



Estimating the Number of Pregnant Women in a Geographic Area



Essential for Planning and Response Professionals

Pregnant women are classified as ‘at-risk individuals’ in the 2006 Pandemic and All-Hazards Preparedness Act.¹ Disasters have been associated with an increase in maternal risk factors among pregnant women, such as hypertensive disorders and anemia,² and poor birth outcomes including preterm birth, low birth weight, and intrauterine growth restriction.³ Estimates of the number of pregnant women within a geographic area can provide the basis for preparing for and responding to the special needs of these women and their fetuses. This document describes the process to estimate the number of pregnant women in a United States jurisdiction at any given point in time. It also gives an example of how to calculate an estimate for a jurisdiction.

Steps in the Estimation Process

1. Before beginning the estimation process, we suggest that you communicate with the official contact for the Title V Maternal and Child (MCH) Block Grant at your state health department. (See perfdata.brsa.gov/mchb/mchreports/link/statelink_result.asp for a list of Title V coordinators.) Your state may also have an MCH Epidemiologist. (See www.cdc.gov/reproductivehealth/MCHEpi/MapAssignees.htm.) These professionals can help with the estimation process and give you additional insight into risk factors among pregnant women in your jurisdiction. They can also guide you to other important government and non-governmental agencies to include in preparedness planning for pregnant women.

2. To estimate the number of affected pregnant women in a disaster area at a given point in time, you will need 3 pieces of information: the location of the disaster or affected area (inclusive counties or census tracts); the total population number of women of reproductive age (WRA), age 15-44 years, in the disaster area; and the pregnancy rate per 1,000 WRA in the area. Much of this information may be available to you through your local government agency, or it can be accessed on the internet.

Location of the Disaster: For preparedness planning, you can calculate an estimate for your own jurisdiction. In the event of an actual emergency response, you would use the same process but focus on the disaster-affected area as defined by the Federal Emergency Management Agency (FEMA). FEMA officially defines the disaster area as one or more geopolitical areas (counties or census tracts) soon after the event unfolds. The area of an unfolding disaster may get redefined several times, so dates and times of definitions are important to capture along with the names and descriptions of the geopolitical areas. You can find disaster maps by using “gis maps” as the search term on the FEMA website. They provide text documentation as well as SHP files (shapefiles) for use with ArcGIS and other GIS software, and KMZ (boundary files) for use with Google Earth. The GIS files provide both the names of the affected geopolitical areas as well as a quick visual reference. Other sources for online geographic layer files are the USGS National Atlas – North American Atlas (nationalatlas.gov/atlasftp.htm); and US Census Bureau Cartographic Boundary Files (www.census.gov/geo/www/cob).

Number of Women of Reproductive Age (WRA): The second piece of information is the population of WRA stratified by the same geopolitical units that define the disaster area. This can be obtained online through either the U.S. Census Bureau’s American Fact Finder (AFF) at factfinder2.census.gov or CDC’S National Center for Health Statistics (NCHS) Vital Statistics program at 205.207.175.93/vitalstats/ReportFolders/ReportFolders.aspx?IF_ActivePathName=P/Populations. You may also want to consult your state’s vital records program. If a disaster crosses state boundaries and/or persons from adjacent states need to be included, then consider using AFF or NCHS data.

Pregnancy Rate: The third piece of information, the pregnancy rate, is often the most difficult to get. A pregnancy rate per 1,000 WRA can be calculated using 3 pregnancy outcomes—live births, induced abortions, and fetal losses (deaths). Pregnancy rates for women of reproductive age are generally not published for local areas.

We discuss each respective rate below, with information on how you may obtain the data you need.

- **Fertility rate:** All states count and report fertility (live births) the same way. NCHS collects this information and reports it publicly for geographic areas at and above the county level that are greater than 100,000 in total resident population. Current fertility rates are always at least one year behind the current year, and often they are two or more years behind.
 - o Request fertility rates from local or state vital statistics departments. That is where you can get the most up-to-date information and information in counties with smaller populations.
 - o If a fertility rate is not available through local sources for the year or geography required, then use a live birth rate for the state(s) of interest from NCHS at www.cdc.gov/nchs/products/nvsr.htm. Look for the title “Births: Preliminary Data for YEAR” where year equals the latest year available. The March of Dimes Peristats website is another source (www.marchofdimes.com/peristats). Peristats offers a 3-year live birth summary for most counties in the US. Unfortunately the latest year is several years behind the current year, but it may offer the most stable estimate depending on the area.

- **Induced abortion rate:** Nearly one-fifth of U.S. pregnancies end in induced abortions.⁴ This proportion varies widely across geographic areas and among different demographic subpopulations, making local estimation virtually impossible unless local numbers are available.⁵ The proportion also varies by mode of data collection, with higher rates reported in the National Survey of Family Growth (NSFG) compared to the abortion surveillance system.
 - o Because of the wide variation by geographic areas, we suggest that you use local abortion data from state vital statistics if it is reliable.
 - o Otherwise use the most recent national CDC surveillance data because it includes reported events, not survey data. (See annual reports at www.cdc.gov/reproductivehealth/Data_Stats/Abortion.htm.) Rates are reported for most states, but these data will not be as current as state vital statistics data. For states that do not have rates reported, apply the national rate to your geographic area.

- **Fetal loss rate:** It is estimated that nationally in 2004 one-sixth of all pregnancies ended in fetal loss.⁵ Approximately 75% of these losses are in the first trimester. This fetal loss rate is relatively stable across most geographic areas and demographic groups and nationally is calculated based on reports of fetal loss in the NSFG. These national data are more accurate than state vital statistics data because most state reports of fetal deaths are limited to those at least 20 weeks gestation. Even though national rates are less current than state vital death statistics and may involve using data from a different year than the other pregnancy outcomes above, we recommend using the most recent national fetal loss rate per 1,000 WRA due to its accuracy.
 - o Apply the national fetal loss rate which can be obtained from the most recent NCHS National Vital Statistics Report about rates of pregnancies and pregnancy outcomes at www.cdc.gov/nchs/ by using “fetal loss” as the search term.

Where pregnancy rates are specific for each geographic unit in the disaster area, the calculation must be computed separately for each geographic unit before the numbers can be summed to represent the entire area. However if the pregnancy rate applied in the calculation is a summary rate that applies to all the geographic units contained in the disaster area, then the population numbers for all the units can be summed prior to the calculation.

3. Since pregnancy outcomes are reported on websites and in the literature as annual numbers, the numbers must be adjusted to reflect the proportion of the 12 month period that each outcome represents. The average live birth lasts 9 months, the average abortion lasts only 2 months, and the average fetal loss lasts only 3 months. These proportions are needed to accurately predict the number of pregnant women at any one time during the year—i.e., the time of the disaster.

4. If the above steps do not work for you, you could apply national rates to your population, although due to population distributions and/or behavioral patterns, these rates are likely to be less accurate than local information. In the U.S., pregnant women have been estimated to be 1% of the general population at any point in time.⁶ Also, ~5% of women of reproductive age are estimated to be pregnant or up to 6 weeks postpartum at any point in time.⁷

Calculations

Once you have all of the data needed, the calculations for point-in-time estimates are as follows:

- WRA** = women of reproductive age (15-44 years)
- b** = fertility rate (births) from the most recent year for appropriate jurisdiction
- a** = abortion rate
- d** = fetal loss (death) rate (most recent national rate per 1,000 women)
- P** = proportion of the year a woman is pregnant for each pregnancy outcome by month.
 - Pb: 9 months = .75
 - Pa: 2 months = .167
 - Pd: 3 months = .25

The calculation for pregnant women where all values are known is:

$$\text{WRA}/1000 * \{ (B*Pb) + (A*Pa) + (D*Pd) \}$$

Example for places with rates: A Fictional State—“Atlantic”

In 2010, there were 607,707 women of reproductive age (WRA) in “Atlantic.” The 2010 state fertility rate (B) for “Atlantic” was 65.8/1,000 WRA, and the abortion rate (A) from state vital statistics was 3.8/1,000 WRA. The 2005 national fetal loss rate (D) was 17.1/1,000 WRA.

The calculation for pregnant women where all values are known is: $WRA/1000 * \{ (B*Pb) + (A*Pa) + (D*Pd) \}$

Thus, $607,707/1000 * \{ (65.8*0.75) + (3.8*0.167) + (17.1*0.25) \} = 32,974$ pregnant women

Approximately 33,000 women in “Atlantic” were pregnant at any given point in time in 2010.

Example for places with numbers (not rates): A Fictional County—“Pacific”

In 2010, the “Pacific” 2010 county number of births (NB) was 581, the number of abortions (NA) was 54, and the number of fetal deaths (ND) was 1.

Since the vital statistics document gives numbers instead of rates, the calculation is simpler. Multiply the numbers for births, abortions and fetal deaths by their respective proportion of the year a woman is pregnant for each pregnancy outcome by month, and then sum them.

The calculation for pregnant women where all values are known is: $(NB*Pb) + (NA*Pa) + (ND*Pd)$

Thus, $(581*0.75) + (54*0.167) + (1*0.25) = 445$ women in “Pacific” County were pregnant at any given point in time in 2010.

Because fetal deaths only account for a small proportion of all fetal loss, this is a slight underestimation.

NOTE: The purpose is to estimate rather than precisely count the number of pregnant women. You might choose to test different models in which you use different data sources available for your state abortion and fetal loss rates to create a potential range or to create an estimate in which you have the most confidence.

References

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For more information on this Program or other DRH activities related to Preparedness and Response:

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