



Maternal and Infant Health Assessment (MIHA) Survey Technical Notes

“Pregnancy is the most beautiful process. The time when you think more about your body and taking care of yourself for somebody really special inside you.”

— MIHA 2013 Respondent

Included in this document are the definition of indicators (page 1), data annotation and suppression criteria (page 8) and weighting methods (page 9) used in the 2010-2014 Maternal and Infant Health Assessment (MIHA) survey. Additional information about the MIHA survey can be found on the MIHA webpage at <http://www.cdph.ca.gov/MIHA>.

Definition of Indicators

Indicators are based on self-reported data from the Maternal and Infant Health Assessment (MIHA) survey and refer to the most recent birth, or pregnancy for the most recent birth, unless otherwise indicated. Unless noted, the denominator for each indicator includes all women with a live birth. The question number corresponding to the MIHA 2014 survey is listed after each definition. Any changes to the survey question or indicator compared to prior years are noted in the definition. The questionnaires can be found at www.cdph.ca.gov/MIHA/Questionnaires.

Prior Poor Birth Outcomes

Prior low birth weight or preterm delivery (2010-2012 only): Prior to the most recent birth, ever had a baby weighing <2,500 grams at birth or born <37 weeks gestation. (Q2, 3)

Prior delivery by c-section (2010-2012 only): Ever had a cesarean section prior to the most recent birth. (Birth certificate)

Health Status

In good to excellent health before pregnancy: Self-rated health just before pregnancy. In 2010, the indicator was self-rated *physical* health. In 2011, the survey question was changed from two separate questions on physical health and mental health to one question on “health.” An additional response of “Very good” also was added between response categories “Excellent” and “Good.” Starting in 2011, the indicator is not comparable with prior years. (Q7)

Chronic Conditions

Diabetes or gestational diabetes: Told by a health care worker that she had diabetes (high blood sugar). Starting in 2014, the question on gestational diabetes during this pregnancy was dropped, therefore the indicator measures only diabetes before pregnancy. Starting with 2013-2014 Snapshots, the indicator is not comparable with prior years. (Q16A)

Hypertension, preeclampsia, or eclampsia: Told by a health care worker that she had hypertension (high blood pressure) before or during this pregnancy. Starting in 2014, preeclampsia, eclampsia, or toxemia during this pregnancy was dropped, therefore the indicator measures only hypertension before pregnancy. Starting with 2013-2014 Snapshots, the indicator is not comparable with prior years. (Q16B)

Asthma: Told by a health care worker that she had asthma before or during this pregnancy. Starting in 2014, asthma during pregnancy was dropped, therefore the indicator measures only hypertension before pregnancy. Starting with 2013-2014 Snapshots, the indicator is not comparable with prior years. (Q16C)

Nutrition and Weight

Daily folic acid use, month before pregnancy: Took a multivitamin, prenatal vitamin, or folic acid vitamin every day of the week during the month before pregnancy. (Q9)

Overweight/obese before pregnancy: Body Mass Index (BMI) calculated from self-reported weight and height, classified as overweight (25-29.99) or obese (30+). BMI calculated only for women reporting height within 48-83 inches and weight within 75-399 pounds. Starting in 2011, BMI values outside 13-69.99 were also excluded. Because the number of additional women excluded was small, the indicator in 2010 is comparable to subsequent years. (Q10, 13)

Inadequate/excessive weight gain during pregnancy: Adequacy of total weight gained during pregnancy, given pre-pregnancy BMI, was based on the National Academies of Science, Engineering and Medicine guidelines and restricted to women who delivered at 37-42 weeks gestation, singletons and twins, prenatal weight gain within 0-97 pounds, height within 48-83 inches, pre-pregnancy weight within 75-399 pounds, and BMI values within 13-69.99. See guidelines for more detail www.nationalacademies.org/hmd/Reports/2009/Weight-Gain-During-Pregnancy-Reexamining-the-Guidelines.aspx . (Q10, 11, 13; data on singletons/twins and gestational age from birth certificate)

Food insecurity during pregnancy: Calculated from the modified U.S. Department of Agriculture (USDA) Food Security Module Six Item Short Form and categorized as food secure (0-1) or food insecure (2-6). Responses with one or two missing values were imputed. See USDA guidelines for more detail: http://www.ers.usda.gov/datafiles/Food_Security_in_the_United_States/Food_Security_Survey_Modules/short2012.pdf. (Q74-77)

Intimate Partner Violence (IPV) and Depressive Symptoms

Physical IPV in the year before pregnancy (2010 and 2011 only): Pushed, hit, slapped, kicked, choked, or physically hurt in any way by current or former partner during the 12 months before pregnancy.

Physical or psychological IPV during pregnancy: During pregnancy, experienced any of the following: pushed, hit, slapped, kicked, choked, or physically hurt in any way by current or former partner; frightened for safety of self, family, or friends because of current or former partner's anger/threats; current or former partner tried to control most/all daily activities. (Q33-35)

Prenatal depressive symptoms: During pregnancy, experienced both of the following for two weeks or longer: felt sad, empty or depressed for most of the day; lost interest in most things she usually enjoyed. (Q27, 28)

Postpartum depressive symptoms: Since most recent birth, experienced both of the following for two weeks or longer: felt sad, empty or depressed for most of the day; lost interest in most things she usually enjoyed. (Q56, 57)

Hardships and Support During Pregnancy

Experienced two or more hardships during childhood: Composite indicator measuring 2 or more hardships experienced during the woman's childhood (from birth through age 13). Hardships included: a parent or guardian she lived with got divorced or separated; she moved because of problems paying the rent or mortgage; someone in her family went hungry because family could not afford enough food; her parent or guardian got in trouble with the law or went to jail; a parent or guardian she lived with had a serious drinking or drug problem; she was in foster care (removed from her home by the court of child welfare agency), and very often or somewhat often her family experienced difficulty paying for basic needs like food or housing. (Q31A-G, Q32)

Had "a lot" of unpaid bills (2010 only): Had a lot of bills she couldn't pay during pregnancy.

Homeless or did not have a regular place to sleep: Did not have a regular place to sleep at night (moved from house to house) or was homeless (had to sleep outside, in a car or in a shelter) during pregnancy. (Q30C-D)

Moved due to problems paying rent or mortgage: Had to move to a new address during pregnancy because of problems paying the rent or mortgage. Starting in 2011, the indicator is not comparable to

prior years, which measured whether a woman moved to a new address for any reason. (Q30B)

Woman or partner lost job: Lost job even though wanted to go on working, or husband or partner lost their job during pregnancy. (Q30E-F)

Woman or partner had pay or hours cut back: Had pay or hours cut back or partner had pay or hours cut back during pregnancy. (Q30G).

Became separated or divorced: Became separated or divorced from partner during pregnancy. (Q30A)

Had no practical or emotional support: During pregnancy, had neither someone to turn to for practical help, like getting a ride somewhere, or help with shopping or cooking a meal; nor someone to turn to if she needed someone to comfort or listen to her. (Q29A-B)

Substance Use

Any smoking, 3 months before pregnancy: Smoked any cigarettes on an average day during the three months before pregnancy. (Q36, 37A)

Any smoking, 1st or 3rd trimester (2010-2012 only): Smoked any cigarettes on an average day during the first or last three months of pregnancy. In 2011, the phrase in italics was added to the question on smoking during the first trimester of pregnancy: “During the first 3 months of your pregnancy (*including before you knew you were pregnant for sure*), how many cigarettes or packs of cigarettes did you smoke on an average day? (A pack has 20 cigarettes.)” Starting in 2011, the indicator is not comparable with prior years.

Any smoking, 3rd trimester: Smoked any cigarettes on an average day during the last three months of pregnancy. In 2014, the question on smoking during the first trimester was taken off of the survey and the indicator was modified starting with 2013-2014 Snapshots. (Q36, 37B)

Any smoking, postpartum: Smoked any cigarettes at the time of the survey. (Q36, 38)

Any binge drinking, 3 months before pregnancy: Drank four or more alcoholic drinks in one sitting (within about two hours) at least one time during the three months before pregnancy. (Q39, 41)

Any alcohol use, 1st or 3rd trimester (2010-2012 only): Drank any alcoholic drinks in an average week during the first or last three months of pregnancy. In 2011, the phrase in italics was added to the question on drinking during the first trimester of pregnancy: “During the first 3 months of your pregnancy (*including before you knew you were pregnant for sure*), about how many drinks with alcohol did you have in an average week?” Starting in 2011, the indicator is not comparable with prior years.

Any alcohol use, 3rd trimester: Drank any alcoholic drinks in an average week during the last three months of pregnancy. In 2014, the question on drinking alcohol during the first trimester was taken off of the survey and the indicator was modified starting with 2013-2014 Snapshots. (Q39, 42)

Pregnancy Intention and Family Planning

Mistimed or unwanted pregnancy: Just before pregnancy, felt that she did not want to get pregnant or wanted to get pregnant later. This indicator is not comparable with the unintended pregnancy indicator reported before 2011. (Q14)

Unsure of pregnancy intentions: Just before pregnancy, felt that she was not sure if she wanted to get pregnant. (Q14)

Postpartum birth control use: Woman or husband/partner was doing something at the time of the survey to keep from getting pregnant; excluded from the denominator were women who were currently pregnant or had a hysterectomy/oophorectomy. Starting with 2013-2014 Snapshots, the indicator definition changed and is not comparable with prior years. (Q52, 53, 54)

Infant Sleep and Breastfeeding

Placed infant on back to sleep: Put baby down to sleep on his or her back most of the time, excluding from the denominator women whose infant did not reside with them at the time of the survey. (Q63)

Infant always or often shared bed: Baby always or often slept in the same bed with her or someone else, excluding from the denominator women whose infant did not reside with them at the time of the survey. (Q64)

Intended to breastfeed, before birth: Before delivery, planned to breastfeed only or to breastfeed and use formula, excluding from the denominator women whose infant did not reside with them at the time of the survey. (Q59)

Intended to breastfeed exclusively, before birth: Before delivery, planned to breastfeed only, excluding from the denominator women whose infant did not reside with them at the time of the survey. (Q59)

Any breastfeeding, 1 month after delivery: Fed infant breast milk for at least one month after delivery with or without formula, other liquids or food; excluding from the denominator women whose infant did not reside with them at the time of the survey. The infant feeding questions changed in 2011. Starting in 2011, the indicator is not comparable with prior years. (Q60, 61A, 61B; infant age calculated from date of birth on the birth certificate)

Exclusive breastfeeding, 1 month after delivery: Fed infant only breast milk (no supplementation with formula, other liquids or food) for at least one month after delivery; excluding from the denominator women whose infant did not reside with them at the time of the survey. The infant feeding questions changed in 2011. Starting in 2011, the indicator is not comparable with prior years. (Q60, 61A, 61B, 62A, B, C; infant age calculated from date of birth on the birth certificate)

Any breastfeeding, 3 months after delivery: Fed infant breast milk for at least three months after delivery with or without supplementing with formula, other liquids or food; excluding from the denominator women whose infant did not reside with them or whose infant was not yet three months old at the time of the survey. The infant feeding questions changed in 2011. Starting in 2011, the indicator is not comparable with prior years. (Q60, 61A, 61B; infant age calculated from date of birth on the birth certificate)

Exclusive breastfeeding, 3 months after delivery: Fed infant only breast milk (no supplementation with formula, other liquids or food) for at least three months after delivery; excluding from the denominator women whose infant did not reside with them or whose infant was not yet three months old at the time of the survey. The infant feeding questions changed in 2011. Starting in 2011, the indicator is not comparable with prior years. (Q60, 61A, 61B, 62A, B, C; infant age calculated from date of birth on the birth certificate)

Health Care Utilization and Public Program Participation

Had a usual source of pre-pregnancy care: Just before pregnancy, had a particular doctor, nurse, or clinic that she usually went to for health care. (Q6)

Initiated prenatal care in 1st trimester: Had first prenatal care visit in the first 3 months or 13 weeks of pregnancy, not counting a visit for just a pregnancy test or a WIC visit. In 2011, the phrases in italics were added to the questions: “Did you get any prenatal care during your most recent pregnancy? (Please do not count a visit just for a pregnancy test *or only for WIC, the Women, Infants and Children supplemental nutrition program.*)” and “How many weeks or months pregnant were you when you had your first prenatal care visit? (Please do not count a visit just for a pregnancy test *or only for WIC.*)” In 2012, the filter question, “Did you get any prenatal care during your most recent pregnancy?” was dropped. The MIHA indicator is not comparable across 2010, 2011, and 2012. However, this indicator is comparable for 2012 and beyond. (Q19)

Had a dental visit during pregnancy (2012 only): Visited a dentist, dental clinic, or got dental care at a health clinic.

Had a postpartum medical visit: Had a postpartum check-up for herself (the medical check-up 4-6 weeks after a woman gives birth). (Q51)

Mom or infant needed but couldn't afford care postpartum: Since her most recent birth, there was a time when she needed to see a doctor or nurse for her own medical care or for her infant, but didn't go because she couldn't afford to pay for it. (Q50, 66)

WIC status during pregnancy (2013-2014 Statewide Snapshots subgroup – WIC products only): WIC is the Special Supplemental Nutrition Program for Women, Infants, and Children. WIC status during pregnancy was categorized as prenatal WIC participant, eligible nonparticipant, or ineligible for WIC based on: self-reported participation in the WIC program during pregnancy, household income, and type of insurance coverage for prenatal care or delivery reported on the birth certificate. Prenatal WIC participants were women who self-reported that they were on WIC at any time during their most recent pregnancy. Those not on WIC during pregnancy were categorized as WIC eligible nonparticipants if they had Medi-Cal for prenatal care or delivery on the birth certificate or if they had self-reported income at or below 185% of the Federal Poverty Guideline (FPG). Respondents were categorized as ineligible for WIC if they had another source or no insurance for prenatal care or delivery, and self-reported income above 185% FPG.

Participated in WIC during pregnancy: WIC is the Special Supplemental Nutrition Program for Women, Infants, and Children. In 2010 and 2013-2014, participation in WIC during pregnancy was based on self-report on the MIHA survey. In 2012, participation in WIC during pregnancy was based on WIC client records obtained from WIC Management Information System (WIC MIS) and linked to the MIHA survey. This indicator is not available for 2011.

Received CalFresh (food stamps) during pregnancy: CalFresh, formerly known as food stamps, is the California Supplemental Nutrition Assistance Program. (Q78)

Health Insurance Coverage

Pre-pregnancy/postpartum insurance: During the month before pregnancy/at the time of the survey, had Medi-Cal or a health plan paid for by Medi-Cal; private insurance through her or her husband's/partner's job, her parents, or purchased directly; or was uninsured. Women with both Medi-Cal and private insurance were categorized as Medi-Cal. Starting in 2011, women with "Other" insurance, such as military, Healthy Families, Medicare, or international are not shown (the 2010 indicator combined the "Other" and "Private" insurance categories); and women were asked to provide the name of their health insurance plan, which was used to categorize insurance with greater precision. Starting in 2011, the indicator is not comparable with prior years. (Q8, Q49)

Prenatal insurance: During pregnancy, had Medi-Cal or a health plan paid for by Medi-Cal; private insurance through her or her husband's/partner's job, her parents, or purchased directly; or was uninsured. Women with both Medi-Cal and private insurance categorized as Medi-Cal. Starting in 2011, women with "Other" insurance, such as military, Healthy Families, Medicare, or international are not shown; (the 2010 indicator combined the "Other" and "Private" insurance categories); and the prenatal insurance question changed in order to distinguish between Medi-Cal and a plan paid for by Medi-Cal, as well as to identify how women obtained private insurance. Women also were asked to provide the name of their health insurance plan, which was used to categorize insurance with greater precision. Starting in 2011, the indicator is not comparable with prior years. (Q44)

Infant health insurance: Infant had Medi-Cal or a health plan paid for by Medi-Cal; private insurance through parent's job or purchased directly; Healthy Families; or was uninsured. Starting in 2011, infants with "Other" insurance, such as military, California Children's Services, or Medicare are not shown (the 2010 indicator combined the "Other" and "Private" insurance categories); and, women were asked to provide the name of their infant's health insurance plan, which was used to categorize insurance with greater precision. Women whose infant did not reside with them at the time of the survey were excluded from the denominator. Starting in 2011, the indicator is not comparable with prior years. (Q65)

Maternal Demographics

Age: Age of mother at time of birth. (Birth certificate)

Did not complete high school (or GED): At the time of the survey, had completed no school; 8th grade or less; or some high school, but did not graduate. (Q69)

Unmarried: At the time of birth, was single (never married); separated, divorced, or widowed; or living with someone like they were married, but not legally married. (Q67)

Race/Ethnicity: Mother's Hispanic origin and first race code, if multiple race codes indicated. (Birth certificate)

Born outside the U.S.: Mother's place of birth. (Birth certificate)

Speaks non-English language at home: Usually speaks Spanish, or an Asian or other language at home (if more than one language spoken, the one used most often; women who speak English and Spanish equally are not included in this group). (Q71)

Neighborhood Poverty (Statewide Snapshots subgroup): The percent of people living below the federal poverty threshold in a given neighborhood, as defined by census tract of residence. The estimated percent of people below poverty by census tract is obtained from American Community Survey 5-year estimates from the most recent year <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>. (Linked Birth certificate-American Community Survey)

Lives in a high poverty neighborhood: Lives in a neighborhood, as defined by census tract of residence, in which 20% or more of people are living below the federal poverty threshold. The estimated percent of people below poverty by census tract is obtained from American Community Survey 5-year estimates from the most recent year <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>. (Linked Birth certificate-American Community Survey)

Income as a percent of the Federal Poverty Guideline: Calculated from monthly family income, before taxes from all sources, including jobs, welfare, disability, unemployment, child support, interest, dividends, and support from family members, and the number of people living on that income. See the annual Poverty Guidelines published by the U.S. Department of Health and Human Services for more detail: aspe.hhs.gov/poverty/index.cfm. (Q83, 84, 85)

Total Live Births (Statewide Snapshots subgroup): The number of live births the mother delivered, inclusive of the recent birth. Twins and triplets are considered one birth (Birth Certificate).

Geographical Area (Statewide Snapshots subgroup): Urban and rural/frontier designations are based on the population size or densities of Medical Service Study Areas (MSSAs). MSSAs are sub-county geographic units composed of one or more census tracts. Women are classified as living in an urban area if their MSSA ranges in population from 75,000 to 125,000; a rural area if their MSSA has a population density of less than 250 persons per square mile and a frontier area if their MSSA has a population density of less than 11 persons per square mile. (Birth Certificate)

Data Annotation and Suppression Criteria

Most MIHA publications using data from 2010-2012 suppressed estimates when the number of events (sample numerator) was less than 10.

Revised data suppression criteria were implemented with the 2013-2014 MIHA publications (and were also applied to the 2010-2012 County and Regional MIHA Snapshots by Maternal Characteristics). Current criteria require estimates to be suppressed when:

1. The sample numerator is less than 5,
2. The number of women in the population of interest (population denominator) is less than 100,
3. The relative standard error (RSE) is greater than 50%, or
4. A measure has been determined to address a sensitive topic and the prevalence is greater than 80% and the unweighted population divided by the weighted population is greater than 50%.

Additionally, estimates are annotated and users are warned to interpret with caution if the RSE is between 30% and 50%. The RSE is a commonly used measure of reliability, or precision, of survey estimates and is calculated using the following formulas:

For estimates with a prevalence $\leq 50\%$:

$$\text{Standard error} \div \text{estimate}$$

For estimates with a prevalence $> 50\%$:

$$\text{Standard error} \div (1 - \text{estimate})$$

Weighting Methods

Sampling weights are created in MIHA to account for the stratified design, oversampling of specific groups, non-response among the women sampled, and non-coverage of women who could not be sampled because their births were not in the sampling frame. When the final MIHA sample is weighted each year, it is designed to be representative of all mothers who delivered live-born infants in California during the calendar year that the survey was conducted, and who met other inclusion criteria: the mother resided in California, was at least 15 years of age, and had a singleton, twin or triplet birth. Although MIHA data are weighted to the entire birthing population, minus exclusions, the survey is only administered in English and Spanish and results may not be generalizable to women who speak other languages. The population represented by MIHA is referred to as the “target” population and is defined using the Birth Statistical Master File (BSMF), the final compilation of California birth data released annually by the Office of Vital Statistics.

In 2010 through 2012, African Americans and women who were not on WIC but had Medi-Cal for prenatal care or delivery were oversampled, meaning their probability of selection was greater than the proportion of births they represent in the state. Starting in 2012, American Indians and Alaska Natives were also oversampled. From 2010 through 2012, the sample was stratified by county to provide sufficient numbers for estimates for the 20 counties with the most births. Starting in 2013, the number of counties included in this stratification increased to 35, and while African Americans and American Indian/Alaska Natives continued to be oversampled, WIC eligible nonparticipants were no longer oversampled.

Every woman who responded to MIHA is assigned a weight, which stands for the number of mothers in California like herself that she represents. Starting in 2010, this State Weight has consisted of 4 components (see below) calculated within strata. Additional steps have been added in subsequent years to create a Final Weight and improve the ability of the sample to represent the target population. Starting in 2011, raking was added to the weighting process to adjust the State Weights to more accurately represent the BSMF, particularly at the county level. Starting in 2013, trimming of weights was implemented to reduce the influence of excessively large survey weights. Raking and trimming were retroactively applied to datasets to create Final Weights starting with year 2010, but previously published MIHA products were not revised with the new Final Weights (2010 products had used unraked and untrimmed weights (State Weight only); 2011-2012 products used raked but untrimmed weights).

Calculation of the State Weight

The components of the State Weight are as follows:

Non-Coverage Weight

The non-coverage weight accounts for differences between the frame from which the sample was drawn and the target population to which generalizations are made. The MIHA sample is drawn from birth certificate data for births occurring from February through May of each year. This is referred to as the “sampling frame.” Birth certificate data files from which the MIHA sample is drawn are provided in monthly batches by the Office of Vital Statistics. The non-coverage weight accounts for the difference between the number of births in the sampling frame (February through May) and the number in the calendar year. The non-coverage weight also accounts for changes that might be made to the birth file after the sample is taken (e.g., births may not be in the frame files for sampling if they are reported late, but these late reported births would eventually be included in the calendar year BSMF). The non-coverage weight is defined, within stratum S , as:

$$\text{Number in the Target Population}_s \div \text{Number in the Sampling Frame}_s$$

Inverse of Sampling Fraction

The sampling fraction is the probability of selection, or the ratio of the number of women sampled to the number of women in the sampling frame. Therefore, the inverse of the sampling fraction within stratum S is:

$$\text{Number in the Sampling Frame }_s \div \text{Number Sampled }_s$$

Non-Response Weight

This weight adjusts for non-response to the survey by women who were sampled. The non-response weight is calculated within stratum S as:

$$\text{Number Sampled }_s \div \text{Number of Respondents }_s$$

Post-stratification Weight for Non-response (Propensity Score Adjustment)

The non-response weight described above accounts for non-response on factors used to define the strata (e.g., African American or American Indian/Alaska Native race, WIC status, and county/region of residence). Additional individual level factors may also predict whether a woman is likely to respond to the MIHA survey. Therefore, another adjustment for non-response is calculated to make the MIHA survey more representative of the target population from which the sample was taken. The probability of responding (versus not responding) is calculated using a logistic regression model among all women sampled in each sampling region (county or group of counties). Variables in the logistic regression model come from the BSMF and include maternal race/ethnicity, US or foreign birthplace, age, education, reported principal source of delivery payment, total children born alive, and month prenatal care began. A predicted probability (p) of being a respondent, or propensity score, is output for every woman sampled. The score is then re-scaled, which means that p is multiplied by a constant factor for all respondents, so that the sum of p over all respondents now adds to the number of respondents.

Starting in 2014, the post-stratification weight was capped at the 99th percentile of the post-stratification weight for that year (i.e., 2.56 in 2014).

Formula for State Weight

The State Weight is calculated using the four components defined above:

$$\text{NON-COVERAGE} * \text{INVERSE SAMPLING FRACTION} * \text{NON-RESPONSE} * \text{POST-STRATIFICATION}$$

Adjustments to Create the Final Weight

Raking Survey Weights (or Iterative Proportional Fitting)

Raking is a process by which the weighted prevalence of a selected variable is aligned with the known prevalence in a target population. In MIHA, the State Weights are raked so that weighted birth certificate variable estimates reflect the BSMF as closely as possible at the level of the respondent's sampling region (county or group of counties). Raking is conducted over a series of predetermined variables (see table below), one at a time, in an iterative process. The weight assigned to each woman who falls in category C of raking variable V is multiplied by a factor of:

$$\text{Number in the Target Population }_{vc} \div \text{Weighted Number of MIHA Respondents }_{vc}$$

The first adjustment occurs to the State Weight calculated in the previous section. This results in a different weight value, which is adjusted using the next variable and the process continues for each variable.

After this is done for all desired variables, the data are checked to ensure the percentages for each raking variable are as close as possible to the BSMF within the sampling region or group. If results can be adjusted to be more similar to the BSMF, the process starts again with the first raking variable, using the weight from the last iteration.

After the raking process is complete, the resulting weight is rescaled (e.g., multiplied by a constant factor), so that the sum of the raked weights over all respondents adds to the number of women in the BSMF who meet MIHA's inclusion criteria in that county/region. MIHA data were raked on the following variables or combination of variables each year from 2010-2014:

Variables Used for Raking, 2010-2014

2010	2011	2012	2013	2014
Race by age				
Race by foreign born				
Age by foreign born				
Prior C-section	Prior C-section	Prior C-section		
Low birth weight				
Preterm birth				
Prior live birth				
Delivery payer				
Delivery method				
			BMI before pregnancy	BMI before pregnancy
			Education	Education
				Race by preterm birth

After raking, differences between county-level and regional-level MIHA data and the BSMF are small. Only about 1% of estimates in the largest 20-35 counties are greater than 3 percentage points different from the BSMF after raking. The median difference between the weighted/trimmed MIHA value and the BSMF in 2014 for raking variables was 0.33%, and over 82% of estimates were within 1 percentage point of the BSMF value. Differences between MIHA and the target population are sometimes greater in the smaller sampling regions, such as San Benito County, than in the counties that have more births.

Rationale for Raking

The weighting method used before raking was introduced produced weighted data that were very close to the BSMF at the state level and for most counties/regions. However, using this method, there were some remaining discrepancies between the weighted MIHA data and the BSMF within subgroups of women and at the county and regional levels. For example, when the 2011 MIHA data were weighted using the 2010 method (no raking), an estimated 39.0% of women with a live birth in Kern County were White compared with 28.5% in the BSMF, a difference of 10.5 percentage points.

After raking, the MIHA estimate was adjusted to 28.8%, much closer to the BSMF estimate. The use of the raked weight produces estimates that are closer to the BSMF for subgroups, and at the county and regional level.

Trimming Survey Weights

Trimming is the process by which survey weights are reset to a predetermined upper limit, which reduces the occurrence of uniquely high weights that may skew survey results. The following method is used to trim raked survey weights:

1. A standardized distance is calculated between each respondent's raked weight and the median weight in her stratum S . The formula for calculating this standardized distance is:
$$\frac{(\text{respondent's raked weight} - \text{median raked weight in the respondent's stratum } S)}{\text{statewide interquartile range of raked weights}}$$
2. Strata with respondents who have distances in the top 1% of the overall distribution of distances from the median are identified.
3. Weights for women in these strata are trimmed at the third standard deviation, or the 99.73rd percentile, of raked weights (i.e., no weights in the identified strata would exceed the 99.73rd percentile (1046) in 2014). Trimmed weights are also constrained to being no higher than 5 * the initial State Weight, and no lower than 1/5 of the State Weight.
4. As larger weights are trimmed, smaller weights are modified so that the sum of the weights in the state and each county/region match the population totals in the BSMF.

For example, the four steps above can be applied to a woman in 2014 with an individual raked weight of 1900, from a stratum that had a median weight of 500 (numbers are simulated):

1. Calculate standardized distance for her weight from the median weight in the stratum:
$$(1900 - 500) \div 50 = 28$$
2. After calculating distances for each respondent, her standardized distance (28) is in the top 1% of distances. Therefore, her stratum would be among those identified for trimming.
3. During the final step of weight creation, her raked weight (1900) would be trimmed to 1046.
4. Weights for other women within her county would also be modified during this process so that the sum of the weights continued to match state and county totals.

Rationale for Trimming

On occasion, analyses of MIHA data have produced unexpected results. While some variation in results is to be expected in survey data, at times it has appeared that unusual results were primarily due to as few as one individual with a uniquely high survey weight value. Because MIHA data are stratified and differentially sampled by county or sampling region, respondents from some counties with a lower sampling fraction sometimes have survey weight values that are high when compared to other respondents in the sample. When those women had unusual responses to certain variables, these extremely high weights had a disproportionate effect on estimates for those variables.

The difference between estimates using weights that have been raked and trimmed and weights that have only been raked is small. Comparing all estimates included in the MIHA Data Snapshots from 2010-2014, the largest difference between the two estimates was 3.7 percentage points. The median of the difference ranged from a high of 0.1 (2010-2012) to a low of 0.02 (2013-2014).

Comparability across Years

Updated weighting methods are retroactively applied to datasets starting with year 2010. MIHA publications for 2010-2012 that have been produced using earlier methods (i.e., without the raking or trimming steps) have not been updated using the new weights, but all future analyses will apply the raked and trimmed weights for 2010 onward. The difference between the estimates using the old and new weighting methods is small. Therefore, users may compare the 2010, 2011, and 2012 estimates to 2013-2014 and all future years, in spite of the changes to the weighting methods.