Mental Wellness Index Measure Weighting Methodology

Contents

Introduction

Mental Wellness Index (MWI) measures are assigned weights that seek to convey their relative contribution to shaping assets and obstacles to community mental wellness. These weights are used to calculate the composite MWI rankings that aggregate all measures in the MWI. Figure 1 depicts the MWI framework, and Figure 2 shows the measures in each domain of the framework.

Figure 1. Mental Wellness Index Framework

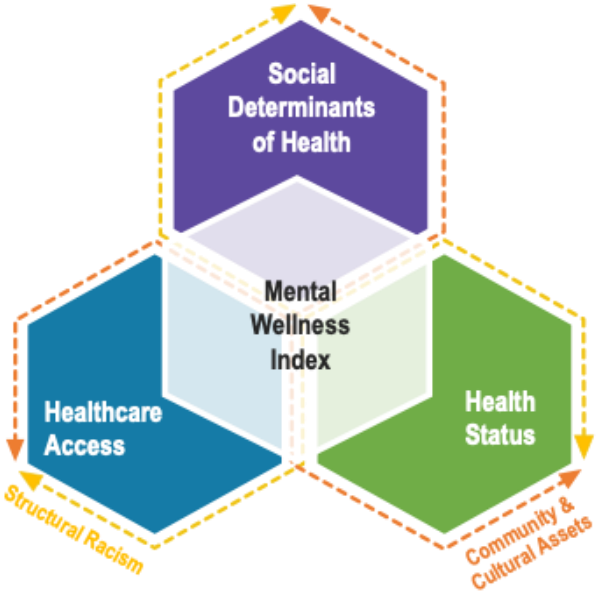
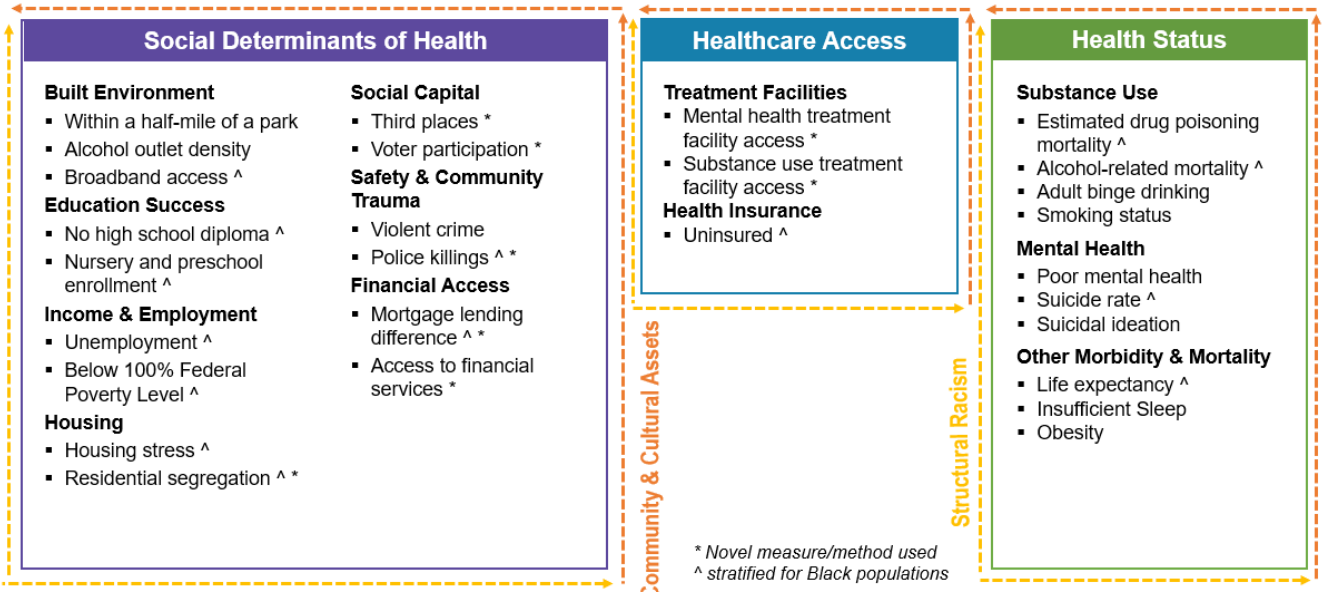


Figure 2. MWI Domains and Measures



The fundamental challenge with identifying a set of weights for the MWI measures is that not all measures carry the same importance or influence across all communities. For example, while increased educational attainment has been shown to lead to improved health outcomes, benefits from education are not experienced equally across racial and ethnic groups.[1] As such, creating a fixed set of weights that broadly applies across all populations assumes a standard of importance that may ignore or overemphasize the features that are more important for one population or another.

We have used a series of processes to create default weights for the MWI measures with the goal of finalizing the weights through the Analytic Hierarchy Process. First, to arrive at the default weights in the MWI tool, we began by reviewing the literature and seeking to understand the weighting methodologies used by other health indices. Most other health indices focus on general health, rather than mental wellness specifically. While general health and mental wellness represent different endpoints, there are also clear relationships between general health and mental wellness, which informed our choice to assign default weights based on the precedent set by the weighting schemes of other health indices.

To arrive at the default weights currently in the MWI tool, we took the following steps:

1. Review of literature
2. Review of other health indices
3. Assign default domain weights
4. Assign default measure weights

Ultimately, our goal is to build a community and user-driven weighting process into the MWI tool, where communities and users will be able to input the relative importance of MWI measures to their experiences and the weighting assignments are automatically generated based on those preferences. (We note that users may currently manually upload their own data and assign weights in the MWI tool).

In the next planned phase of development, we plan to continue with the following steps to adjust measure weights:

5. Determination of weights through the Analytic Hierarchy Process, a structured technique to incorporate subject matter expert feedback on the relative importance of measures
6. Cross-validation with other health indices

Glossary

Domains: represent the three primary components of the MWI: Social Determinants of Health (SDOH), Healthcare Access, and Health Status. The term "domain" may be used to refer to analogous primary grouping structures in other health indices.

[1] Braveman, P. A., Cubbin, C., Egerter, S., Williams, D. R., & Pamuk, E. (2010). Socioeconomic disparities in health in the United States: what the patterns tell us. *American journal of public health*, *100 Suppl 1*(Suppl 1), S186–S196. https://doi.org/10.2105/AJPH.2009.166082

Subdomain: Within each domain, smaller classifications of measures grouped together by a thematic concept.

Measures: a measurable concept in the MWI framework for which data have been collected.

Dynamic Factors: refers to Structural Racism and Community & Cultural Assets, two factors which influence the distribution of values for each measure.

Determining Default Weights

The steps to arrive at default weights are described in this section.

1. Review of Literature

There is well-documented evidence on the impact of social determinants of health,[2,3,4] access to health care,[5] and morbidity and mortality on overall health and specifically life expectancy.[6] However, there is currently a gap in the literature quantifying the relative contributions of each of those domains, and subdomains and measures within those domains, to mental wellness.

2. Review of Other Health Indices

Subsequently, we reviewed other health-related indices and their weighting methods, including America's Health Rankings (AHR), County Health Rankings (CHR), California's Healthy Places Index (CHPI), Child Opportunity Index 2.0 (COI 2.0) , Centers for Disease Control's (CDC) Social Vulnerability Index (SVI), Office of Minority Health's (OMH) Minority Heath Social Vulnerability Index (MH-SVI), and the Service Area Status (SAS) from Health Resources and Services Administration (HRSA).

These frameworks/indices were examined based on the following features:

- Geographic level and scope
- Overall measure groups and weights
- Approach for weighting
- Individual measure processing
- Variable weighting schemes

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[2] Compton, M. T., & Shim, R. S. (2020). Why Employers Must Focus on the Social Determinants of Mental Health. *American Journal of Health Promotion*, *34*(2), 215–219. https://doi.org/10.1177/0890117119896122c

[3] Alegría, M., NeMoyer, A., Falgàs Bagué, I., Wang, Y., & Alvarez, K. (2018). Social Determinants of Mental Health: Where We Are and Where We Need to Go. *Current Psychiatry Reports, 20*(11), 95. https://doi.org/10.1007/s11920-018-0969-9

[4] Compton, M.C. & Shim, R.S. (2015). The Social Determinants of Mental Health. *Focus, 13,* 419-425. https://doi.org/10.1176/appi.focus.20150017

[5] County Health Rankings. (2021) *Clinical Care*. https://www.countyhealthrankings.org/explore-health-rankings/measures-data-sources/county-health-rankings-model/health-factors/clinical-care

[6] County Health Rankings. *County Health Rankings Model*. https://www.countyhealthrankings.org/explore-health-rankings/measures-data-sources/county-health-rankings-model.

- Validation techniques

Table 1 provides a brief overview of each of these indices and their weighting approaches across domains and individual measures. With respect to weighting across domains and measures, "equal" signifies that all domains or measures were assigned the same weight, while "different" signifies that each domain or measure was assigned a different weight that was not equal to the other domains and measures.

Table 1. Health Indices Weighting Methods Comparison

Health Index	Geographic Unit	Weighting Across Domains	Weighting Across Measures	Weighting Methods
America's Health Rankings	State	Different	Different	No explicit documentation on weighting determination
County Health Rankings	County	Different	Different	Weights determined by considering: 1. Historical perspective 2. Weighting schemes from other health rankings 3. Analytic approach * 4. Pragmatic approach**
California's Healthy Places Index	Tract	Different	Equal	Analytic approach* + sensitivity analyses
Child Opportunity Index 2.0	Tract	Equal	Different	Analytic approach* / validation (individual measures) + Pragmatic approach** (domains)
Social Vulnerability Index	Tract	Equal	Equal	Pragmatic approach**, no explicit documentation on weighting determination
Minority Heath Social Vulnerability Index	Tract	Equal	Equal	Pragmatic approach**, no explicit documentation on weighting determination
Service Area Status	ZCTA	Different	Different	Weights determined in partnership with HRSA's Health Center Program

** "Analytic approach" signifies any data-oriented method where weights emerge using a statistical approach, often requiring the use of an outcome measure (e.g., life expectancy, self-reported health, etc.)*
*** "Pragmatic approach" signifies equal weighting among either domains or measures, often intended to facilitate ease of communication with stakeholders.*

Across the various composite health indices, we found that multiple weighting schemes were used for both domain weights and individual measure weights. In brief, weights across domains either employ domain-specific weights or apply an equal weighting structure across each group. Then within each domain, measures can either have measure-specific weights, or measures are weighted equally across the domain.

3. Assign Default Domain Weights

We used a top-down weighting approach, where weights were assigned first for the domains, then distributed between the measures within each domain. This choice, as opposed to a bottom-up approach (weights assigned to measures to create emergent domain weights), was selected to assign weights based on the importance of the domain concepts, rather than arriving at domain weights that may be skewed based on the number of measures or available data within each domain.

Using other health indices as comparisons, we arrived at default domain weights of 60% for Social Determinants of Health, 25% for Health Status, and 15% for Healthcare Access. These values were determined by mapping the weights of the domain concepts from the other health indices to the three domains in the MWI, as shown in Table 2 below. Based on the percentage ranges for the domains within the other indices, we arrived at approximate values for each of the domains.

Table 2. Domain Weights Mapping Table

	Mental Wellness Index	America's Health Rankings	County Health Rankings	California Healthy Places Index	Child Opportunity Index 2.0	Social Vulnerability Index	Minority Health-Social Vulnerability Index	Service Area Status
Social Determinants of Health	**60%**	**40%** = *Social & Economic Factors (30%) + Physical Env. (10%)*	**50%** = *Social & Economic Factors (40%) + Env. Factors (10%)*	**95%** = *Economic (32%) + Education (19%) + Housing (5%) Neighborhood (8%) + Clean Env. (5%) + Social (10%) + Transportation (16%)*	**100%** = *Education (33.3%) + Health & Env. (33.3%) + Social & Economic (33.3%)*	**100%** = *Socioeconomic Status (25%) + Household Composition & Disability (25%) + Minority Status & Language (25%) + Housing & Transportation (25%)*	**66.6%** = *Socioeconomic Status (16.6%) + Household Composition and Disability (16.6%) + Minority Status & Language (16.6%) + Housing Type & Transportation (16.6%)*	**47%** = *Non-Access Measures (2.5%) + Access Barrier Measures (44.5%)*
Health Status	**25%**	**45%** = *Behaviors (20%) + Health Outcomes (25%)*	**30%** = *Health behaviors (30%)*	-	-	-	**16.6%** = *Medical Vulnerability (16.6%)*	**15%** = *Direct Measures (15%)*
Healthcare Access	**15%**	**15%** = *Clinical Care (15%)*	**20%** = *Clinical Care (15%)*	**5%** = *Healthcare (5%)*	-	-	**16.6%** = *Healthcare Infrastructure & Access (16.6%)*	**38%** = *Access Outcome Measures (38%)*

4. Assign Default Measure Weights

To assign measure weights, we applied the following steps:

1. Evenly split the domain weights between the measures in each domain.
2. Apply 10% penalties to the weights for measures that are:
    a. Not race stratified (penalty applied only to measures for which race stratification is applicable but was not available), and/or
    b. Not geographically granular (data that are not available at Census Tract, ZIP Code, or ZIP Code Tabulation Area [ZCTA] levels).

Table 3 shows the resulting measures and measure weights.

Table 3. MWI Default Measure Weights

Domain	Measure	Unadjusted Weights	Not Race Stratified Penalty	Not Geographically Granular Penalty	Final Default Weight
SDOH	Access to Financial Services	4		X	3.75
SDOH	Alcohol Outlet Density	4		X	3.75
SDOH	Below 100% Federal Poverty Level	4			4.17
SDOH	Broadband Access	4			4.17
SDOH	Housing Stress	4			4.174
SDOH	Living Within a Half-Mile of a Park	4			4.17
SDOH	Mortgage Acceptance Rate	4			4.17
SDOH	No High School Diploma	4			4.17
SDOH	Nursery and Preschool Enrollment	4			4.17
SDOH	Police Killings	4			4.17
SDOH	Residential Segregation	4			4.17
SDOH	Third Places	4			4.17
SDOH	Unemployment	4			4.17
SDOH	Violent Crime	4	X	X	3.33
SDOH	Voter Participation	4	X	X	3.33
Healthcare Access	Mental Health Treatment Facility Access	5			5
Healthcare Access	Substance Use Treatment Facility Access	5			5
Healthcare Access	Uninsured	5			5
Health Status	Adult Binge Drinking	2.5	X		2.49
Health Status	Alcohol-Related Mortality	2.5		X	2.49

Domain	Measure	Unadjusted Weights	Not Race Stratified Penalty	Not Geographically Granular Penalty	Final Default Weight
Health Status	Estimated Drug Poisoning Mortality	2.5		X	2.49
Health Status	Insufficient Sleep	2.5	X		2.49
Health Status	Life Expectancy	2.5			3.08
Health Status	Obesity	2.5	X		2.49
Health Status	Poor Mental Health	2.5	X		2.49
Health Status	Smoking Status	2.5	X		2.49
Health Status	Suicidal Ideation	2.5	X	X	1.97
Health Status	Suicide Mortality	2.5		X	2.49

Next Steps to Finalize Weights

This section discusses the next steps we are taking to finalize domain and measure weights.

5. Analytic Hierarchy Process

The Analytic Hierarchy Process (AHP) was first introduced in 1987 by R. W. Saaty[7] and since then, has been used by decision makers and researchers in a variety of disciplines, including within the applied health space.[8] However, it has not yet been used within the context of creating a weighting scheme for health indices.

The advantages of using this method are that it allows for a quantitative determination of weights and preferences applied to a single endpoint (community mental wellness) based on a multi-factored set of criteria (domains and measures), and that these preferences can be elicited from subject matter experts and local users who know their experiences and use cases best. Especially for the MWI, where outcome data for analytic techniques are not available and literature on the relative contributions of these factors is sparse, this method provides a more robust means to determine weights.

The primary challenge of using this method is determining the proper sampling group from which to solicit preferences. In brief, there are two groups we have considered surveying to best obtain weights that reflect the priorities of the communities of interest (Black populations for our first priority population): representatives for the community or community members themselves. Representatives for a community may include individuals such as leaders of community-based organizations, local behavioral health program directors, social workers, or community-based participatory researchers. The

[7] Saaty, R.W. (1987). The analytic hierarchy process—what it is and how it is used. *Mathematical Modelling, 9*(3–5), 161–176. https://doi.org/10.1016/0270-0255(87)90473-8

[8] Vaidya, O.S. & Kumar, S. (2006). Analytic hierarchy process: An overview of applications. *European Journal of Operational Research, 169*(1), 1–29. https://doi.org/10.1016/j.ejor.2004.04.028

pros and cons of sampling based on representative of communities versus community members are shown below:

	Representatives	Community Members
PROS	• May represent priorities of a larger group, require smaller sample size • May be better suited to having a community-wide perspective in line with community lens of the MWI tool	• Ability to get closer to the truth of what is valued in their community for mental wellness
CONS	• Still may hold inherent biases given their positions	• May require larger sample size to ensure a community-wide perspective • Risk of overburdening community members • Concepts and terms may not reflect the language used by community members or be unfamiliar

The primary question asked of respondents is to identify the most important factors that influence community mental wellness. Importance should also take into consideration whether a given factor has been or can be impacted by the MWI's two dynamic factors: Structural Racism and Community & Cultural Assets. Relative importance is determined by providing respondents with pairings of two factors and asking them to provide a judgement regarding which of the two factors is more important for capturing community mental wellness. Respondents are asked to rank the relative importance among the domains and subdomains in Table 4 on a scale of "very much more" to "very much less" importance (see the Appendix for the full scale). For example, a respondent would determine the relative importance of the SDOH domain compared to the Healthcare Access and Health Status domains then proceed to determine the relative importance of the other domains to each other. A respondent would then repeat this process by determining the relative importance of the subdomains within each domain.

Table 4. MWI Domains and Subdomains

Domains	Social Determinants of Health	Healthcare Access	Health Status
Subdomains	• Built Environment • Education Success • Income & Education • Housing • Social Capital • Safety & Community Trauma • Financial Access	• Mental Health Facility Treatment • Substance Use Facility Treatment • Health Insurance	• Substance Use • Mental Health • Other Morbidity and Mortality
Alternatives	N/A (no alternatives are being considered)		

Weighting Form:

Using an online form builder through Microsoft Forms, we created a systematized process to collect user preferences. The form consists of five primary sections:

1. Respondent information
2. MWI domain comparisons
3. Social determinants of health subdomain comparisons
4. Healthcare access measure comparisons
5. Health status subdomain comparisons

Please see the Appendix to view the form and questions used.

While traditional AHP scales are often scored on a 9-point scale of importance, in order to reduce respondent burden while maintaining sufficient response granularity, we have pared down the scale to a seven-point scale, as follows:

- A is **very much more** important than B (7)
- A is **much more** important than B (5)
- A is **somewhat more** important than B (3)
- A and B are **equally** important (1)
- A is **somewhat less** important than B (1/3)
- A is **much less** important than B (1/5)
- A is **very much less** important than B (1/7)

Calculation:

Our AHP calculation method is derived from Geoff Coyle's Practical Strategy: Structured Tools and Techniques section on Analytic Hierarchy Process (AHP).[9]

6. Cross-validation with Other Health Indices

Analytic and face validity verification is in progress to evaluate the robustness, validity, and accuracy of the MWI. As part of the analytic validity testing, the team will examine the correlation of the MWI with other major health indices, such as the Social Vulnerability Index (SVI), County Health Rankings (CHR), HRSA's Service Area Status (SAS), and others. To test its face validity, listening sessions will be held with community key informants and others to solicit feedback on ways to improve the MWI and the MWI tool to increase its validity and usefulness. The MWI team will update this page with results as they become available.

[9] Coyle, G. (2004). *The Analytic Hierarchy Process (AHP).* Pearson Education Limited 2004. https://training.fws.gov/courses/references/tutorials/geospatial/CSP7306/Readings/AHP-Technique.pdf

Appendix

Mental Wellness Index™ (MWI) Weighting

The **Mental Wellness Index™ (MWI)** is a composite index measure that captures factors influencing community-level mental wellness (which includes both mental health and substance use disorders) for each ZIP code in the nation. The overall score ranges between 0 and 100, where higher scores indicate more community assets that support mental wellness and a lower score indicates more community obstacles that challenge mental wellness.

The MWI is composed of 28 measures across 3 domains:

1. Social Determinants of Health
2. Healthcare Access
3. Health Status

Currently, there is a gap in the available literature to determine the relative importance each measure has on community mental health. However, our team has chosen to employ the Analytic Hierarchy Process (AHP), a method from the field of decision science, to understand your preferences & priorities on the relative importance of each measure.

We plan to combine the results from this form to create a set of default, recommended weights for the MWI.

Preview for weighting task:
- Enter information about your background
- Complete pairwise comparisons of relative importance across 3 domains and 28 measures.

Approximate time for completion: 15-20 minutes

We appreciate your time in advance!

* Required

Rater Information (optional)

Our goal in asking about your occupation, racial / ethnic identity, and area code is to understand how our personal roles, identities, and environments may relate to our perceptions of what is important to understanding the factors that contribute to our community mental wellness.

1

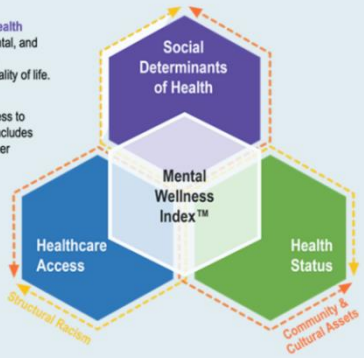
What is *your* definition of **mental wellness**?
What does **community** mental wellness look like for you?

*

Domain: Social Determinants of Health are the social, economic, environmental, and structural conditions that influence a community's mental wellness and quality of life.

Domain: Healthcare Access is access to traditional healthcare systems, and includes quality, financial, geographic, and other considerations.

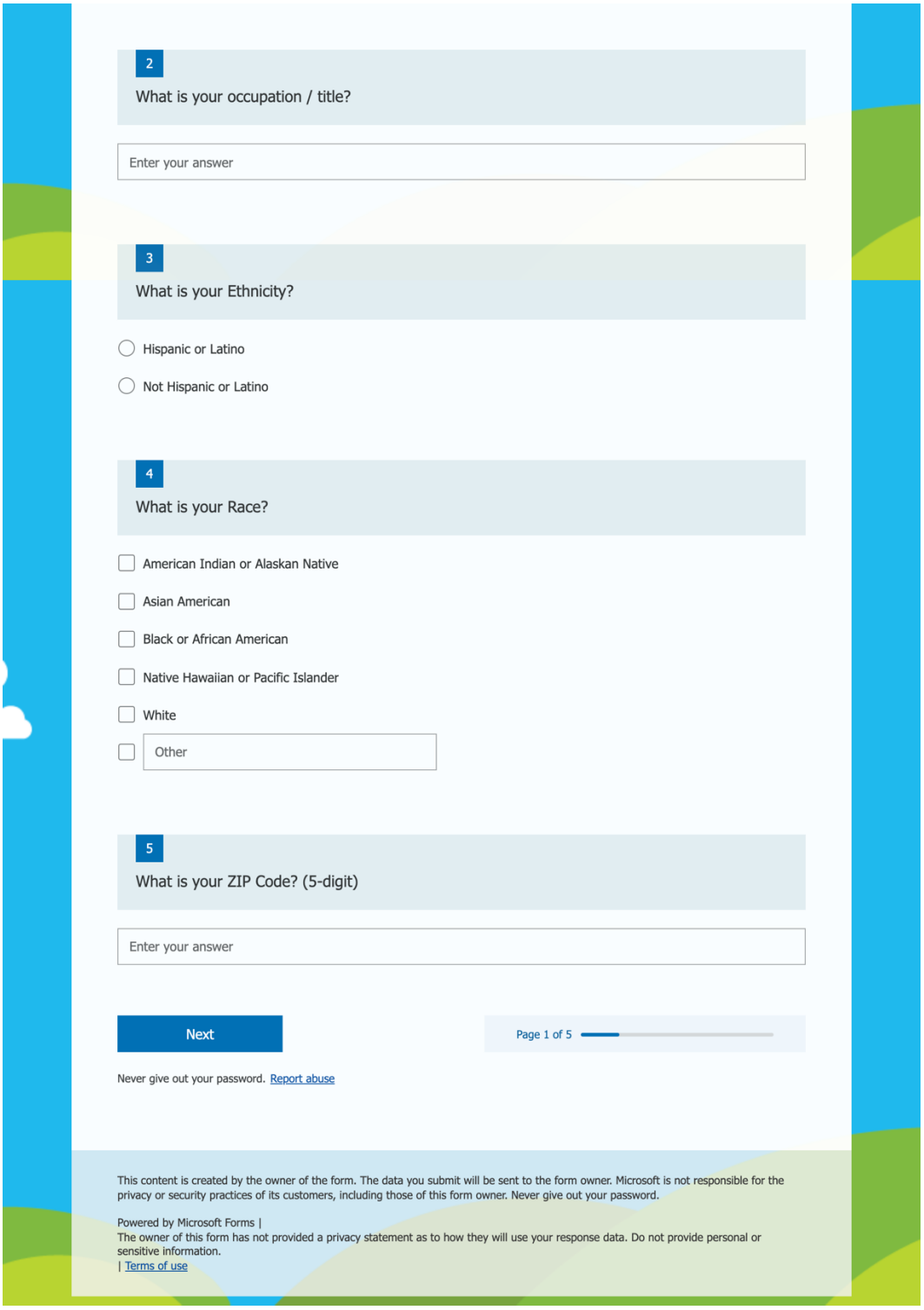
Domain: Health Status refers to mental health, substance use, and other morbidity and mortality measures linked to mental wellness.



Dynamic Factor: Structural Racism is the macrolevel systems, social forces, institutions, ideologies, and processes that interact with one another to generate and reinforce inequities among racial and ethnic groups (Gee & Ford, 2011).

Dynamic Factor: Community & Cultural Assets are resources in the form of people, places, and organizations that promote social connection and improve the health and well being of the community (Based on Arts and Planning Toolkit, 2021 and NICE, 2017)

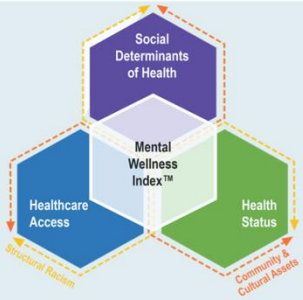
Enter your answer



Mental Wellness Index™ (MWI) Weighting

* Required

Domain Weighting



The following domains are composed of measure which capture:
Social Determinants of Health: Built Environment, Education Success, Income & Employment, Housing, Social Capital, Safety & Community Trauma, Financial Access
Healthcare Access: Access to Mental Health and Substance Use Treatment Facilities and Insurance Status
Health Status: Community level prevalence of Substance Use, Mental Health, and Other morbidity and mortality

6

Which of the following is more important in capturing community mental wellness? *

A >>> B: A is **very much more** important than B
A >> B: A is **much more** important than B
A > B: A is **somewhat more** important than B
A = B: A and B are **equally** important
A < B: A is **somewhat less** important than B
A << B: A is **much less** important than B
A <<< B: A is **very much less** important than B

	A >>> B	A >> B	A > B	A = B	A < B	A << B	A <<< B
Social Determinants of Health (A) vs. Healthcare Access (B)	○	○	○	○	○	○	○
Social Determinants of Health (A) vs Health Status (B)	○	○	○	○	○	○	○
Healthcare Access (A) vs. Health Status (B)	○	○	○	○	○	○	○

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Mental Wellness Index™ (MWI) Weighting

Social Determinants of Health Domain

Social Determinants of Health (SDOH) are the conditions of the environments where people are born, live, work, play and worship. Our team has operationalized SDOH measures into 8 subdomains, with the respective measures within them.

When comparing two subdomains, consider the measures that compose those domains.

Measures with a ^ in the figure are able to be race-stratified
Measures underlined in the figure are novel concepts or created from novel methods.

7

Which of the following is more important in capturing the impacts of Social Determinants of Health on community mental wellness?

A >>> B: A is **very much more** important than B
A >> B: A is **much more** important than B
A > B: A is **somewhat more** important than B
A = B: A and B are **equally** important
A < B: A is **somewhat less** important than B
A << B: A is **much less** important than B
A <<< B: A is **very much less** important than B

(please refer to the diagram to see what measures are captured in each subcategory)

	A >>> B	A >> B	A > B	A = B	A < B	A << B	A <<< B
Built Environment (A) vs. Education Success (B)	○	○	○	○	○	○	○
Income & Employment (A) vs. Housing (B)	○	○	○	○	○	○	○
Social Capital (A) vs. Safety & Community Trauma (B)	○	○	○	○	○	○	○
Financial Access (A) vs. Built Environment (B)	○	○	○	○	○	○	○
Education Success (A) vs. Income & Employment (B)	○	○	○	○	○	○	○
Housing (A) vs. Social Capital (B)	○	○	○	○	○	○	○
Safety & Community Trauma (A) vs. Financial Access (B)	○	○	○	○	○	○	○

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Mental Wellness Index™ (MWI) Weighting

Healthcare Access Domain

Healthcare Access defines the ability for communities to receive and interact with the healthcare system to address their needs related to mental wellness.

Mental health treatment facilities is a measure that considers spatial accessibility to facilities, as well as facility characteristics that describe Access (Language and Payment accepted), Specialized Programs, Continuum of Treatment, Continuum of Care (ancillary services).
Substance use treatment facilities is a measure that considers spatial accessibility to facilities, as well as facility characteristics that describe Access (Language and Payment accepted), Specialized Programs, Continuum of Treatment, Continuum of Care (ancillary services).

Measures with a ^ in the figure are able to be race-stratified
Measures underlined in the figure are novel concepts or created from novel methods.

8

Which of the following is more important in capturing the impacts of Healthcare Access on community mental wellness?

A >>> B: A is **very much more** important than B
A >> B: A is **much more** important than B
A > B: A is **somewhat more** important than B
A = B: A and B are **equally** important
A < B: A is **somewhat less** important than B
A << B: A is **much less** important than B
A <<< B: A is **very much less** important than B

	A >>> B	A >> B	A > B	A = B	A < B	A << B	A <<< B
Mental Health Treatment Facilities (A) vs. Substance Use Treatment Facilities (B)	○	○	○	○	○	○	○
Mental Health Treatment Facilities (A) vs. Uninsured	○	○	○	○	○	○	○
Substance Use Treatment Facilities (A) vs. Uninsured (B)	○	○	○	○	○	○	○

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Mental Wellness Index™ (MWI) Weighting

Health Status Domain

The Health Status domain describes the prevalent conditions and health outcomes within a community. Our team has grouped the 10 health status measures into 3 subdomains, measures relating to Substance Use, Mental Health, and Other morbidity and mortality measures.

The Mental Health and Substance Use measures capture the range of
Other Morbidity & Mortality measure measures were chosen given their strong link to mental wellbeing.

Measures with a ^ in the figure are able to be race-stratified
Measures underlined in the figure are novel concepts or created from novel methods.

9

Which of the following is more important in capturing the impacts of Health Status on community mental wellness?

A >>> B: A is **very much more** important than B
A >> B: A is **much more** important than B
A > B: A is **somewhat more** important than B
A = B: A and B are **equally** important
A < B:A is **somewhat less** important than B
A << B: A is **much less** important than B
A <<< B: A is **very much less** important than B

(please refer to the diagram to see what measures are captured in each subcategory)

	A >>> B	A >> B	A > B	A = B	A < B	A << B	A <<< B
Substance Use morbidity and mortality (A) vs. Mental Health morbidity and mortality (B)	○	○	○	○	○	○	○
Substance Use morbidity and mortality (A) vs. Other morbidity and mortality (B)	○	○	○	○	○	○	○
Mental Health morbidity and mortality (A) vs. Other morbidity and mortality (B)	○	○	○	○	○	○	○

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