904

Environmental Tobacco Smoke Exposure

(also known as passive, secondhand or involuntary smoke)

Definition/ cut-off value

Environmental tobacco smoke (ETS) exposure is defined (for WIC eligibility purposes) as exposure to smoke from tobacco products inside the home. *(1,2,3)

* See Clarification for background information.

Participant category and priority level

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

Justification

ETS is a mixture of the smoke given off by a burning cigarette, pipe, or cigar (sidestream smoke), and the smoke exhaled by smokers (mainstream smoke). ETS is a mixture of about 85% sidestream and 15% mainstream smoke (4) made up of over 4,000 chemicals, including Polycyclic Aromatic Hydrocarbons (PAHs) and carbon monoxide (5). Sidestream smoke has a different chemical make-up than main-stream smoke. Sidestream smoke contains higher levels of virtually all carcinogens, compared to mainstream smoke (6). Mainstream smoke has been more extensively researched than sidestream smoke, but they are both produced by the same fundamental processes.

ETS is qualitatively similar to mainstream smoke inhaled by the smoker. The 1986 Surgeon General's report: *The Health Consequences of Involuntary Smoking. A Report of the Surgeon General* concluded that ETS has a toxic and carcinogenic potential similar to that of the mainstream smoke (7). The more recent 2006 Surgeon General's report, *The Health Consequences of Involuntary Exposure to Tobacco Smoke: A Report of the Surgeon General,* reaffirms and strengthens the findings of the 1986 report, and expands the list of diseases and adverse health effects caused by ETS (8).

ETS is a known human carcinogen (2). Women who are exposed to ETS are at risk for lung cancer and cardiovascular diseases (9). Prenatal or postnatal ETS exposure is related to numerous adverse health outcomes among infants and children, including sudden infant death syndrome (SIDS) (10, 11), upper respiratory infections (12), periodontal disease (13), increased severity of asthma/wheezing (12), metabolic syndrome (14), decreased cognitive function (15), lower birth weight and smaller head circumference (16). Infants born to women exposed to ETS during pregnancy have a small decrease in birth weight and a slightly increased risk of intrauterine growth retardation compared to infants of unexposed women (17).

Studies suggest that the health effects of ETS exposure at a young age could last into adulthood. These include cancer (18), specifically lung cancer (19, 20), and cardiovascular diseases (14, 21, 22,). There is strong evidence that ETS exposure to the fetus and/or infant results in permanent lung damage (23, 24, 25, 26).

ETS exposure increases inflammation and oxidative stress (27, 28, 29). Inflammation is associated with asthma (30), cardiovascular diseases (31, 32), cancer (33), chronic obstructive pulmonary disease (34), and metabolic syndrome (14, 35). PAHs are the major class of compounds that contribute to the ETS-related adverse health outcomes. These compounds possess potent carcinogenic and immunotoxic properties that aggravate inflammation.

Oxidative stress is a general term used to describe the steady state of oxidative damage caused by highly reactive molecules known as free radicals. The free radicals can be generated both during the normal metabolic process and from ETS and other environmental pollutants. When free radicals are not neutralized by antioxidants, they can cause oxidative damage to the cells. This damage has been implicated in the cause of certain diseases. ETS provokes oxidant damage similar to that of active smoking (36).

Antioxidants may modulate oxidative stress-induced lung damage among both smokers and non-smokers (22, 27-29, 37-40). Fruits and vegetables are the major food sources of antioxidants that may protect the lung from oxidative stress (1). Research indicates that consuming fruits and vegetables is more beneficial than taking antioxidant supplements (1). This suggests that other components of fruits and vegetables may be more relevant in protecting the lung from oxidative stress. Dietary fiber is also thought to contribute to the beneficial health effects of fruits and vegetables (1).

The Institute of Medicine (IOM) reports that an increased turnover in vitamin C has been observed in nonsmokers who are regularly exposed to tobacco smoke (41). The increased turnover results in lowered vitamin C pools in the body.

Although there are insufficient data to estimate a special requirement for non-smokers regularly exposed to ETS, the IOM urges those individuals to ensure that they meet the Recommended Dietary Allowance for vitamin C (36, 41).

The WIC food package supplements the participant intake of vitamin C. In addition, many WIC State Agencies participate in the WIC Farmers' Market Nutrition Program, which provides coupons for participants to purchase fresh fruits and vegetables. WIC Program benefits also include counseling to increase fruit and vegetable consumption, and to promote a healthy lifestyle, such as

protecting participants and their children from ETS exposure. WIC staff may also make appropriate referrals to participants, and/or their caregivers, to other health and social services, such as smoking cessation programs.

Clarification

In a comprehensive scientific report, the Surgeon General concluded that there is no risk-free level of exposure to secondhand smoke (8). However, for the purpose of risk identification, the definition used for this risk criterion is based on the Centers for Disease Control and Prevention (CDC) Pediatric Nutrition Surveillance System (PedNSS) and the Pregnancy Nutrition Surveillance System (PNSS) questions to determine Environmental Tobacco Smoke (ETS) exposure:

1. Does anyone living in your household smoke inside the home? (infants, children)
2. Does anyone else living in your household smoke inside the home? (women)

Because the definition used by other Federal agencies for ETS exposure is specific to "inside the home" and has been validated (3), the definition used for WIC eligibility must also be as specific. In addition, FNS encourages the use of the PedNSS and PNSS ETS exposure questions for WIC nutrition assessment.

There are other potential sources of ETS exposure, such as work and day care environments. However, no other validated questions/definitions could be found that were inclusive of other environments and applicable to WIC.

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