Does reducing the serving size of beer influence how much students drink on a night out? A randomised controlled field experiment

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Abstract

Public health researchers have recently suggested that alcohol consumption may be curbed by reducing the default serving size of alcohol (i.e., simultaneously decreasing the size of serving containers and the standard volume served), as this has been shown to influence the overall quantity of alcohol poured, perceptions of portion size, drinking pace, and purchasing/consumption behaviour. In a randomised controlled field-experiment, we examine the effect on alcohol consumption from reducing serving size, i.e., simultaneously reducing the size of beer glasses and the volume of beer served by 20% (from 50 cl to 40 cl) in a student bar. The results show no significant differences in consumption between the treatment and control conditions. Participants who received the smaller serving size drank 102.04 cl of beer per person while participants who received the standard serving size drank 101.42 cl of beer per person (N = 102, p = .95). This outcome appears to be the result of participants served with the smaller serving size drinking significantly more servings of beer than participants served with the standard serving size (p = .02). Thus, the intuitively attractive strategy of decreasing serving sizes to nudge people towards a decrease in consumption of alcohol does not seem to work in as straightforward a manner as sometimes suggested by existing research. To explain this result and its implications, we discuss the strengths and limitations of the experiment and suggest further research avenues.

JEL Classification: C93; D910; I180

Keywords

serving size — nudge — field experiment — alcohol consumption — public health

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Background

Excessive alcohol consumption poses a serious health risk and is listed among leading risk factors for global burden of disease (Lim et al., 2012). In many countries, higher education institutions directly or indirectly serve as a nexus, fostering social networks and events in which young adult students engage in and often adopt long term behaviours supporting excessive alcohol consumption (Crutzen, Kuntsche & Schelleman-Offermans, 2013). This has not only long-term consequences but short-term consequences as well, such as missed classes and lower grades, injuries, sexual assaults, overdoses, memory blackouts, changes in brain function, lingering cognitive deficits, and death (White & Hingson, 2013). For these reasons, members of society at large – and educational institutions in particular – have expressed interest in exploring specific avenues for decreasing the frequency and volume involved in excessive alcohol consumption among students.

Aside from regulating the price, availability, and marketing of alcohol (Jackson et al., 2010; NICE, 2010; WHO, 2009), research suggests that institutions and broader society might also regulate behaviour through soft paternalistic interventions referred to as 'nudges' (Thaler & Sunstein, 2008). A nudge can be defined as "a function of (a) any attempt at influencing people's judgment, choice or behaviour in a predictable way (b) that is motivated because of cognitive boundaries, biases, routines, and habits in individual and social decision-making posing barriers for people to perform rationally in their own self-declared interests, and which (c) works by making use of those boundaries, biases, routines, and habits as integral parts of such attempts" (Hansen, 2015: 158). Nudges may thus be conceived of as subtle psychologically informed interventions that seek to influence people's decisions in directions which, when used benignly, better fit their self-declared interests.

Existing research connecting nudges to public regulation of alcohol consumption suggests that the serving size of alcoholic drinks may influence the total quantity of alcohol poured, perceptions of portion size, drinking pace, and overall purchase and consumption of alcohol (Wansink & van Ittersum, 2005; Pechey et al., 2016; Kersbergen, 2013). Albeit the exact mechanisms underlying this "portion size effect" are not fully understood, this effect is sometimes referred to as 'unit bias' (Geier, Rozin & Doros, 2006). Unit bias is predicted to influence people's consumption and lead to higher/lower levels of consumption as unit sizes increase/decrease either due to perceptual factors (Pechey et al., 2015), its signalling of the appropriate amount to be consumed (Robinson et al., 2016), its influence on number and size of sips taken (Lawless et al., 2003), the frequency of the decision-point created when finishing the unit (Geier, Rozin & Wansink, 2012) and/or the hassle involved in acquiring a further unit (Wansink, Painter & Lee, 2006). This suggests that if the serving size of alcohol is decreased, then alcohol consumption will decrease due to unit bias. A potential policy implication of this may be ensuring that serving sizes be set below a certain threshold, assuming further research in real-world settings aligns with past results (Pechey et al., 2016).

Few studies have been carried out on the impact of reducing serving size in real-world settings, however. There have been studies on the impact of the size of wine glasses in restaurants and bars which support the effect of varying glass sizes (Pechey et al., 2016), but this seems to be more readily replicable for restaurants than for bars as results in the latter setting have been inconsistent (Clarke et al., 2019). It has been suggested this might reflect moderating influences, from the sizes selected, characteristics of the establishments, or random fluctuations, but also that further research is needed. Other studies suggest that reducing the standard serving size of alcoholic beverages prompts significant reductions in alcohol consumption (Kersbergen et al., 2013). However these studies were carried out in scenarios where pricing was proportional to serving size, where participants, while blinded towards the real purpose of the study, were aware that they were participating in some sort of an experiment viz. one on personality characteristics, and where participants were consuming alcohol in artificial settings or in groups made up of strangers invited for the experiment.

To broaden the limited knowledge in this field of research we conducted a randomised controlled field experiment aimed to examine the impact of reducing the serving size of beer (i.e., simultaneously reducing the size of serving containers and the volume served) by comparing consumption from standard 50 cl and smaller 40 cl serving size glasses in the real world setting of a student bar. Importantly, the barguests in our study were unaware that an experiment took place, and price and availability were controlled for by making the beer free and adding extra bar staff to avoid queueing. In line with what is suggested in the relevant literature, we expected that guests served smaller servings would consume less beer compared to guests served larger servings. Yet given the varied findings in the literature and the current situation in the field relative to replicability, we formally made no hypothesis about the directionality of the effect. Thus, our formal research hypothesis was that the average beer consumption would be significantly different between the two groups. Hence:

> H_1: Reducing serving size significantly influences consumption.
> H_0: Reducing serving size does not significantly influence consumption.

Methods

Setting

The experiment was conducted in a student bar at a dormitory in Copenhagen, Denmark, on April 20, 2017. Once a month this bar hosts a quiz event in the evening, arranged by students for students living at the dormitory and any friends they might bring along. A typical quiz night begins when doors open around 7:30pm, at which time students start arriving. Most are present by 8pm when the quiz begins, and everyone leave again around 10:30pm. Upon their arrival, students first find a table and then go to the bar to purchase drinks. As with usual quiz nights, students present for the experiment could choose either beer or soft drinks. Soft drinks were available in bottles (50 cl) or cans (33 cl) and the beer was draught beer served from a keg, the sort typically provided in 50 cl transparent disposable plastic beer glasses, which is the standard type and size of beer glasses used in Denmark at most venues such as student bars, music festivals, and ad hoc events. At this event, students typically drink throughout the evening, going to and from the bar as the quiz progresses, winners are announced, and the event is concluded. It is worth noting that on this particular quiz night no participants purchased soft drinks, which was also reported by the bar not to be unusual.

Design

The experimental design was a randomised controlled experiment where either a 50 cl or a 40 cl transparent disposable plastic beer glass was randomly assigned to each participant. The primary outcome measure was the volume of beer served to people with 'Standard glasses' and 'Smaller glasses' during the quiz night.

Procedure

The experiment began with the opening of venue doors at 7:30 pm, at which time the bar was also open. In total, 102 students (59 women and 43 men) arrived to hang out with their friends and participate in the quiz. Upon their arrival, and then again at the beginning of the quiz, students were informed that beer would be free throughout the evening. The cover story was that there had been a big party at the bar the evening before, but they had not been able to finish all the kegs of beer the organizers had paid for, so beer would be free tonight. While not typical, such an announcement

is not so unusual either as events at the bar do sometimes provide beer for free. This was also qualitatively reflected by the fact that students appeared to be fairly happy at the prospect of free beer, but not particularly excited. In addition, the students were told that the bar was running short on beer glasses so they would each get a sticker with their name on their beer glass so they could re-use the same glass throughout the evening. Students then consumed free beer for the entire quiz event, which lasted approximately two and a half hours. There were no constraints in consuming beer, neither with regards to the amount consumed nor any financial restrictions, as the beer was free of charge. Notably, to ensure that going to the bar and getting a new beer presented a minimal barrier, extra staff were added for the event in question, resulting in almost no queue at the bar. After the quiz event a few groups of participants continued to hang out finishing their free beers, after which the bar was closed and the experiment, as well as the evening, ended.

Each student was randomly assigned to one of two groups when they went up to the bar for the first time. This was done by referencing a random excel-based pre-ordered sequence of the two different sizes of beer glasses used for the experiment (see Figure 1) placed under the bar top out of sight from the students. Thus, a group of students (treatment) were served 40 cl of beer in smaller '40 cl' plastic glasses (n = 49), while another group of students (control) were served 50 cl of beer in standard '50 cl' plastic glasses (n = 53). Before glasses were handed to students, their name was asked for and written on a label on the glass (see Figure 2). The bartender repeated the message that they needed to keep their glass for refills throughout the evening. All students accepted this explanation without any further questions. In this way we were able to measure how much beer each student consumed using numbers of servings as a proxy. Almost all students had finished their beer at the end of the experiment and the few who left approximately a half-filled glass were noted down in the data.

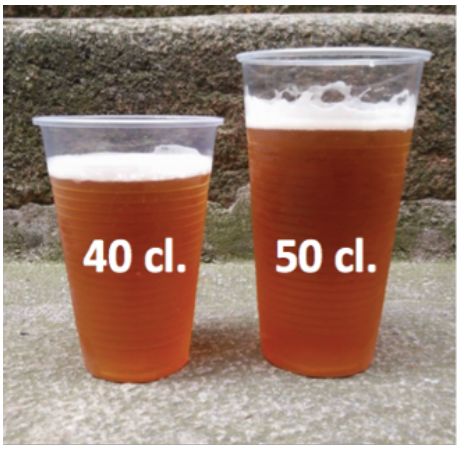

Figure 1. Design of the glasses used in the experiment (filled to 40 cl and 50 cl respectively).

Figure 2. Before glasses were handed to students, their name was asked for and written on a label on the glass. Go-pro cameras placed under the bar-desk out of sight from the students then video-taped names on glasses and the pouring of the beer.

Before glasses were handed to students, their name was asked for and written on a label on the glass. Total servings of beer were determined via Go-pro cameras placed under the bar top out of sight from the students. These cameras captured footage of student names on glasses and the pouring of the beer in order to measure the number of drinks consumed by each student in terms of glasses poured. Throughout the night the cameras were able to keep track of all the glass fillings, no students were being filmed, and the owner's names on the glasses were visible for all servings.

Analysis

A standard t-test was used to determine whether total volume of beer consumed in the two groups was significantly different from each other. The main findings are reported both visually and as OLS regression estimates. The key two hypotheses to be tested were whether beer consumption in volume (cl) and units differed across the two groups. Finally, as an explorative analysis, we examined whether there were differences in the results between men and women in our study. All p-values are reported from two-sided tests.

Results

In total, the students consumed 103.75 litres of beer during the evening.

Figure 3 presents the average volume of beer consumed per person in each of the two groups. The students served smaller servings (treatment) consumed on average 102.04 cl beer per person, and the students served standard servings (control) consumed on average 101.42 cl beer per person. The consumption is not statistically nor substantially different between the two groups (p = .95).

Students served smaller servings did not drink less beer but simply visited the bar to refill more often than students in the group served the standard size. This is confirmed by the analysis reported in Figure 4. Students served smaller servings drank on average 2.55 servings of beer per person, and

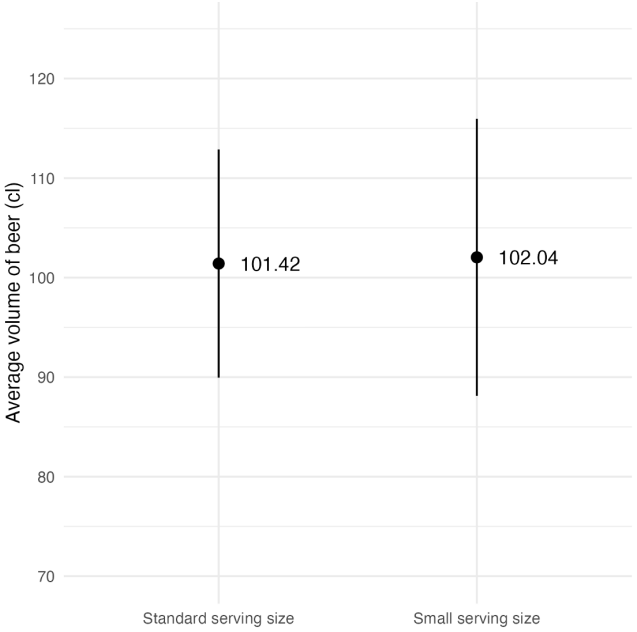

Figure 3. The average volume of beer in cl. consumed per person in each of the two groups.

Note: The error bars indicate 95% confidence intervals.

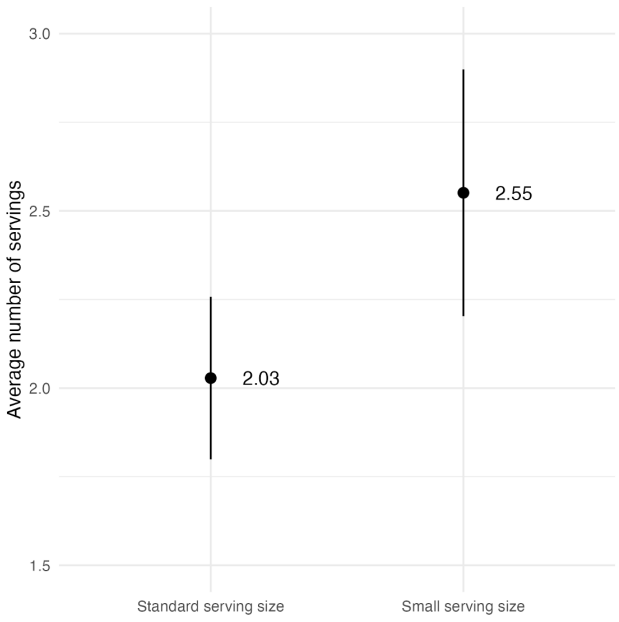

Figure 4. The average number of servings consumed per person in each of the two groups.

Note: The error bars indicate 95% confidence intervals.

students served standard servings drank on average 2.03 servings of beer per person. The difference between the number of servings consumed in each group is statistically significant (p = .02). Table 1 presents regression models showing the average differences between the two groups (small vs. standard servings) for volume (Model 1) and servings (Model 2).

Finally, we explored potential gender differences in the volume of beer consumed and the number of servings consumed. Noteworthy, men consumed both more beer per person and more servings of beer than women, and men seemed to drink more of the smaller servings (see Figure 5). To test this formally, Model 3 and Model 4 in Table 1 provide interaction tests for the gender differences. There is no significant interaction in terms of volume (Model 3), but there is a small significant interaction effect when looking at the number of servings (Model 4). However, the effect is only statistically significant at a .1 level.

Discussion

This experiment shows that reducing the serving size (i.e., simultaneously reducing the size of the glasses and the volume served), did not change the total consumption of beer when students had the opportunity to be served continuously for a prolonged period on a night out. This result deviates from what might be expected on the basis of existing studies on the 'portion size effect' and unit bias (Wansink & van Ittersum, 2005; Pechey et al., 2016; Kersbergen et al., 2013; Geier, Rozin & Doros, 2006), as well as a recent Cochrane systematic review that tableware size influences consumption of food and non-alcoholic beverages (Hollands et al., 2015).

Since the students in the experiment consumed the same volume of beer regardless of serving size, this may indicate that the type of participants as well as the setting are relevant moderating factors when examining the effect of serving size on alcohol consumption. That is, we speculate that the settings studied in the literature cited above are notably different than our own experimental setting. Previous experiments had participants sit down to eat a meal, or take part in a more formal quiz night with strangers invited solely for the experiment, or were served alcohol from non-disposable glasses. The less formal setting of the current experiment and/or the type of participants studied perhaps drowned the potential influence of serving size on consumption behaviour. This is supported by the fact that students in the group served smaller servings went to the bar more often, suggesting that other factors besides unit bias are at work when drinking beer in a social setting of peers with a continuous supply of beer. We speculate that these other factors might include preference for constantly having something in one's glass, social norms, perception of what amounts to acceptable or encouraged drinking behaviour, drinking pace as a socially cued dynamic that is not moderated by serving size when among peers, and the like. All of these factors may prove important avenues for future research.

Strengths and limitations

This experiment is the first, to our knowledge, to examine the impact of reducing the serving size on continuous alcohol

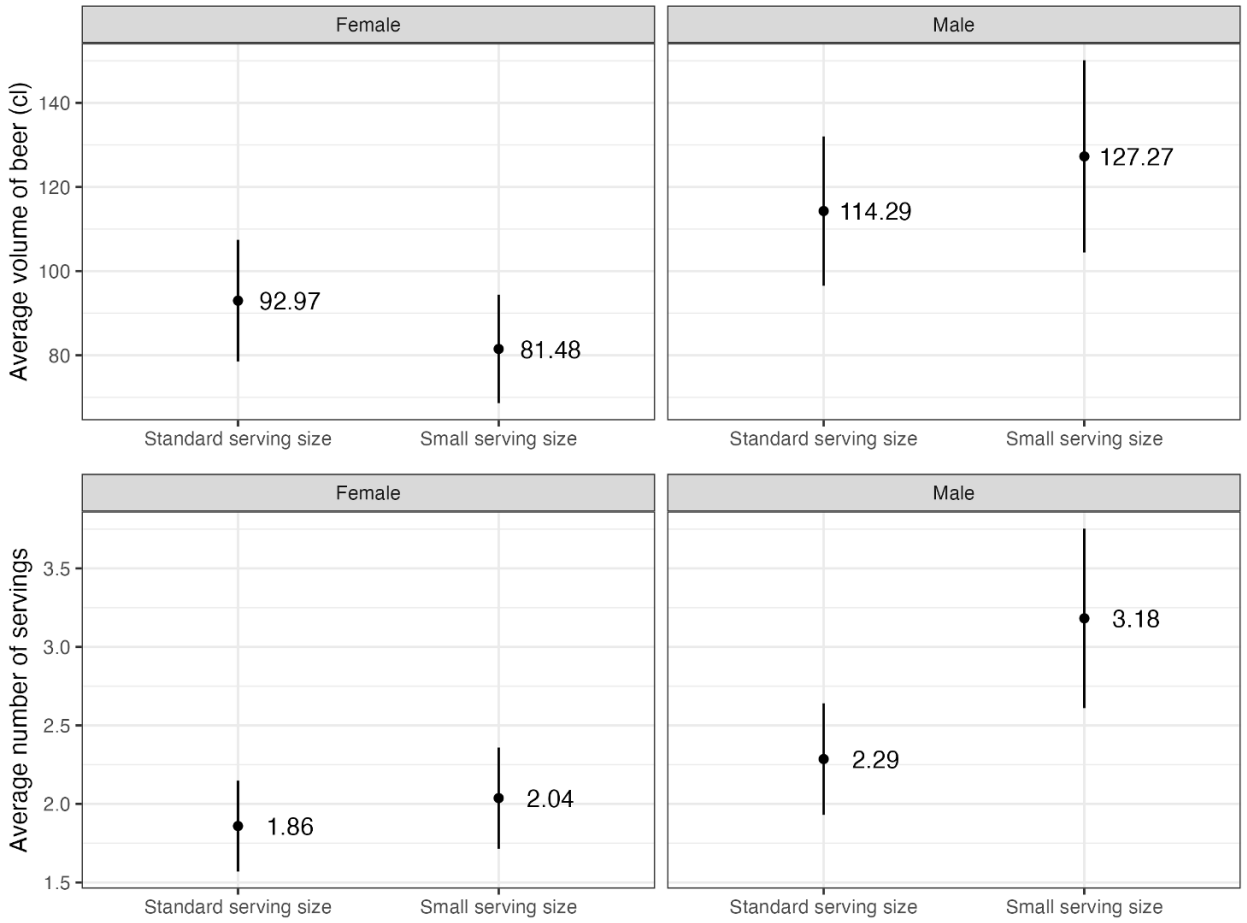

Figure 5. The average number of servings consumed per person in each of the two groups.

Note: The error bars indicate 95% confidence intervals.

Table 1. The average volume and number of servings by gender, OLS regression

	Volume, average (1)	**Servings, average (2)**	**Volume, interactions (3)**	**Servings, interactions (4)**
Small serving size	0.63	0.52**	-11.49	0.18
	(9.14)	(0.21)	(11.25)	(0.26)
Male			21.32*	0.43
			(12.09)	(0.27)
Small serving size x Male			24.47	0.72*
			(17.30)	(0.39)
Constant	101.42***	2.03***	92.97***	1.86***
	(6.34)	(0.15)	(7.61)	(0.17)
Observations	102	102	102	102
R^2	0.0000	0.06	0.15	0.21

Note: Unstandardized regression coefficients with standard errors in parentheses.

* $p < .1$, ** $p < .05$, *** $p < .01$

consumption among peers in a real-world setting using a randomised controlled design. The surprising result that the beer consumption of students was not affected by the serving size of their beer suggests that other possible mechanisms influence consumption, and that these might be more important to look into than the serving size when it comes to decreasing consumption in similar settings of continuous consumption. Accordingly, the findings confirm that additional research is needed to better understand when reducing serving size serves as an efficient policy approach.

Despite the experiment's strengths, it should be noted that certain limitations also exist. First, while the two groups of participating students did not react to the differences in serving sizes, they did interact throughout the evening. This means that drinking small servings of beer (40 cl) did not take place in isolation from drinking standard servings of beer (50 cl). While the interaction of the groups does provide for added realism of setting, since multiple sizes and types of alcoholic drinks are usually available in one place, the results would benefit from replications where groups drink separately. Second, while the fact that beer was free served to isolate the results from pricing effects, this feature likewise did not add to the realism of the experiment, although it should also be noted that settings do exist where drinks are free, e.g., weddings, funerals and private parties. Still, the interpretation of the results would benefit from replications where participants have to pay for the beer, especially since taking money out of the pocket could serve as a segmentation cue or cost reminder and drive a serving size effect. Third, the experiment was limited in time to 2.5 hours and did not extend throughout a whole night. Thus, the results will benefit from replications where participants are given the opportunity to continue drinking.

Implications for research and policy

Replications, especially varied replications, of the current experiment are needed. Fortunately, the setup introduced here should be easy for researchers to reproduce. The experiment described above is fairly cheap and the variations suggested are easy to replicate. For most countries, it will be simple to find potential participants already within settings where such experiments would take place.

As for policy implications, this experiment suggests that expectations surrounding regulatory reduction of alcohol serving sizes immediately and automatically helping to curb excessive consumption in settings of continuous consumption should be revised. We have little doubt that serving sizes matter for settings such as lunch and dinner, where a segmentation effect may be driven by price, friction from ordering, and norms relative to the number of servings consumed, especially for adults. The current experiment, however, does suggest that regulating serving sizes to below a certain limit, e.g., as part of alcohol licensing requirements, could be an unnecessary regulatory distraction and burden in the pursuit of curbing unhealthy consumption of alcohol.

Conclusions

In conclusion, reducing the serving size (i.e., simultaneously reducing the size of the glass and the volume served) of beer to 40 cl instead of standard 50 cl did not influence how much beer students consumed during a night out at a student bar with continuous drinking among peers. Accordingly, the findings presented above have significant implications for our understanding of the limitations of nudging students with serving size to reduce alcohol consumption. In particular, the findings suggest that the potential effect of behaviourally informed regulation of serving sizes should be expected to vary according to the setting of consumption as well as the type of people drinking.

Supplementary material

To view supplementary material for this article, please visit https://doi.org/10.7910/DVN/EQRVFW.

Availability of data and materials. Replication material is available at the Harvard Dataverse: https://doi.org/10.7910/DVN/EQRVFW.

Authors'contribution

P.G.H., M.S.M., and M.S. designed, coordinated, and carried out the experiment as well as analyzed the data and drafted the manuscript together with E.G.L. and A.M.J. All authors read and approved the final manuscript. All authors of the article qualify for authorship, have agreed upon joint decision about the order of authorship, have participated sufficiently in the work to take public responsibility for the content, have been involved in drafting and revising the article, and have read and approved the final version of the manuscript.

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Conflict of interest

The authors declare that they have no competing interests.

Ethics clearance

The experiment was approved by the committee for research ethics at Roskilde University. It involved only a minor tweak to a normal scenario of a regular quiz night at a dormitory student bar where events with free beer regularly occur. The event was not arranged by the researchers, and the tweak was expected to reduce alcohol consumption. No bar guests were filmed and no personal data was recorded. Being a field experiment in a natural setting, there was no opt-out, consent, or debriefing implemented.

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