external validity) of the study results **This information is provided throughout the Discussion.**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based **This information is provided in the Funding Support and Disclosures sections**

Supplementary references

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