904 Environmental Tobacco Smoke Exposure

Definition/Cut-off Value

Environmental tobacco smoke (ETS) exposure is defined (for WIC eligibility purposes) as exposure to smoke from tobacco products inside enclosed areas, like the home, place of child care, etc. ETS is also known as secondhand, passive, or involuntary smoke (1). The ETS definition also includes the exposure to the aerosol from electronic nicotine delivery systems (2).

Participant Category and Priority Level

Category	Priority
Pregnant Women	I
Breastfeeding Women	I
Non-Breastfeeding Women	III,IV,V, or VI
Infants	I
Children	III

Justification

Most environmental tobacco smoke (ETS) exposure occurs in homes and workplaces (3). It can also happen in public places, such as in restaurants, bars, casinos, and cars and other vehicles (3). There are no safe levels of exposure to ETS (1, 4). It is known to increase the risk of lung cancer, respiratory diseases, and cardiovascular diseases among adults, and to have adverse effects on birth outcomes and the health of infants and children (4). ETS exposure increases oxidative stress and inflammation (5-7). Inflammation is associated with asthma (8), cardiovascular diseases (9, 10), cancer (11), chronic obstructive pulmonary disease (12), and metabolic syndrome (13, 14).

ETS from Tobacco Smoking

ETS from traditional tobacco and nicotine products is a mixture of the sidestream smoke given off by a burning cigarette, pipe, or cigar, and the mainstream smoke exhaled by smokers. ETS is made up of over 7,000 chemicals, and at least 69 of which are known to cause cancer (1).

ETS from Electronic Nicotine Delivery Systems (ENDS)

Vapes, vaporizers, vape pens, hookah pens, electronic cigarettes (e-cigarettes or e-cigs), and e-pipes are some of the many terms used to describe electronic nicotine delivery systems (ENDS). ENDS are noncombustible tobacco products used to smoke or "vape" a solution that often contains nicotine. The solution, or "e-liquid," is heated to create an aerosol that the user inhales. (15)

While ENDS do not produce sidestream vapor, their mainstream vapor has been shown to be hazardous. It contains chemicals, such as nicotine, which can cause cancer, can harm the fetus, and are a source of indoor air pollution (2, 16-19). An individual's level of exposure to secondhand nicotine depends on the amount of nicotine in the ENDS product, as well as on product characteristics, device operation, and the user's inhalation pattern. A few studies have demonstrated that passive exposure to ENDS among healthy

adults causes an increase in nicotine in the bloodstream that is similar to that from passive exposure to cigarette smoke (2). More research is needed to evaluate health consequences of ETS exposure from ENDS, particularly for pregnant women and children (2).

The following table summarizes the conditions associated with increased risk from ETS exposure for the mother, infant, and child:

ETS Source	Effects on Mother	Effects on Birth Outcomes	Effects on Infant	Effects on Child
Tobacco Smoke	• Stroke (4) • Nasal irritation (4) • Asthma (4) • Lung cancer (4) • Cardiovascular disease (4) • Increased levels of inflammation and oxidative stress (5, 6, 7)	• Ectopic pregnancy (4) • Fetal growth restriction (4, 20, 21)*	• Sudden unexpected infant death (SUID) (4, 20) • Lower birth weight (21, 22) † • Smaller head circumference (22) ‡ • Impaired lung growth and function (4) • Lower respiratory illnesses (4)	• Middle ear disease (4, 20) • Lower respiratory illness (4, 20) • Increased severity of asthma/wheezing (20) • Metabolic syndrome (14) May develop in adulthood: • Lung cancer (23, 24) • Cardiovascular diseases (10, 25) • Potential nicotine use (26)
Electronic Nicotine Delivery System (ENDS) Vapor	Limited data, but potential association with (2): • Impaired lung function from long-term exposure • Dermatitis • Allergic sensitization	Nicotine exposure effects (2): • Preterm birth§ • Stillbirth	Nicotine exposure effects (2): • Sudden unexpected infant death (SUID) • Impaired brain development • Deficits in auditory processing • Attention and cognition problems	Limited data, but potential association with (2): • Nut allergy reaction due to e-liquids containing flavorants derived from nuts

*See risk #336 *Fetal Growth Restriction* for more information.

†See risk #141 *Low Birth Weight and Very Low Birth Weight* for more information.

‡See risk #152 *Low Head Circumference (Infants and Children <24 Months of Age)* for more information.

§See risk #142 *Preterm or Early Term Delivery* for more information.

Nutrition

Nonsmokers who are regularly exposed to ETS have been observed to have high vitamin C turnover, thus resulting in a vitamin deficiency (27, 28). Data from the Center of Disease Control and Prevention National Health and Nutrition Examination Survey 2003-2004 found that children exposed to ETS had lower levels of vitamins A, C, and E, as well as beta-carotene and folate when compared to non-exposed children (29). Antioxidants may reduce oxidative stress-induced lung damage among both smokers and non-smokers (5-7, 28, 29). Research on preventing oxidative stress-related diseases by antioxidant supplementation has produced mixed results; therefore, it is recommended to consume fruits and vegetables for appropriate antioxidants intake (28, 29). It is recommended that individuals exposed to ETS meet the Recommended Dietary Allowance for vitamin C (27, 30).

Thirdhand Smoke

Thirdhand smoke (THS) is the unintentional intake of tobacco smoke and other related chemicals that occurs without the presence of active smoking. Residual tobacco smoke pollutants adhere to the clothing and hair of smokers, to pet fur, and to surfaces, furnishings, and dust in indoor environments (31). Contact with the pollutants can cause nicotine exposure. Infants and children are the most at risk of THS exposure because they spend more time indoors and are closer to or on the ground where the nicotine-contaminated dust accumulates (31, 32). Once smoking has occurred indoors, THS cannot be eliminated by airing out rooms, opening windows, using fans or air conditioners, or confining smoking to only certain areas of a home. Replacing items is often the only way to reduce, though not eliminate, residual tobacco smoke pollutants (33). There is limited research on the extent of negative health outcomes from exposure to THS. While THS is not a WIC Nutrition Risk, it should be considered for overall health implications.

Implications for WIC Nutrition Services

WIC staff can provide the following nutrition services to women, infants and children who are exposed to environmental tobacco smoke:

- Administer State or local agency substance use screening methods. For more information, please see: *WIC Substance Use Prevention Resource*, Chapter 5: https://wicworks.fns.usda.gov/resources/wic-substance-use-prevention-guide.
- Provide a safe and supportive environment when discussing ETS exposure. For more information on techniques for delivering effective messages, please see: *WIC Substance Use Prevention Guide*, Chapter 6: https://wicworks.fns.usda.gov/resources/wic-substance-use-prevention-guide.
- Encourage fruit and vegetables that are high in vitamin C.
- Highlight WIC foods, especially 100% juice that are good sources of vitamin C and other important nutrients.
- Offer the following suggestions to minimize secondhand and thirdhand smoke exposure (20, 33, 34):
    - Have smoke-free rules for the car and home.
    - Make sure places that are frequently visited are smoke-free (i.e., school, work, parks, restaurants, places of worship, etc.).
    - Ask anyone who cares for children or pets to follow smoke-free rules.
    - Those who smoke outside should do so away from open doors or windows.

- If smoking has occurred inside a house, consider replacing fabric-covered items and thoroughly washing walls.

Clarification

The following questions were adapted from the validated surveys to be applicable for WIC purposes, and can be used to determine ETS exposure (35, 36):

- In the past seven days, have you and/or child been in an enclosed space while someone used tobacco products?

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