

# **Statistical Brief on the Social Determinants and Health Equity Module, Behavioral Risk Factor Surveillance System, 2022**

(Updated 08/15/2023)

## **Objective**

This statistical brief provides general guidance for Behavioral Risk Factor Surveillance System (BRFSS) coordinators and researchers on the analysis of BRFSS Social Determinants and Health Equity Module data to enable consistency in analytic methods and results reporting.

## **Background and Rationale**

Social determinants of health (SDOH) are the conditions in the environments where people are born, live, learn, work, play, worship, and age (1), which refer to a broad array of social, structural, and contextual experiences such as educational attainment, employment status, access to food and housing, financial stability, and access to health care (2). These factors have shown a major impact on people's physical health, mental well-being, and quality of life (2). Because some of these social risk factors or experiences are highly interrelated, a composite measure of SDOH will be more important and practical than a focus on individual social risk factors when evaluating the impact of SDOH on health outcomes. Recent research has evaluated the health impact of either individual SDOH measures (3,4) or a summarizing measure of SDOH by counting the number of SDOH factors (5,6).

## **The SDOH/HE Module**

Systematically measuring SDOH, including racism and psychological determinants of health, to address social needs is essential for improving health equity. BRFSS is a state-based landline and cellular telephone survey of noninstitutionalized adults aged  $\geq 18$  years on their health-related behavioral risk factors, health care access and use of preventive services, chronic diseases and conditions, and other health outcomes. In 2022, 39 states, the District of Columbia (DC), and 2 participating US territories (Puerto Rico and the US Virgin Islands) collected the Social Determinants and Health Equity module data, which will be referenced as SDOH/HE for the remainder of this document.. The questions were based on the Center for Medicare and Medicaid Innovation Social Needs Assessment Tool (7–9) and asked about employment/economic stability, housing stability and quality, food security, transportation access, utilities security, loneliness, social & emotional support, life satisfaction, and mental well-being. Table 1 summarizes the 10 questions in the 2022 SDOH/HE module with response options for each of the questions.

**Table 1. SDOH/HE Module Questionnaire in BRFSS, 2022**

<b>Question No. with Variable Name</b>	<b>2022 Question</b>
Q1: Life Satisfaction (LSATISFY)	In general, how satisfied are you with your life? Are you... 1 Very satisfied 2 Satisfied 3 Dissatisfied 4 Very dissatisfied 7 Don't know/not sure 9 Refused
Q2: Social and Emotional Support (EMTSUPRT)	How often do you get the social and emotional support that you need? Is that... 1 Always 2 Usually 3 Sometimes 4 Rarely 5 Never 7 Don't know/not sure 9 Refused
Q3: Social Isolation (SDHISOLT)	How often do you feel socially isolated from others? Is it... 1 Always 2 Usually 3 Sometimes 4 Rarely 5 Never 7 Don't know/not sure 9 Refused
Q4: Employment Stability (SDHEMPY)	In the past 12 months have you lost employment or had hours reduced? 1 Yes 2 No 7 Don't Know/ Not sure 9 Refused
Q5: Food Security (FOODSTMP)	During the past 12 months, have you received food stamps, also called SNAP, the Supplemental Nutrition Assistance Program on an EBT card? 1 Yes 2 No 7 Don't Know/ Not sure 9 Refused
Q6: Food Security (SDHFOOD1)	During the past 12 months how often did the food that you bought not last, and you didn't have money to get more? Was that... 1 Always 2 Usually 3 Sometimes 4 Rarely 5 Never

	<p>7 Don't know/not sure 9 Refused</p>
<p>Q7: Housing Security (SDHBILLS)</p>	<p>During the last 12 months, was there a time when you were not able to pay your mortgage, rent or utility bills?</p> <p>1 Yes 2 No 7 Don't Know/ Not sure 9 Refused</p>
<p>Q8: Utility Security (SDHUTILS)</p>	<p>During the last 12 months was there a time when an electric, gas, oil, or water company threatened to shut off services?</p> <p>1 Yes 2 No 7 Don't Know/ Not sure 9 Refused</p>
<p>Q9: Transportation Access (SDHTRNSP)</p>	<p>During the past 12 months has a lack of reliable transportation kept you from medical appointments, meetings, work, or from getting things needed for daily living?</p> <p>1 Yes 2 No 7 Don't Know/ Not sure 9 Refused</p>
<p>Q10: Mental Well-being (SDHSTRE1)</p>	<p>Stress means a situation in which a person feels tense, restless, nervous or anxious or is unable to sleep at night because their mind is troubled all the time. Within the last 30 days, how often have you felt this kind of stress? Was it...</p> <p>1 Always 2 Usually 3 Sometimes 4 Rarely 5 Never 7 Don't know/not sure 9 Refused</p>

**Preparation of the final data set for analyzing SDOH/HE Module data**

In 2022, 34 states, DC, and 2 territories (Puerto Rico and US Virgin Islands) collected SDOH/HE module data through the common combined landline and cell phone survey; Nebraska and Ohio collected the data using the version 1 questionnaire; Oklahoma collected the data using the version 2 questionnaire; and Maryland and Michigan used split surveys of

versions 1 and 2 questionnaires. For more information on survey versions and module data analysis, please refer to the 2022 document for [Complex Sampling Weights and Preparing Module Data for Analysis](#). Table 2 summarizes the states with corresponding data set names and weight variable for each of the data sets.

**Table 2. US States and Territories That Used the SDOH/HE Module with Corresponding Data Set Names and Weight Variables in BRFSS, 2022**

Module	Description	Data Set	Data Weight	State(s)
Social Determinants and Health Equity	Combined Land Line and Cell Phone data	LLCP2022	_LLCPWT	Alabama, Alaska, Arizona, California, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Maine, Massachusetts, Minnesota, Mississippi, Missouri, Montana, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Puerto Rico, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Virgin Islands, Washington, West Virginia, Wisconsin, Wyoming
	Combined Land Line and Cell Phone data, version 1	LLCP22V1	_LCPWTV1	Maryland, Michigan, Nebraska, Ohio
	Combined Land Line and Cell Phone data, version 2	LLCP22V2	_LCPWTV2	Maryland, Michigan, Oklahoma

The following SAS and R codes are used for preparation of final SDOH/HE data set for analysis:

**SAS Code:**

```
data SDOH_llcp2022 (where=( _state in (1,2,4,6,9,10,11,12,13,16,
    18,19,20,21,23,25,27,28,29,30,32,33,34,35,37,44,45,47,
    48,49,50,53,54,55,56,72,78)));
set LLCP2022; *This is the Common combined dataset;
*Rename final weight variable to be consistent across new data sets;
rename _LLCPWT=_finalwt;
run;

data SDOH_llcp22v1 (where=( _state in (24,26,31,39)));;
set LLCP22V1; *This is the Version 1 dataset;
*Rename final weight variable to be consistent across new data sets;
If _state in (31,39) then _finalwt= _LCPWTV1; *Nebraska(31) and
Ohio(39) used version 1 questionnaire;
If _state in (24,26) then _finalwt= _LCPWTV1/2; *Maryland(24) and
Michigan(26): Split in versions 1 and 2, so final weight will be
divided by 2;
run;

data SDOH_llcp22v2 (where=( _state in (24,26,40)));;
set LLCP22V2; *This is the Version 2 dataset;
*Rename final weight variable to be consistent across new data sets;
If _state in (40) then _finalwt= _LCPWTV2; *Oklahoma(40) used version
2 questionnaire;
If _state in (24,26) then _finalwt= _LCPWTV2/2; *Maryland(24) and
Michigan(26): Split in versions 1 and 2, so final weight will be
divided by 2;
run;

*Combine 3 data sets to obtain SDOH/HE Module Data for analysis,
BRFSS, 2022;
data SDOH_BRFSS2022;
set SDOH_llcp2022 SDOH_llcp22v1 SDOH_llcp22v2;
run;
```

**R code:**

```
#Load tidyverse package
library("tidyverse")

#Keep states that used SDOH/HE module; These are the states in the
Common combined dataset.
SDOHLCP2022 <- LLCP2022[LLCP2022$STATE %in%
c(1,2,4,6,9,10,11,12,13,16,
18,19,20,21,23,25,27,28,29,30,32,33,34,35,37,44,45,47,
48,49,50,53,54,55,56,72,78), ]
```

```

#FINALWT assigned from LLCPT - weight variable
SDOHLCP2022$FINALWT <- SDOHLCP2022$LLCPWT

#Remove LLCPT variable from data
SDOHLCP2022 = subset(SDOHLCP2022, select = -c(LLCPWT))

#Keep states Nebraska (31) and Ohio (39)- used version 1 questionnaire
LLCP22V1A <- LLCPT22V1[LLCP22V1$STATE %in% c(31,39), ]
#FINALWT assigned from LCPWT - weight variable
LLCP22V1A$FINALWT <- LLCPT22V1A$LCPWT

#Keep states Maryland (24) and Michigan (26)- used version 1
#questionnaire, split in versions 1 and 2,
LLCP22V1B <- LLCPT22V1[LLCP22V1$STATE %in% c(24,26), ]
#FINALWT assigned from LCPWT and divide by 2
LLCP22V1B$FINALWT <- LLCPT22V1B$LCPWT/2

#Combine version 1 questionnaire datasets for Nebraska, Ohio,
#Maryland, Michigan
SDOHLCP22V1 <- rbind(LLCP22V1A, LLCPT22V1B)

#Keep Oklahoma (40)- used version 2 questionnaire
LLCP22V2A <- LLCPT22V2[LLCP22V2$STATE %in% c(40), ]
#FINALWT assigned from LCPWT - weight variable
LLCP22V2A$FINALWT <- LLCPT22V2A$LCPWT

#Keep states Maryland (24) and Michigan (26)- used version 2
#questionnaire, split in versions 1 and 2
LLCP22V2B <- LLCPT22V2[LLCP22V2$STATE %in% c(24,26), ]
#FINALWT assigned from LCPWT and divide by 2
LLCP22V2B$FINALWT <- LLCPT22V2B$LCPWT/2

#Combine version 2 questionnaire datasets for Oklahoma, Maryland,
#Michigan
SDOHLCP22V2 <- rbind(LLCP22V2A, LLCPT22V2B)

#Combine all data sets for analysis
SDOHLCP2022 <- bind_rows(SDOHLCP2022, SDOHLCP22V1, SDOHLCP22V2)

```

## Variable Recoding

We suggest creating the following recoded variables from participants' original response options to each of the questions in the SDOH/HE module. The recoded variables are presented in Table

3. Participants who respond “don’t know/not sure,” refuse to answer, or have missing responses to any of the questions will be set as missing.

**Table 3. Calculated Variables from Responses to the Questions in the SDOH/HE Module, BRFSS, 2022**

Recoded Variable	2022 SDOH/HE Question with Recoding
M_LSATISFY	<p>In general, how satisfied are you with your life? Are you...</p> <p><b>SAS Code:</b></p> <pre> If LSATISFY in (1,2) then M_LSATISFY=2; else If LSATISFY in (3,4) then M_LSATISFY=1; else M_LSATISFY=.; Label M_LSATISFY='Life satisfaction: 1=Dissatisfied/Very dissatisfied, 2=Satisfied/Very satisfied'; </pre> <p><b>R Code:</b></p> <pre> M_LSATISFY &lt;- case_when( LSATISFY %in% 1:2 ~ 2, LSATISFY %in% 3:4 ~ 1) M_LSATISFY &lt;- factor(M_LSATISFY, levels = c(1:2), labels = c("Life satisfaction: Dissatisfied/Very dissatisfied", "Satisfied/Very satisfied")) </pre>
M_EMETSUPRT	<p>How often do you get the social and emotional support that you need? Is that...</p> <p><b>SAS Code:</b></p> <pre> If EMETSUPRT in (1,2) then M_EMETSUPRT=3; else If EMETSUPRT in (3) then M_EMETSUPRT=2; else If EMETSUPRT in (4,5) then M_EMETSUPRT=1; else M_EMETSUPRT=.; Label M_EMETSUPRT='Get social and emotional Support: 1=Rarely/Never, 2=Sometimes, 3=Always/Usually'; </pre> <p><b>R Code:</b></p> <pre> M_EMETSUPRT &lt;- case_when( EMETSUPRT %in% 1:2 ~ 3, EMETSUPRT %in% 3 ~ 2, EMETSUPRT %in% 4:5 ~ 1) M_EMETSUPRT &lt;- factor(M_EMETSUPRT, levels = c(1:3), labels = c("Get social and emotional Support: Rarely/Never", "Sometimes", "Always/Usually")) </pre>
M_SDHISOLT	<p>How often do you feel socially isolated from others? Is it...</p> <p><b>SAS Code:</b></p> <pre> If SDHISOLT in (1,2) then M_SDHISOLT=1; else If SDHISOLT in (3) then M_SDHISOLT=2; else If SDHISOLT in (4,5) then M_SDHISOLT=3; else M_SDHISOLT=.; </pre>



	<p>Label M_SDHISOLT='Feel social isolation: 1=Always/Usually, 2=Sometimes, 3=Rarely/Never';</p> <p><b>R Code:</b>  M_SDHISOLT &lt;- case_when(  SDHISOLT %in% 1:2 ~ 1,  SDHISOLT %in% 3 ~ 2,  SDHISOLT %in% 4:5 ~ 3)  M_SDHISOLT &lt;- factor(M_SDHISOLT, levels = c(1:3), labels = c("Feel social isolation: Always/Usually ", "Sometimes", "Rarely/Never"))</p>
M_SDHEMPLY	<p>In the past 12 months have you lost employment or had hours reduced?</p> <p><b>SAS Code:</b>  if SDHEMPLY=1 then M_SDHEMPLY=1;  else if SDHEMPLY=2 then M_SDHEMPLY=2;  else M_SDHEMPLY=.;  Label M_SDHEMPLY='Loss or reduced employment: 1=Yes, 2=No';</p> <p><b>R Code:</b>  M_SDHEMPLY &lt;- case_when(  SDHEMPLY %in% 1 ~ 1,  SDHEMPLY %in% 2 ~ 2)  M_SDHEMPLY &lt;- factor(M_SDHEMPLY, levels = c(1:2), labels = c("Loss or reduced employment: "Yes ", "No"))</p>
M_FOODSTMP	<p>During the past 12 months, have you received food stamps, also called SNAP, the Supplemental Nutrition Assistance Program on an EBT card?</p> <p><b>SAS Code:</b>  if FOODSTMP=1 then M_FOODSTMP=1;  else if FOODSTMP=2 then M_FOODSTMP=2;  else M_FOODSTMP=.;  Label M_FOODSTMP='Receive SNAP: 1=Yes, 2=No';</p> <p><b>R Code:</b>  M_FOODSTMP &lt;- case_when(  FOODSTMP %in% 1 ~ 1,  FOODSTMP %in% 2 ~ 2)  M_FOODSTMP &lt;- factor(M_FOODSTMP, levels = c(1:2), labels = c("Receive SNAP: Yes ", "No"))</p>
M_SDHFOOD1	<p>During the past 12 months how often did the food that you bought not last, and you didn't have money to get more? Was that... Read:</p> <p><b>SAS Code:</b>  if SDHFOOD1 in (1,2) then M_SDHFOOD1=1;  else if SDHFOOD1 in (3) then M_SDHFOOD1=2;  else if SDHFOOD1 in (4,5) then M_SDHFOOD1=3;  else M_SDHFOOD1=.;  Label M_SDHFOOD1='Food not lasting/no money to buy: 1=Always/Usually, 2=Sometimes, 3=Rarely/Never';</p>

	<p><b>R Code:</b></p> <pre>M_SDHFOOD1 &lt;- case_when( SDHFOOD1 %in% 1:2 ~ 1, SDHFOOD1 %in% 3 ~ 2, SDHFOOD1 %in% 4:5 ~ 3) M_SDHFOOD1 &lt;- factor(M_SDHFOOD1, levels = c(1:3), labels = c("Food not lasting/no money to buy: Always/Usually", "Sometimes", "Rarely/Never"))</pre>
M_SDHBILLS	<p>During the last 12 months, was there a time when you were not able to pay your mortgage, rent or utility bills?</p> <p><b>SAS Code:</b></p> <pre>if SDHBILLS=1 then M_SDHBILLS=1; else if SDHBILLS=2 then M_SDHBILLS=2; else M_SDHBILLS=.; Label M_SDHBILLS='Unable to pay for mortgage/rent/utility bills: 1=Yes, 2=No';</pre> <p><b>R Code:</b></p> <pre>M_SDHBILLS &lt;- case_when( SDHBILLS %in% 1 ~ 1, SDHBILLS %in% 2 ~ 2) M_SDHBILLS &lt;- factor(M_SDHBILLS, levels = c(1:2), labels = c("Unable to pay for mortgage/rent/utility bills: Yes", "No"))</pre>
M_SDHUTILS	<p>During the last 12 months was there a time when an electric, gas, oil, or water company threatened to shut off services?</p> <p><b>SAS Code:</b></p> <pre>if SDHUTILS=1 then M_SDHUTILS=1; else if SDHUTILS=2 then M_SDHUTILS=2; else M_SDHUTILS=.; Label M_SDHUTILS='Threatened to shut off utility services: 1=Yes, 2=No';</pre> <p><b>R Code:</b></p> <pre>M_SDHUTILS &lt;- case_when( SDHUTILS %in% 1 ~ 1, SDHUTILS %in% 2 ~ 2) M_SDHUTILS &lt;- factor(M_SDHUTILS, levels = c(1:2), labels = c("Threatened to shut off utility services: Yes", "No"))</pre>
M_SDHTRNSP	<p>During the past 12 months has a lack of reliable transportation kept you from medical appointments, meetings, work, or from getting things needed for daily living?</p> <p><b>SAS Code:</b></p> <pre>if SDHTRNSP=1 then M_SDHTRNSP=1; else if SDHTRNSP=2 then M_SDHTRNSP=2; else M_SDHTRNSP=.; Label M_SDHTRNSP='Lack of reliable transportation: 1=Yes, 2=No';</pre> <p><b>R Code:</b></p> <pre>M_SDHTRNSP &lt;- case_when( SDHTRNSP %in% 1 ~ 1,</pre>

	SDHTRNSP %in% 2 ~ 2) M_SDHTRNSP <- factor(M_SDHTRNSP, levels = c(1:2), labels = c("Lack of reliable transportation: Yes", "No"))
M_SDHSTRE1	Stress means a situation in which a person feels tense, restless, nervous or anxious or is unable to sleep at night because their mind is troubled all the time. Within the last 30 days, how often have you felt this kind of stress? Was it... <b>SAS Code:</b> If SDHSTRE1 in (1,2) then M_SDHSTRE1=1; else If SDHSTRE1 in (3) then M_SDHSTRE1=2; else If SDHSTRE1 in (4,5) then M_SDHSTRE1=3; else M_SDHSTRE1=.; Label M_SDHSTRE1='Feel stress within the last 30 days: 1=Always/Usually, 2=Sometimes, 3=Rarely/Never';  <b>R Code:</b> M_SDHSTRE1 <- case_when( SDHSTRE1 %in% 1:2 ~ 1, SDHSTRE1 %in% 3 ~ 2, SDHSTRE1 %in% 4:5 ~ 3) M_SDHSTRE1 <- factor(M_SDHSTRE1, levels = c(1:3), labels = c("Feel stress within the last 30 days: Always/Usually", "Sometimes", "Rarely/Never"))

**Analytic Approaches**

A few questions in the Social Determinants of Health module—which was included in the 2017 BRFSS—were similar to those in the SDOH/HE module used in 2022. In 2017, 17 states collected SDOH data (with data publicly available from only 16 states). Since the public release of the 2017 BRFSS data set, researchers have used the SDOH data to evaluate the associations of SDOH with health indicators. As previously described, either individual SDOH measures (3,4) or a summarizing measure of SDOH (5,6) have been used in those studies. Upon release of the 2022 BRFSS data in 2023, we encourage researchers to analyze the data and disseminate research findings through presentations and publications, focusing on the following aspects:

1. Examine the associations between individual SDOH measures and specific health outcomes

Using the state-based, cross-sectional, population surveillance data from BRFSS, associations between individual SDOH measures (such as lack of social and emotional support, social isolation, food insecurity, house insecurity, financial insecurity) with health outcome measures could be studied following traditional epidemiologic methods.

2. Examine the associations between a summarizing measure of SDOH and specific health outcomes

To calculate the summarizing score of SDOH measures, individual SDOH variables should be recoded as 1/0. Please see Table 4 for recoding.

**Table 4. SDOH/HE Measures with Recoding in BRFSS, 2022**

Measurement	Calculated Variable	Question with Recoding
Life satisfaction	R_LSATISFY	In general, how satisfied are you with your life? Are you... 1=Dissatisfied/Very dissatisfied 0=Satisfied/Very satisfied
Social and emotional support	R_EMTSUPRT	How often do you get the social and emotional support that you need? Is that... 1=Sometimes/Rarely/Never 0=Always/Usually
Social isolation	R_SDHISOLT	How often do you feel socially isolated from others? Is it... 1=Always/Usually/Sometimes 0=Rarely/Never
Lost or reduced hours for employment	R_SDHEMPLOY	In the past 12 months have you lost employment or had hours reduced? 1=Yes 0=No
Receiving food stamps or SNAP	R_FOODSTMP	During the past 12 months, have you received food stamps, also called SNAP, the Supplemental Nutrition Assistance Program on an EBT card? 1=Yes 0=No
Food insecurity	R_SDHFOOD1	During the past 12 months how often did the food that you bought not last, and you didn't have money to get more? Was that... Read: 1=Always/Usually/Sometimes 0=Rarely/Never
Housing insecurity	R_SDHBILLS	During the last 12 months, was there a time when you were not able to pay your mortgage, rent or utility bills? 1=Yes 0=No
Threatened to shut off utility services	R_SDHUTILS	During the last 12 months was there a time when an electric, gas, oil, or water company threatened to shut off services? 1=Yes 0=No
Lack of reliable transportation	R_SDHTRNSP	During the past 12 months has a lack of reliable transportation kept you from medical appointments, meetings, work, or from getting things needed for daily living? 1=Yes 0=No
Mental distress	R_SDHSTRE1	Stress means a situation in which a person feels tense, restless, nervous or anxious or is unable to sleep at night because their mind is troubled all the time. Within the

		last 30 days, how often have you felt this kind of stress? Was it... 1=Always/Usually 0=Sometimes/Rarely/Never
--	--	---

The summarizing score of SDOH measurements can be computed as shown below. The SDOH score ranges from 0 to 10 and can be categorized as having 0, 1, 2, 3,  $\geq 4$  social risk factors.

**SAS Code:**

```

SDOH_SUM1 =R_LSATISFY +R_EMPTUPRT +R_SDHISOLT +R_SDHEMPY +R_FOODSTMP
            +R_SDHFOOD1 +R_SDHBILLS +R_SDHUTILS +R_SDHTRNSP +R_SDHSTRE1;

SDOH_SUM2=SUM(R_LSATISFY, R_EMPTUPRT, R_SDHISOLT, R_SDHEMPY, R_FOODSTMP,
              R_SDHFOOD1, R_SDHBILLS, R_SDHUTILS, R_SDHTRNSP, R_SDHSTRE1;

      if SDOH_SUM1 in (1) then SDOH_cat5=1; *SDOH score=1;
else if SDOH_SUM1 in (2) then SDOH_cat5=2; *SDOH score=2;
else if SDOH_SUM1 in (3) then SDOH_cat5=3; *SDOH score=3;
else if SDOH_SUM1 >=4 or SDOH_SUM2 >=4 then SDOH_cat5=4;*SDOH score>=4;
else if SDOH_SUM1 =0      then SDOH_cat5=0; *Having none of the social needs;
else SDOH_cat5=.;

```

**R Code:**

```

SDOHSUM1 = R_LSATISFY + R_EMPTUPRT + R_SDHISOLT + R_SDHEMPY + R_FOODSTMP +
R_SDHFOOD1 + R_SDHBILLS + R_SDHUTILS + R_SDHTRNSP + R_SDHSTRE1

rowwise() %>% mutate(SDOHSUM2 = sum(R_LSATISFY, R_EMPTUPRT, R_SDHISOLT,
R_SDHEMPY, R_FOODSTMP, R_SDHFOOD1, R_SDHBILLS, R_SDHUTILS, R_SDHTRNSP,
R_SDHSTRE1, na.rm=T))

SDOHCAT5<- case_when(
  SDOHSUM1 %in% 1 ~ 1,
  SDOHSUM1 %in% 2 ~ 2,
  SDOHSUM1 %in% 3 ~ 3,
  SDOHSUM1 %in% 4:10 | SDOHSUM2 %in% 4:10 ~ 4,
  SDOHSUM1 %in% 0 ~ 0)

```

Please note: A few subjective measures such as life satisfaction (Q1), social and emotional support (Q2), social isolation (Q3), and mental stress (Q10) can be treated as outcome variables in epidemiologic studies, depending on the study purposes (3). In addition, other social risk factors such as lack of health care access or cost barriers for access to care could be counted in

when generating a composite score of SDOH measures, in addition to the SDOH measures described in Table 1, depending on the specific research purposes.

### Contact Information:

For general questions or questions on SAS codes, please contact Dr. Guixiang (Grace) Zhao:

[fwj4@cdc.gov](mailto:fwj4@cdc.gov)

For questions on R codes, please contact Dr. Karen Kirtland: [gon6@cdc.gov](mailto:gon6@cdc.gov)

### References

1. Centers for Disease Control and Prevention. Social Determinants of Health - Healthy People 2030 | health.gov. <https://health.gov/healthypeople/priority-areas/social-determinants-health>. Accessed August 10, 2023
2. World Health Organization. Closing the gap in a generation: health equity through action on the social determinants of health - Final report of the commission on social determinants of health. 2008. <https://www.who.int/publications/i/item/WHO-IER-CSDH-08.1>. Accessed August 10, 2023
3. Lund JJ, Chen TT, LaBazzo GE, Hawes SE, Mooney SJ. The association between three key social determinants of health and life dissatisfaction: A 2017 Behavioral Risk Factor Surveillance System analysis. *Prev Med*. 2021;153:106724. <https://doi.org/10.1016/j.ypmed.2021.106724>.
4. Carlson SA, Wheaton AG, Liu Y, et al. Associations of self-reported chronic obstructive pulmonary disease with indicators of economic instability and stress - 16 states, 2017 *Chronic Illn*. 2023;19(2):327–338. <https://doi.org/10.1177/17423953211059144>
5. Rethorn ZD, Rethorn TJ, Cook CE, Sharpe JA, Hastings SN, Allen KD. Association of burden and prevalence of arthritis with disparities in social risk factors, findings from 17 US states. *Prev Chronic Dis*. 2022;19:E08. <http://dx.doi.org/10.5888/pcd19.210277>
6. Nelson CC. Using a social determinants of health summary measure to predict general health status in the BRFSS. *Am J Health Promot*. 2022;36(2):301–304. <https://doi.org/10.1177/08901171211044994>
7. De Marchis E, Adler N, Clark C, et al. Screening for social risk factors: a comparison of two multi-domain social risk screening tools. *Health Serv Res*. 2020; 55:138. <https://doi.org/10.1111/1475-6773.13529>

8. Holcomb J, Oliveira LC, Highfield L, Hwang KO, Giancardo L, Bernstam EV. Predicting health-related social needs in Medicaid and Medicare populations using machine learning. *Sci Rep.* 2022;12:4554. <https://doi.org/10.1038/s41598-022-08344-4>
9. Thomas-Henkel C, Schulman M. Screening for social determinants of health in populations with complex needs: implementation considerations, Center for Health Care Strategies. <http://www.chcs.org/media/SDOH-Complex-Care-Screening-Brief-102617.pdf>. Accessed August 10, 2023