

Standards for the Uniform Reporting of Hypertension in Adults Using Population Survey Data: Recommendations From the World Hypertension League Expert Committee

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Surveillance and monitoring of cardiovascular risk factors including raised blood pressure are critical to informing efforts to prevent and control cardiovascular disease. Yet, many countries lack the capacity for adequate national surveillance. Furthermore, hypertension indicators are often reported in different ways, which hampers the ability to compare and assess progress. In order to encourage standardized hypertension surveillance reporting, the World Hypertension League assembled an Expert Committee to develop a standard set of core indicators, definitions, and recommended analyses. The recommended core indicators are: (1) blood pressure distribution, (2) prevalence of hypertension, (3) awareness of the condition, (4) antihypertensive drug

treatment, and (5) control of hypertension based on drug therapy. Each of these can be reported overall and by age group and sex, with crude and age-standardized changes tracked over time in order to assess the impact of instituted policies and programs for hypertension prevention and control. An expanded list of indicators can also facilitate tracking of hypertension prevention and control efforts. Widespread adoption of these indicators and analyses could benefit all those conducting and analyzing hypertension surveys and will facilitate hypertension surveillance efforts. *J Clin Hypertens (Greenwich)*. 2014;16:773–781. © 2014 Wiley Periodicals, Inc.

Surveillance of cardiovascular risk factors including hypertension is critical to national and international efforts to prevent and control cardiovascular disease (CVD).^{1,2} In order to realize the commitments of the 2011 political declaration of the United Nations General Assembly on noncommunicable diseases, 194 member states of the World Health Organization (WHO) adopted a global action plan and 9 global voluntary targets, including a 25% relative reduction in the prevalence of raised blood pressure (BP) among persons aged 18 years and older by 2025 (defined as systolic BP [SBP] ≥ 140 mm Hg and/or diastolic BP [DBP] ≥ 90 mm Hg).³ Although this indicator is important for estimating the population at risk for developing vascular complications, surveillance and monitoring of additional hypertension indicators are necessary to

identify where best to focus hypertension prevention and control efforts to meet the 25% reduction target.

Surveillance efforts that focus on estimating and tracking changes in BP and hypertension prevalence, awareness, treatment, and control over time and characterizing groups at risk for developing CVD, determine and support the need for hypertension prevention and control strategies and then help assess the effectiveness of such initiatives.^{1,2} Despite its importance, some researchers and countries lack the capacity for adequate national hypertension surveillance¹ or, where capacity exists, report BP surveillance data differently.^{4–6} These factors hamper the ability to assess forward progress on awareness, treatment, and control of hypertension. The new Global Action Plan on Prevention and Control of Noncommunicable Diseases 2013–2020 recommends that member states “standardize data collection on risk factors...” and “contribute, on a routine basis, data and information on trends... disaggregated by age, gender, and socioeconomic groups.”³ Furthermore, the action plan calls on international partners to mobilize resources to support regional and global surveillance.³ To that end, the World Hypertension League has developed

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a standard set of definitions for hypertension indicators and recommended analyses that are intended to encourage standardized hypertension surveillance reporting.

METHODS

The World Hypertension League assembled an Expert Committee in 2013 to develop a standard set of definitions for hypertension indicators. As a starting point for discussions, the committee was given a preliminary list of potential indicators and met to assess the importance of the suggested indicators and identify omissions. Indicators were classified as “core,” “expanded,” and “optional” based on their utility and their feasibility to be measured across hypertension surveys in different national settings. As previously defined by WHO, “core” indicators were those that have “an established evidence base and policy relevance, are modifiable through cost-effective interventions, feasible and affordable to obtain, achievable within a country’s technical capacity, and are measurable in a consistent manner with valid definitions and techniques.”¹ “Expanded” indicators were those that are highly desirable for hypertension surveillance but may not be currently feasible in all contexts. “Optional” indicators were those that offer useful information but are not essential to tracking efforts to prevent or control hypertension. Several potentially useful indicators were noted to require additional research to define their utility.

RECOMMENDATIONS

RECOMMENDATION 1: CORE INDICATORS AND ANALYSES FOR HYPERTENSION SURVEILLANCE

To assess the need for population-level prevention and control strategies and progress, the following recommended core indicators were identified: (1) the distribution of BP in the population; (2) the prevalence of hypertension, and the proportions of the population with hypertension who (3) are aware of having the condition, (4) are treated with antihypertensive medication, and (5) have their BP controlled <140/90 mm Hg, as summarized in Table I. Respectively, these are herein referred to as “awareness,” “treatment,” and “control.”

DEFINITIONS

Definition 1: Distributions of SBP and DBP

Distributions of SBP and DBP in the adult population are most usefully summarized by the mean SBP and DBP and their associated standard deviations. Due to the possibility of each mean and standard deviation being unduly influenced by outliers, it is recommended that the median and the first and third quartiles of the distribution are also reported.

Definition 2: Prevalence of Hypertension

The Expert Committee recommends considering two estimates of hypertension prevalence: (A) The proportion

of the adult population who have SBP ≥ 140 mm Hg or DBP ≥ 90 mm Hg or who report currently taking medication for high BP and (B) The proportion of the adult population who have SBP ≥ 140 mm Hg or DBP ≥ 90 mm Hg or who report currently taking medication for high BP or who report having been diagnosed with hypertension by a health professional. Although definition A has been used more commonly to characterize the presence or absence of hypertension, it may underestimate the true prevalence of hypertension depending on the population studied. A number of studies have demonstrated the accuracy of self-reported diagnosis compared with chart reviews and physician-reported history^{7–13} and, in the United States, the inclusion of self-reported diagnosis (which includes individuals who have controlled their BP using lifestyle changes as stand-alone therapy) increases the estimated prevalence hypertension by 5% to 10%.^{14–16}

Definition 3: Prevalence of Awareness of Hypertension

Prevalence of awareness of hypertension is defined as the proportion of adults with hypertension (using definition A, above) who report either having been diagnosed with hypertension by a health professional or who report taking medication for high BP.

Definition 4: Prevalence of Treatment of Hypertension

Prevalence of treatment of hypertension is defined as the proportion of adults with hypertension (using definition A, above) who report taking medication for high BP.

Definition 5: Prevalence of Controlled Hypertension

Prevalence of controlled hypertension is defined as the proportion of adults with hypertension (using definition A, above) who both (1) report taking medication for high BP and (2) have SBP <140 mm Hg and DBP <90 mm Hg.

It is recommended that prevalence, awareness, treatment, and control be expressed as percentages including a 95% confidence interval for each estimate, using the estimation method appropriate for the study design. It is also crucial to report the size of the sample and the features of the sample design used to obtain the above statistics.

Target Population. To facilitate comparison across settings, the core indicators should be reported in the adult population aged 18 to 69 years. This age range represents the newly revised minimum target population of the WHO’s STEPwise approach to surveillance (STEPS) (personal communication, WHO), a survey designed to obtain standardized data on established risk factors for chronic disease.¹⁷

It is also recommended that core indicators be presented for men and women separately and by age group (18–29 years, 30–49 years, and 50–69 years), in keeping with the age groups recommended by STEPS (personal

TABLE I. Summary of Definitions for Recommended Core Indicators

Indicator	Numerator	Denominator
Core indicators		
Mean systolic blood pressure	Sum of valid average systolic blood pressure ^a	Total number of respondents aged 18–69 y who had a valid blood pressure reading
Mean diastolic blood pressure	Sum of valid average diastolic blood pressure ^a	Total number of respondents aged 18–69 y who had a valid blood pressure reading
Prevalence of hypertension	A) Respondents who have systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg or who report currently taking medication for the treatment of high blood pressure B) Respondents who have systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg or who report currently taking medication for the treatment of high blood pressure or who report having been diagnosed with hypertension by a health professional	Respondents aged 18–69 y
Prevalence of awareness of hypertension	Respondents who report either having been diagnosed with high blood pressure or who report being currently treated with medication for high blood pressure	Respondents with hypertension according to definition A
Prevalence of treatment of hypertension	Respondents who report being currently treated with medication for high blood pressure	Respondents with hypertension according to definition A
Prevalence of controlled hypertension	Respondents who report being currently treated with medication for high blood pressure and have systolic blood pressure < 140 mm Hg and diastolic blood pressure < 90 mm Hg	Respondents with hypertension according to definition A
Standard deviations of mean systolic and diastolic blood pressure and 95% confidence intervals for the proportions should be calculated. Each of these core indicators can be reported overall and by age group (18–29 years, 30–49 years, and 50–69 years) and sex, with crude and age-standardized (to the World Health Organization World Standard) changes tracked over time. Reporting core indicators among people with diabetes and among sociodemographic groups is recommended as expanded analyses. ^a In WHO's STEPwise approach to surveillance (STEPS), average systolic and diastolic blood pressure are calculated from 2 of 3 blood pressure readings, taken 3 minutes apart, with preference given to the last 2 measurements.		

communication, WHO). Table II and Table III present a recommended way for reporting core indicators.

Tracking Changes Over Time. In order to assess the impact of hypertension prevention and control strategies, it is essential that changes in core indicators be monitored consistently over time. Reporting of time trends involves tracking both the crude and age-standardized estimates. Crude estimates over time indicate changes in the true burden of a condition, whereas age-standardized estimates show the amount of change that is not the result of the changing age structure of the population. Age-standardized estimates are to be calculated using direct age-standardization to the WHO World Standard (2000–2025)¹⁸ (<http://seer.cancer.gov/stdpopulations/world.who.html>). Comparability over time may also be affected by other factors, such as changes in sociodemographics, risk factors, or changes to survey methodology (such as changes to the sampling methods, population coverage, questionnaire wording, or survey protocol), which should be reported.

Survey Requirements. The core indicators rely on measured SBP and DBP, self-reported diagnosis of

hypertension by a health professional, and self-reported current use of antihypertensive medication. For example, WHO's STEPS includes the following simple set of standardized questions:

- Have you ever been told by a doctor or other health worker that you have raised BP or hypertension? (yes/no).
- During the past 2 weeks, have you been treated for raised BP with drugs (medication) prescribed by a doctor or other health worker? (yes/no).

For BP measurement, the STEPS protocol¹⁷ recommends the use of a properly calibrated digital automatic BP monitor. Average SBP and DBP are calculated from two of three BP readings, taken 3 minutes apart, with preference given to the last 2 measurements.¹⁷

RECOMMENDATION 2: EXPANDED INDICATORS AND ANALYSES FOR HYPERTENSION SURVEILLANCE

The Expert Committee identified several “highly desirable” indicators/analyses that may not be feasible in all settings depending on the available measures or sample size of a given survey. These were: (1) hypertension prevalence, awareness, treatment, and

TABLE II. Recommended Presentation of Mean, Standard Deviation, Median (and Other Quartiles) of Average^a Systolic and Diastolic Blood Pressure

	Both Sexes					Men					Women				
	No.	Mean	SD	Median	(Q1, Q3)	No.	Mean	SD	Median	(Q1, Q3)	No.	Mean	SD	Median	(Q1, Q3)
Mean systolic blood pressure, mm Hg															
Overall (crude)															
Overall (age-standardized)															
Age group, y															
18–29															
30–49															
50–69															
Mean diastolic blood pressure, mm Hg															
Overall (crude)															
Overall (age-standardized)															
Age group, y															
18–29															
30–49															
50–69															

Abbreviations: Q1, 25th percentile; Q3, 75th percentile; SD, standard deviation. ^aIn WHO's STEPwise approach to surveillance (STEPS), average systolic and diastolic blood pressure are calculated from 2 of 3 blood pressure readings, taken 3 minutes apart, with preference given to the last 2 measurements.

TABLE III. Recommended Presentation of Hypertension Prevalence, Awareness, Treatment, and Control

	Prevalence			Awareness			Treatment			Control		
	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI	No.	%	95% CI
Both sexes												
Overall (crude)												
Overall (age-standardized)												
Age group, y												
18–29												
30–49												
50–69												
Men												
Overall (crude)												
Overall (age-standardized)												
Age group, y												
18–29												
30–49												
50–69												
Women												
Overall (crude)												
Overall (age-standardized)												
Age group, y												
18–29												
30–49												
50–69												

control by diabetes status; (2) relevant ethnic and sociodemographic characteristics; (3) treatment among persons aware of having hypertension; (4) control among patients treated; (5) adherence to lifestyle recommendations; (6) prehypertension; and (7) isolated systolic hypertension.

DEFINITIONS

Definition 1: Hypertension Prevalence, Awareness, Treatment, and Control by Diabetes Status

The global number of adults with diabetes was approximately 347 million (or 10% of the adult population

aged 25 years and older) in 2008,¹⁹ with hypertension affecting up to 80% of this subpopulation²⁰ and disproportionately increasing risk for CVD.^{20–22} Hence, it is recommended, where feasible, to report hypertension prevalence, awareness, treatment, and control (as defined under Recommendation 1) in the subpopulation with diabetes. Individuals are classified as having diabetes if they have a fasting plasma glucose ≥ 7.0 mmol/L, report a diagnosis of diabetes, or report using a glucose-lowering medication.¹⁹

Definition 2: Hypertension Prevalence, Awareness, Treatment, and Control by Relevant Ethnic and Sociodemographic Characteristics

The 2013–2020 WHO Action Plan recommends that noncommunicable diseases and their risk factors be disaggregated by socioeconomic groups, in addition to age and sex.³ Furthermore, one of the commitments of the WHO Rio Political Declaration on Social Determinants of Health is to “establish, strengthen and maintain monitoring systems that provide disaggregated data to assess inequities in health outcomes.”²³ It is therefore recommended that estimates of hypertension prevalence, awareness, treatment, and control be reported separately for sociodemographic groups, such as by ethnicity, education, income, or other relevant factors, where feasible. The chosen sociodemographic classifications are likely to be specific to national circumstances and may not be comparable across countries depending on economic and political circumstances. More research is required to develop international standards for comparable sociodemographic indicators.

Definition 3: Proportion Treated With Antihypertensive Medication Among Those Aware of Having Hypertension

This indicator is defined as the proportion of people who report taking medication for the treatment of high BP among those aware of having the condition (ie, those who report having been diagnosed with hypertension or report taking medication for high BP). It is an indicator of the health system’s provision of treatment and the acceptability of that treatment to those diagnosed.

Definition 4: Proportion With Controlled BP Among Those Treated With Antihypertensive Medication

This indicator is defined as the proportion of people who have a measured SBP < 140 mm Hg and a measured DBP < 90 mm Hg among those who report taking medication for control of high BP. It is an indicator of the effectiveness of treatment in those treated for hypertension.

Definition 5: Adherence to Lifestyle Recommendations for BP Control

Healthy behavior change is a cornerstone of hypertension management. Although the specifics of individual recommendations may differ, clinical practice guide-

lines^{24–29} recommend that adults with hypertension use lifestyle strategies to lower BP. National surveys, including STEPS, typically include measures of physical activity, body mass index, fruit and vegetable consumption, alcohol consumption, and smoking status and may include measures of salt consumption and other markers of healthy diet. It is recommended to report, where feasible, the proportion of people with hypertension who meet national hypertension recommendations for (1) dietary intake of salt/sodium, (2) physical activity, (3) healthy diet, (4) healthy weight, (5) alcohol consumption, and (6) nonsmoking.

Definition 6: Prehypertension

Prehypertension is defined as the proportion of the adult population who have SBP between 120 mm Hg to 139 mm Hg and/or DBP between 80 mm Hg to 89 mm Hg in the absence of a diagnosis of hypertension or treatment with medication for high BP. Prehypertension increases the risk for stroke, myocardial infarction, and total CVD events.³⁰

Definition 7: Prevalence of Isolated Systolic Hypertension

Prevalence of isolated systolic hypertension is defined as the proportion of people with hypertension who have measured SBP ≥ 140 mm Hg and measured DBP < 90 mm Hg.

RECOMMENDATION 3: OPTIONAL INDICATORS AND ANALYSES FOR HYPERTENSION SURVEILLANCE

The core and expanded indicators described above are useful for estimating the population at risk for developing hypertension-related complications and the success of the interaction between the health system and patients in the diagnosis and treatment of hypertension. The following additional optional indicators may be desired for national hypertension surveillance programs.

Definition 1: Normotensive Blood Pressure

The proportion of people with normotensive BP is defined as the proportion of the population who have a measured SBP < 140 mm Hg and DBP < 90 mm Hg in the absence of treatment with medication for high BP. The proportion of people with optimal BP is defined as having measured SBP < 120 mm Hg and measured DBP < 80 mm Hg in the absence of treatment with medication for high BP.

Definition 2: Optimal Blood Pressure

The proportion of people with hypertension who have grade/stage 1, 2, and 3 hypertension.

Definition 3: Hypertension Grade/Stage

Calculated among people with hypertension, grade/stage 1 hypertension is defined as SBP between 140 mm Hg to 159 mm Hg and/or a DBP between 90 mm Hg to 99 mm Hg, with neither the SBP or DBP in a higher

grade/stage of hypertension. Grade/stage 2 hypertension is defined as having SBP between 160 mm Hg to 179 mm Hg and/or DBP between 100 mm Hg to 109 mm Hg, with neither the SBP or DBP being in a higher grade/stage of hypertension. Grade/stage 3 hypertension is defined as having SBP \geq 180 mm Hg and/or DBP \geq 110 mm Hg.

RECOMMENDATION 4: INDICATORS REQUIRING PRIORITY RESEARCH

The Expert Committee felt that there were a number of indicators that could be useful for hypertension surveillance but that require further research to understand whether they are feasible and measurable in a consistent manner across settings. These indicators included (1) CVD risk among people with hypertension and among people who are unaware, untreated, and have uncontrolled high BP; (2) proportion of people with hypertension who have controlled their BP using lifestyle modification; and (3) proportion of people with hypertension who have resistant hypertension.

Indicator 1: CVD Risk Among People With Hypertension and Among Those Unaware, Untreated, and With Uncontrolled Hypertension

Since 2000, WHO guidelines have recommended total cardiovascular risk assessment and management in primary care using hypertension and diabetes as entry points based on better cost-effectiveness and health outcomes of integrated programs.³¹ Therefore, where feasible, researchers can explore the best way to measure the CVD risk of the population with hypertension across settings. This might involve the development of population-specific calibrated quantitative risk prediction engines or use of qualitative risk scores such as the WHO/International Society of Hypertension CVD risk prediction charts. The latter estimate is an individual's 10-year combined risk of fatal or nonfatal acute myocardial infarction or stroke based on sex, age, SBP, current smoking, diabetes, and total serum cholesterol.^{24,32} Individuals are classified as "low risk" if they have a <10% total 10-year risk of CVD, "moderate risk" if they have a 10 to <20% risk, and "high risk" if their risk is \geq 20%.³³ Individuals with established CVD are also considered to be at high risk. Risk prediction charts for each WHO subregion can be accessed at <http://ish-world.com/activities/guidelines.htm>.²⁴

The WHO/ISH risk prediction charts were designed to be used at the individual level to help clinicians ensure that individuals at the greatest risk for CVD receive treatment.^{24,33} Research is needed to understand the extent to which the charts accurately estimate population-level CVD risk when applied to survey data and to investigate their limitations.³³ For example, when CVD risk prediction charts are applied to survey data, individuals taking treatment for hypertension with controlled BP are classified as low risk,³³ while CVD risk may be higher for people who are taking antihypertensive therapy.³⁴ Likewise, because surveys are

often cross-sectional, it is difficult to estimate the proportion of people initially at high CVD risk who received antihypertensive treatment, since effective treatment can move individuals into lower risk categories. So, although monitoring trends in population-level CVD risk would help determine the proportion of the population with hypertension who would most benefit from treatment,³³ research is needed to better understand how CVD risk equations can be applied to cross-sectional survey data sources.

Indicator 2: Proportion of People With Hypertension Who Have Controlled Their BP Using Lifestyle Modification

The Expert Committee has recommended, as "expanded indicators," that the proportion of adults with hypertension who meet the recommendations for the various effective lifestyle behaviors be reported. Also important, but less easy to measure, is the proportion of people with hypertension who have effectively used lifestyle changes for BP control. High-priority research can be conducted to determine how best to assess hypertension that has been controlled by lifestyle interventions alone or in combination with pharmacotherapy. In the interim, it is recommended that the proportion of people who report ever having been diagnosed with hypertension but who are not taking antihypertensive medication and who have BP <140/90 mm Hg be reported.

Indicator 3: Proportion of People With Hypertension Who Have Resistant Hypertension

Resistant hypertension is defined by the American Heart Association as "blood pressure that remains above goal in spite of the concurrent use of three antihypertensive agents of different classes," whereas the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) specifies adherence to "full doses of an appropriate three-drug regimen that includes a diuretic."³⁵ There are at least three interpretations of these definitions that can and have been applied to survey data in order to estimate prevalent resistant hypertension. They are (1) uncontrolled BP in spite of concurrent use of \geq 3 antihypertensive medications,³⁶ (2) uncontrolled BP in spite of concurrent use of \geq 3 antihypertensive medications including a diuretic,³⁶ and (3) uncontrolled BP in spite of concurrent use of antihypertensive medications from \geq 3 different drug classes or controlled BP and use of \geq 4 antihypertensive drug classes.³⁷ It is unclear which of these definitions is best when applied at the population level. Furthermore, calculation of this indicator may not be feasible in all contexts, since it may require a detailed medication inventory for each respondent, with medications classified by drug class. High-priority research can be conducted to determine which definition is best for estimating resistant hypertension, balancing accuracy and feasibility in low- and middle-income settings.

DISCUSSION

We have identified a number of standard core indicators and analyses to track progress in the prevention and control of hypertension at the population level. It is anticipated that the widespread adoption of these indicators can facilitate comparison of survey results between countries and tracking over time. The recommended core indicators are: (1) BP distribution, (2) prevalence of hypertension, (3) awareness of diagnosis, (4) antihypertensive drug treatment, and (5) control of hypertension based on drug therapy. These estimates can be reported overall and separately by age group and sex. Crude and age-standardized changes can be tracked over time in order to assess the impact of instituted policies and programs for hypertension prevention and control. An expanded list of indicators and analyses was also identified to facilitate tracking of hypertension including reporting among people with diabetes and by sociodemographic characteristics and adherence to the lifestyle recommendations for BP control. Several high-priority research areas were also identified where the Expert Committee believed indicators were highly desired but where there was an inability to currently assess their feasibility or validity. These areas include the use of CVD risk assessment to determine the proportion of the hypertensive population where diagnosis and pharmacotherapy would be highly indicated (ie, cost-effective). In addition, the development of a valid indicator of the impact of lifestyle interventions on BP control was viewed as a high priority, recognizing the inherent challenge of self-reported survey data.

This core set of recommended indicators extend beyond and complement the recommendations of the WHO Noncommunicable Disease Global Monitoring Framework,³⁸ which includes among its 25 indicators (1) the age-standardized prevalence of raised BP $\geq 140/90$ mm Hg among persons 18 years and older and (2) mean SBP. While useful for tracking and comparing the total population at risk for vascular complications, it is a composite of prevalence, awareness, treatment, and control and therefore not as helpful in determining where to focus efforts to prevent and control hypertension. Understanding the latter may indicate where prevention and control efforts should be targeted. Specifically, prevalence of hypertension is mainly used to indicate the population potentially amenable to clinical approaches to prevent hypertensive complications and can be used to assess the success of primary prevention efforts. Estimates of hypertension awareness, treatment, and control are used to assess and track progress with respect to hypertension control efforts. Population-level awareness of hypertension indicates the efficiency of community and clinical resources in identifying people who might benefit from clinical management of hypertension. A low proportion indicates a need for systematic screening and case-finding interventions, targeted at either the whole population or specific, vulnerable populations. Population-level treat-

ment of hypertension indicates the efficiency of the health system in providing people who would benefit from antihypertensive treatment with that treatment. The prevalence of controlled hypertension represents the health system's success at identifying and effectively treating people with hypertension.

A few caveats to these recommendations are noted. First, national and international guidelines often vary with respect to the recommendations for initiating pharmacotherapy,²⁴⁻²⁹ which may affect the estimates of hypertension treatment and control. For example, WHO recommends drug treatment and lifestyle interventions for individuals with BP $\geq 160/100$ mm Hg or for individuals with $>20\%$ CVD risk and BP $\geq 140/90$ mm Hg and lifestyle interventions for individuals with $<20\%$ CVD risk and BP $\geq 140/90$ mm Hg,²⁴ whereas other guidelines, such as the American Society of Hypertension/International Society of Hypertension guidelines recommend that "treatment with drugs should be started in patients with BPs $>140/90$ mm Hg in whom lifestyle treatments have not been effective."²⁶ Thus, researchers may wish to calculate additional indicators in keeping with relevant national guidelines. Further, in interpreting indicators it is intuitive that it is not desirable to strive for 100% control of hypertension nor to strive to provide antihypertensive pharmacotherapy to all people who are aware of having hypertension, given that recommendations do not include treatment for all people with hypertension. Second, we did not specifically recommend reporting of indicators among all subpopulations that may be of interest. In studies specifically focused on diabetes, renal failure, lifestyle change, or other areas, researchers may wish to report additional indicators or use different therapeutic cut-points (eg, 140/80 mm Hg or 130/80 mm Hg for diabetes as recommended in some guidelines^{27,39}). Third, the recommended indicators are largely based on self-reported information and it is unclear whether such questions are equally valid across cultural contexts. For example, a number of studies have demonstrated the accuracy of self-reported diagnosis compared with chart reviews and physician-reported history,⁷⁻¹³ but these studies are limited to the United States,⁷⁻¹¹ Japan,¹² and Spain,¹³ and research in other population survey contexts is warranted. Some misclassification in self-reported diagnoses is expected from the inclusion of individuals who ever had gestational hypertension only or who have misdiagnosed hypertension caused by inaccurate assessment of BP or an acute episode of elevated BP. Likewise, surveys often differ in terms of the sampling strategy, measurement techniques, and questionnaire wording, depending on feasibility, context, and culture; such methodological differences are beyond the scope of these recommendations. The Expert Committee expressed strong concern that this lack of rigor and consensus in assessing BP will have a major impact on the comparability and validity of indicators⁴⁻⁶ and that

consensus guidelines are warranted. In the interim, the Expert Committee recommends considering use of the STEPS training procedures and methodology for BP assessment or alternatively the various recommendations for assessing BP that have been published.^{25,40–44}

The goal of the project was to develop a standard set of consistent definitions that could be feasibly applied to a variety of survey settings, while noting that in certain cases there is no “right” answer. For example, some members of the Expert Committee recommended reporting indicators in positive terms (ie, aware, treated, controlled) where others recommended the opposite (ie, unaware, untreated, uncontrolled). While the latter is useful for highlighting the problem of hypertension control and sensitizing policy makers, the former may be more intuitive for assessing the “success” of population-level control efforts. In all cases, differences of opinion were resolved by discussion and consensus. While it is anticipated that other experts not in the Expert Committee will have differences of opinion, we nevertheless urge the promotion and use of these standardized indicators in the hope and expectation that widespread adoption will be of benefit to all those conducting and analyzing hypertension surveys. The World Hypertension League will develop a position statement based on these indicators and seek feedback and endorsement by other international health and scientific organizations. Furthermore, the World Hypertension League will sustain an Expert Committee to provide updated recommendations for indicators, as new research on indicators is published.

CONCLUSIONS

The World Hypertension League developed this expert group report to provide an important step forward in the surveillance and monitoring of BP as part of the effort to prevent and control hypertension. A network of experts willing to provide consultation on development and analysis of surveys will be established within the next year and consideration is being given to establishing an expert committee to make recommendations on the conduct of surveys. Those interested in participating can contact the World Hypertension League (<http://www.worldhypertensionleague.org/>).

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