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E-cigarettes: Stick to the Evidence

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Middlekauff and Gornbein¹ argued that “there is reason to believe” people who have had a myocardial infarction (MI) would be more likely to use e-cigarettes than those who did not, which would result in a systematic misclassification error that could explain the association we² found between e-cigarette use and having had an MI.

This assertion is surprising because Gaalema et al.³ (reference 3 in their letter) concluded, based on longitudinal analysis of the first two waves of the Population Assessment of Tobacco and Health dataset, that having an MI was not a significant predictor of initiating non-combusted tobacco (mostly e-cigarettes) use ($p=0.20$). Furthermore, they found, “cardiac status was significantly negatively associated with switching completely from combusted to non-combusted products. While 9.2% of those with no change in health status switched [from combusted tobacco, mostly cigarettes] to non-combusted use, none of those experiencing a new MI switched ($p=0.0015$).” Thus, any differential misclassification is in the opposite direction from what Middlekauff and Gornbein speculate, which strengthens our conclusion that e-cigarette use is associated with the risk of having had an MI.

Our analysis of the National Health Interview Survey shows comparable results (Table 1). Without correcting for covariates, having had an MI was negatively associated with using e-cigarettes. This association became nonsignificant when controlling for covariates. These findings are also evidence against reverse causality.

Middlekauff and Gornbein misinterpret the ORs we present. With respect to never smokers who never used e-cigarettes, the ORs for MI associated with daily smoking controlling for e-cigarette use is 2.72 (95% CI=2.29, 3.24) and daily e-cigarette use controlling for smoking is 1.79 (95% CI=1.20, 2.65). (Although the point estimates of the risk are different, this difference is not statistically significant, $p=0.08$.) As we point out in our paper, the odds of having had an MI for someone switching completely from daily cigarette to daily e-cigarette use can be calculated as the odds associated with being a former smoker times the odds associated with being a daily e-cigarette user divided by the odds of being a daily smoker, 1.09, which is not harm reduction.

Limiting the analysis to e-cigarette-only users is not a good idea because most e-cigarette users are dual users with cigarettes so it is important to study the effects of e-cigarette use simultaneously with cigarettes. Limiting the analysis to sole e-cigarette users would not only be less clinically relevant, but would substantially reduce the sample size and the power of the analysis.

Although Middlekauff and Gornbein are correct that using e-cigarettes for harm reduction has been embraced in England, they do not mention that, as elsewhere,⁴ smokers who use e-cigarettes are less, not more, likely to quit smoking⁵ and that e-cigarettes are attracting low-risk youth to nicotine use, who are then at high risk of progressing to cigarettes.⁶ Rather than a public health leader, England serves as a warning of what can happen when caution is thrown to the wind.⁷

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Table 1. Cross-sectional Associations Between E-cigarette Use^a and Myocardial Infarction Among Smokers Reporting a Recent Quit Attempt^b (NHIS 2014 and 2016 Combined)

Characteristics	Unadjusted model (N=5,682)		Adjusted model (N=5,657)	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Myocardial infarction	0.65 (0.50, 0.87)	0.004	0.82 (0.60, 1.11)	0.197
Hypertension	—	—	1.11 (0.94, 1.30)	0.190
Diabetes mellitus	—	—	1.04 (0.83, 1.31)	0.732
High cholesterol	—	—	1.16 (0.99, 1.36)	0.064
Woman	—	—	0.89 (0.79, 1.02)	0.105
Age (per 10 years)	—	—	0.73 (0.70, 0.78)	<0.001
BMI	—	—	1.00 (0.99, 1.00)	0.197
Race/ethnicity				
White	—	—	ref	—
Hispanic	—	—	0.43 (0.35, 0.53)	<0.001
Black	—	—	0.36 (0.30, 0.43)	<0.001
Asian	—	—	0.41 (0.28, 0.60)	<0.001
Other race	—	—	0.89 (0.58, 1.40)	0.632
Myocardial infarctions				
Never e-cigarette users	155	—	155	—
Ever e-cigarette users	137	—	137	—

Note: Boldface indicates statistical significance ($p < 0.05$). Analysis accounts for complex survey design and weights as described previously.²

^aDaily, some days, or former e-cigarette users.

^bPeople who answered “yes” to the question: *During the PAST 12 MONTHS, have you stopped smoking for more than one day BECAUSE YOU WERE TRYING TO QUIT SMOKING?*

NHIS, National Health Interview Survey.