How low should you go? Determining the optimal cutoff for exhaled carbon monoxide to confirm smoking abstinence when using cotinine as reference.

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**Title**

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**Abstract**

**INTRODUCTION:** Confirming abstinence during smoking cessation clinical trials is critical for determining treatment effectiveness. Several biological methods exist for verifying abstinence (e.g., exhaled carbon monoxide [CO], cotinine), and while cotinine provides a longer window of detection, it is not easily used in trials involving nicotine replacement therapy. The Society for Research on Nicotine and Tobacco's Subcommittee on Biochemical Verification cite 8-10 parts per million (ppm) for CO as a viable cutoff to determine abstinence; however, recent literature suggests this cutoff is likely too high and may overestimate the efficacy of treatment.

**METHODS:** This study examined the relationship between CO and cotinine in a sample of 662 individuals participating in a smoking cessation clinical trial. A receiver operating characteristics curve was calculated to determine the percentage of false positives and false negatives at given CO levels when using cotinine as confirmation of abstinence. Differences were also examined across race and gender.

**RESULTS:** A CO cutoff of 3 ppm (97.1% correct classification) most accurately distinguished smokers from nonsmokers. This same cutoff was accurate for both racial and gender groups. The standard cutoffs of 8 ppm (14.0% misclassification of smokers as abstainers) and 10 ppm (20.6% misclassification of smokers as abstainers) produced very high false-negative
rates and inaccurately identified a large part of the sample as being abstinent when their cotinine test identified them as still smoking.

CONCLUSIONS: It is recommended that researchers and clinicians adopt a more stringent CO cutoff in the range of 3-4 ppm when complete abstinence from smoking is the goal.

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