## PEER REVIEW HISTORY



## ARTICLE DETAILS

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| **TITLE (PROVISIONAL)** | Product Attributes Important to U.S. Adult Consumers' Use of Electronic Nicotine Delivery Systems: a Discrete Choice Experiment |
| **AUTHORS** | Kistler, Christine E; Ranney, Leah; Sutfin, Erin; Chrzan, Keith; Wretman, Christopher; Enyioha, Chineme; Meernik, Clare; Berman, Micah; Zarkin, Gary; Goldstein, A |

## VERSION 1 – REVIEW

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| **REVIEWER** | Samane Zare<br>University of Kentucky, USA |
| **REVIEW RETURNED** | 05-Dec-2018 |

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| **GENERAL COMMENTS** | This paper considers a wide range of attributes important for ENDS users based on age and gender. They answered most of the concerns of the previous reviewers. Since they have the data for the heaviness of smoking index, it will be interesting to have a table to show the relationship of the index with the attribute preferences based on gender and age. For nicotine content cutoffs, note below the table that "they correspond to what the current literature designated as low, medium and high levels of nicotine for the purpose of tobacco cessation and provide at least one reference. |

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| **REVIEWER** | Ce Shang<br>University of Oklahoma Health Sciences Center, US |
| **REVIEW RETURNED** | 29-Apr-2019 |

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| **GENERAL COMMENTS** | The survey design remains confusing. There are nine attributes in total but only five attributes were shown in each choice set. How did the design manage to cover enough valid across-attribute pairs? What were the parameters used to generate an efficient design?<br>The attributes contain both device costs and monthly cost of use, and the latter is to a large extent subject to use patterns. Those who consume more would pay more given same refill prices. It is unclear whether this attribute convey the same information to consumers with different consumption levels. That is a limitation.<br>In addition, based on the results, device prices and monthly cost both essentially capture part of the total cost of consuming ecigs. Therefore economic factor is the most important, not health effects. This should be acknowledge in the study. |

**VERSION 1 – AUTHOR RESPONSE**

Reviewer(s) Reports:

Reviewer: 1
Name: Samane Zare
Institution: University of Kentucky, USA
Competing interests: I declare that I have no significant competing interests that might influence the judgment of this manuscript.

Please leave your comments for the authors below
This paper considers a wide range of attributes important for ENDS users based on age and gender. They answered most of the concerns of the previous reviewers. Since they have the data for the heaviness of smoking index, it will be interesting to have a table to show the relationship of the index with the attribute preferences based on gender and age.

We appreciate the feedback. And yes! We are interested in how other characteristics interact with our characteristics and are planning that paper as part of future work. Given the limitations of 5 tables/figures for the journal and the scope of this paper, we felt it would detract from the overall message and was outside of scope. We do want to note that we are definitely planning on doing this, and appreciate your recommendation to do this.

For nicotine content cutoffs, note below the table that "they correspond to what the current literature designated as low, medium and high levels of nicotine for the purpose of tobacco cessation and provide at least one reference.

We have now added on page 11, in the last section of the “best worst scaling attributes and levels”, a section justifying our choice of nicotine content levels: “Nicotine content levels were drawn from the current spectrum of labelled nicotine concentrations. In addition to the actual concentration, we included a label of “none”, “low”, etc, to denote where in the range of concentrations, a particular concentration falls.” We have added a citation by Goniewicz et al to reference.

Reviewer: 2
Name: Ce Shang
Institution: University of Oklahoma Health Sciences Center, US
Competing interests: None declared

Please leave your comments for the authors below
The survey design remains confusing. There are nine attributes in total but only five attributes were shown in each choice set. How did the design manage to cover enough valid across-attribute pairs? What were the parameters used to generate an efficient design?

We apologize that the survey design remains confusing. We have added additional explanation in the methods. The survey design is a Best-Worst Case 2 ("Best-Worst Profile Case") so the stimulus in a given question in the choice experiment are the attribute levels that describe a single profile of an ENDS product, from which a respondent chooses one level as the best and one as the worst (or in our case one that makes them most want to use the product and one that makes them least want to use the product). Moreover, this was a partial profile experiment, because whereas there were nine attributes in total, any one question contained just five of them. We felt that showing 9 attributes

would be too cognitively taxing for respondents and that 5 would help participants deliberate on all of the levels.

We appreciate your point that we need more information on our efficient design. We now note in the methods: “We sought efficiency by using a computer search algorithm to generate a design that showed each of a given attribute's levels an equal number of times (one-way level balance) and each pairing of a given attribute level with the levels of other attributes an equal number of times (two-way level balance, which reduces correlations among the attributes). These two criteria will maximize both level balance and orthogonality, the two constituents of design efficiency for experimental design for a set of single profiles. Overall, each attribute level was seen about 3 times per participant (2.97), and each valid cross-attribute pair was seen not quite half the time by each participant (0.42 times). Reliable best-worst utilities can be obtained as long as each participant sees each level about 3 times. The order of attributes varied across the survey blocks so that positional balance was maintained.”

The attributes contain both device costs and monthly cost of use, and the latter is to a large extent subject to use patterns. Those who consume more would pay more given same refill prices. It is unclear whether this attribute convey the same information to consumers with different consumption levels. That is a limitation.

We agree that the latter, monthly cost of use, is in part due to use patterns, however refill prices appeared to be highly variable at the time the study was conducted, and we tried to offer a range of prices to give a general sense of this. When we pretested the survey this and asked testers to explain the attributes and levels, they appeared to understand that these levels were applied to general use. It is possible that participants then extrapolated the dollar amounts in the DCE to their own use, and so we have added this information to the limitations section in the discussion. We believe that our findings demonstrate, as expected, cost is important to consumer choice and higher price is a disincentive to use.

In addition, based on the results, device prices and monthly cost both essentially capture part of the total cost of consuming ecigs. Therefore economic factor is the most important, not health effects. This should be acknowledged in the study.

We agree that price is the overwhelming decisional factor. Price however is not a uniform or undifferentiated variable. The overall price of something is composed of a number of attributes and it is useful to understand if one component of price is more important than another. Our study shows that both factors are almost equally important at least as we have presented them. Another study focusing solely on price and its component factors would be very useful. We completely agree. We have a paragraph in the discussion that now reads:

“While Health Effects had the highest importance score, the combined importance of Purchase Price and Monthly Cost was greater than Health Effects, so the importance of financial burden on ENDS use should not be underestimated. If we combine the two cost-related attributes, Purchase Price and Monthly Cost, overall cost’s importance score would be 24.1% as compared to 17.6% for Health Effects. A recent study of the cross-price elasticity of ENDS and tobacco cigarettes found that ENDS are partially substitutable for cigarettes. However, the availability of ENDS also reduced the number who reported they would quit smoking if cigarette costs increased by 20% (50.2% to 30.0%), revealing that ENDS may discourage smokers from quitting completely. Additionally, increases in the cost of ENDS products may shift consumers back towards combustible tobacco, though recent simulations found no relationship between cigarette prices and ENDS use. Taxation may reduce ENDS use but further work is needed to model the consequences of price increases on ENDS use.”