

Guidelines for Interpreting Cotinine Levels: United States

The following guidelines are based largely on the work of Neal Benowitz, et.al. These numbers were derived from serum cotinine values as measured by HPLC/MS. Note that optimal cut-points differ by race/ethnicity and sex. We encourage you to read the entire text of the 2009 article. (1)

| Race/ethnicity | Adult cutoff | Adolescent cutoff |
|---------------------|--------------|-------------------|
| Non-Hispanic whites | 5 ng/mL | 3 ng/mL |
| Non-Hispanic blacks | 6 ng/mL | 3 ng/mL |
| Mexican-Americans | 1 ng/mL | 1 ng/mL |

| Gender | USA cutoff |
|--------------|------------|
| Adult male | 1.78 ng/mL |
| Adult female | 4.47 ng/mL |

Note: Saliva cotinine values are slightly higher than in serum by a ratio of 1.16. (2) In addition, EIA results give values higher than HPLC or CG methods due to cross-reactivity with 3-OH-cotinine, a metabolite of cotinine. **When using the Salimetrics Cotinine EIA cut-points should be adjusted accordingly. (See figure on p. 2.)**

For additional discussion of cut-points and a comparison with UK levels see articles by Jarvis, et al. (3,4)

We recommended the following guidelines when interpreting results from the Salimetrics Cotinine EIA

1) Person does not smoke or use nicotine products:

Average cotinine level for adult non-smokers in US: 0.1 ng/mL. It is unusual to see cotinine levels > 1 ng/mL in US non-smokers.

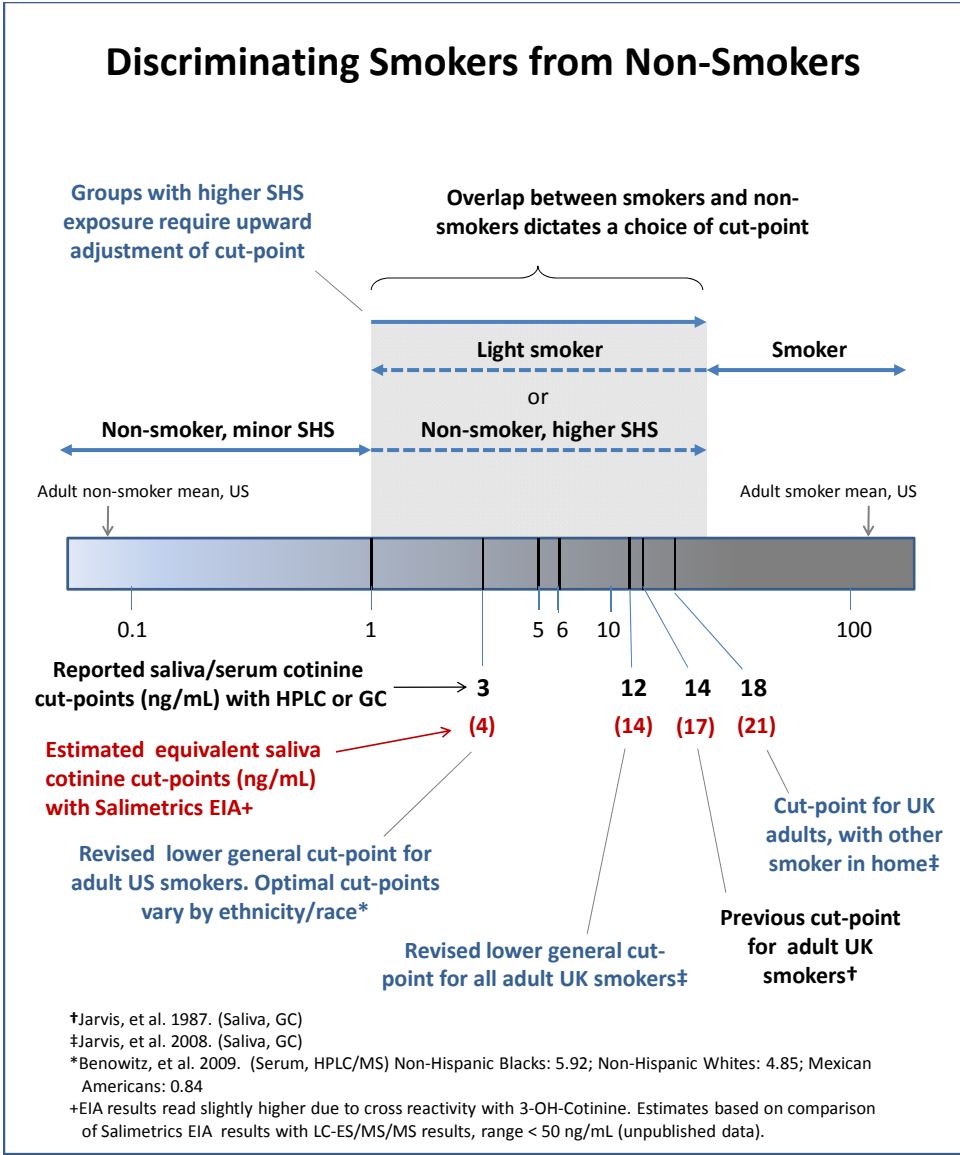
Note: There is always risk of secondhand exposure but exposure has steadily decreased in the US & Europe with greater regulatory oversight concerning smoke-free indoor air quality.

2) Person has exposure to secondhand smoke

Cotinine levels indicating significant exposure: > 1 ng/mL (can be as high as ~30 ng/mL)

Cotinine levels indicating minor exposure: < 1 ng/mL

Note: There is overlap between less-intense smokers and heavily exposed non-smokers.



3) Person is actively using tobacco/nicotine products:

All adults & adolescents cutoff : 4 ng/mL (Corresponds to 3 ng/mL cut-point from Benowitz, et al. 2009.)
 Average cotinine level for adult smokers in US: > 100 ng/mL

Note: Groups with high levels of secondhand smoke may require higher cut-points to avoid false identification of non-smokers as smokers. For example, Jarvis, et al. 2008 reports an optimal cut-point of 18 ng/mL for adults who live with a smoker in the home. (3) (This would correspond to a level of ~21 ng/mL with the Salimetrics EIA.)

Smoking Definitions

One of the difficulties encountered in identifying smokers by self report is that there are many different ideas of what constitutes smoking behavior. For example, when asked about their smoking status, light or intermittent smokers will often classify themselves as nonsmokers. In order to maintain consistency in the use of various terms while gathering data on smoking behavior, the US Centers for Disease Control and Prevention have developed and updated the following definitions: (5)

- Never Smokers – Adults who have never smoked a cigarette or who have smoked fewer than 100 cigarettes in their entire lifetime.
- Former Smokers – Adults who have smoked at least 100 cigarettes in their lifetime, but say they currently do not smoke.
- Nonsmokers – Adults who currently do not smoke cigarettes, including both former smokers and never smokers.
- Current Smokers – Adults who have smoked 100 cigarettes in their lifetime and currently smoke cigarettes every day (daily) or some days (nondaily).

Other terms not defined by the CDC are also frequently used:

- Light Smoker – There is no consensus on a definition for light smoking. Various criteria used have included < 1 pack per day, < 15 cigarettes per day, < 10 cigarettes per day, and 1-39 cigarettes per week. Light smokers include low-rate daily smokers (< 5 cigarettes per day) and “chippers” who consistently smoke ≤ 5 cigarettes per day on the days when they do smoke. (6)
- Intermittent Smoker – A broad term that covers a variety of patterns of tobacco use but is generally defined as smoking on a nondaily basis. Social smokers, who limit smoking to contexts such as parties, bars, or nightclubs, often fit into this category. Intermittent smoking is also common among younger smokers and minority populations. (6)

References

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2. Repace, J., Al-Delaimy, W.K., & Bernert, J.T. (2006). Correlating atmospheric and biological markers in studies of secondhand tobacco smoke exposure and dose in children and adults. *JOEM*, 48(2), 181-94.
3. Jarvis, M.J., Fidler, J., Mindell, J., et al. (2008). Assessing smoking status in children, adolescents and adults: Cotinine cut-points revisited. *Addiction*, 103(9), 1553-61.



4. Jarvis, M.J., Tunstall-Pedoe, H., Feyerabend, C., et al. (1987). Comparison of tests used to distinguish smokers from nonsmokers. *Am J Pub Health*, 77(11), 1435-38.
5. US Centers for Disease Control and Prevention (2010). Health behaviors of adults: United States, 2005-2007. *Vital and Health Statistics*, Series 10, Number 245, Appendix II, p. 80.
6. Schane, R.E, Ling, P.M., & Glantz, S.A. (2010). Health effects of light and intermittent smoking: A review. *Circulation*, 121(13), 1518-22.