# **Appendix: Radiation Emergency Quick Reference Guide: Selected Information and Resources about Women of Reproductive Age, Including Pregnant and Postpartum People, and Infants**

## Purpose

The purpose of this guide is to present select information for public health practitioners and healthcare providers as they prepare for or respond to a nuclear or radiological incident affecting women of reproductive age, including pregnant and postpartum people, and infants.

## Background

Women of reproductive age (WRA), including people who are pregnant, postpartum, and lactating, and infants, are “populations with special clinical needs” in any emergency, as defined by the U.S. Pandemic and All-Hazards Preparedness and Advancing Innovation Act of 2019.1 Radiation emergencies can negatively affect people who are pregnant, postpartum, lactating, and infants, as evidenced by previous emergencies such as the Hiroshima and Nagasaki atomic bombs in Japan (August 6-9, 1945), the Chernobyl Nuclear Plant accident in Ukraine (April 26, 1986), the Great East Japan Earthquake and Fukushima Daiichi Nuclear Power Plant accident (March 11, 2011), as well as other nuclear accidents such as the Three Mile Island nuclear power plant partial meltdown in Pennsylvania (March 28, 1979).

The Division of Reproductive Health (DRH) at the Centers for Disease Control and Prevention assessed current knowledge about the needs of these populations and pertinent response resources that may be needed in a radiation emergency. DRH used guiding principles for addressing the needs of pregnant people to develop six questions to evaluate the impact of these emergencies related to WRA, including pregnant and postpartum people (15–49 years).14,15 Additionally, two of the questions also include infant-related considerations after exposure: 1) long-term outcomes of in utero radiation exposure to evaluate the effects of radiation and 2) infant feeding during emergencies.

The purpose of the quick reference guide is to highlight references addressing the following questions:

1. Are people who are pregnant more susceptible to the effects of nuclear radiation exposure, such as an increased risk for severe illness or death?
2. Are people who are pregnant at increased risk for pregnancy complications and adverse pregnancy outcomes after a radiation emergency?
3. Are there special considerations for treatment, prophylaxis, and/or interventions for people who are pregnant and postpartum?
4. Are exposed WRA at increased risk for negative long-term health outcomes such as cancer or infertility?
5. Are infants with exposure in utero at increased risk for death, disability, or severe illnesses?
6. Are there infant feeding considerations for exposed postpartum and lactating people?

## Methods

We searched MEDLINE, Embase, CINAHL, and Scopus databases to identify relevant literature published from January 1950—March 2022. Search strategy included terms related to nuclear accidents, radiation exposure, radiation effects, pregnancy, and birth. We limited our review to English language original research, case reports, review articles, and government reports or websites that had information on WRA, pregnant, postpartum, or lactating people, or people with in utero exposure to nuclear radiation. The exposures of interest were nuclear accidents, incidents or events, radiation exposure or affects after an incident, postpartum after incidental exposures, food and water source exposures, and exposures to infants via breast milk. We limited our search to the following outcomes: adverse pregnancy and birth outcomes, structural defects and neurodevelopmental disorders, infertility among exposed WRA and infants, and cancer risks among WRA and infants. We reviewed over 3,800 articles and excluded literature about medical/radiation therapy, nuclear medicine procedures, and radiation exposure of pregnant healthcare workers.

## Summary of Findings

A total of 200 articles on WRA and their infants were included from the literature search. In addition, we scanned over 20 government websites and reports to supplement results from our literature search to add to the quick reference guide. The results of the literature review include the following number of articles per question: if pregnant women more suceptible to nuclear radiation (n=1), if pregnant women are more likely to have pregnancy complications (n=26), special treatment considerations for WRA and infants (n=0), long-term outcomes after radiation exposure for WRA (n=14), increased risk of disability, illness, or death for people with in utero radiation exposure (n=155), and infant feeding considerations (n=15). Among the articles reviewed, 38 were selected to highlight the outcomes of interest in our population of interest because they discussed an original finding, provided an estimated level exposure, summarized two or more outcomes, and/or had a large sample size. Whenever needed, we supplemented information from eight governmental websites to provide additional information.