Regulation was first published in July 1977 "because the extension of regulation is piecemeal, the sources and targets diverse, the language complex and often opaque, and the volume overwhelming." Regulation is devoted to analyzing the implications of government regulatory policy and its effects on our public and private endeavors.

FOR THE RECORD

Reducing Soda Consumption

We are writing to respond to the article by Jonathan Klick and Eric Helland ("Slim Odds," Spring 2011), which questions taxation of sugar-sweetened beverages as a public health strategy to combat obesity. The authors disparage our cohort study published in *The Lancet* ("Relation between Consumption of Sugar-Sweetened Drinks and Childhood Obesity: A Prospective," Vol. 357 (2001)) finding an independent association between sugar-sweetened beverage consumption and measures of body weight in children. They offer three specific criticisms and an *ad hominem* attack, none of which has any merit. We address their specific points below.

Consumption | Klick and Helland write, "First, an increase of one serving per day is a large change in consumption. In fact, it is more than four times the average change in consumption observed in the data." In stating this, they confuse a secular trends analysis (i.e., changes in a population) with a cohort design such as ours that examines individuals over time. It is true that *average* consumption of sugar-sweetened beverages among youth in our cohort increased by only a few ounces during the two-year study. This average includes many youth with more substantial increases and many with more substantial decreases. A better measure of this variation is the standard deviation, which was 1.14 servings of sugar-sweetened beverages per day. It is typical and appropriate to examine the effect of a one-standard-deviation change upon outcomes, as we did.

In any event, secular trends have little bearing on the understanding of how changes in individual consumption may affect body weight. By their argument, one could not, for example, make any inferences about how changing cigarette smoking by one pack a day affects lung cancer risk if, during the observation interval, overall cigarette smoking changed by less than that amount. In actuality, a change in one serving of sugar-sweetened beverages per day is not only well within the observed variation in our cohort, but also feasible from a public health perspective.

Excluding incidents of obesity | Klick and Helland write, "Perhaps more troubling, the Ludwig results themselves appear to either purposely or negligently ignore an important part of the data: almost as many children transitioned out of obesity from the start of the study to the follow-up period (35) as entered obesity (37).... More generally, excluding the already-obese children (more than a quarter of the entire sample) when analyzing the determinants of obesity demands some explanation." In noting this, they overlook a basic concept in statistics, that analysis of incidence must exclude any individual who has already developed the condition of interest. For the same reason, an analysis of cigarette smoking and incident lung cancer must exclude all existing cases of lung cancer at the start of the observation period. Thus, our analysis of obesity incidence excludes these initial cases. Of note, all 548 children (without exclusion for obesity status) were included in our analysis of change in body mass index (BMI), which also showed a statistically significant, positive association with increasing sugar-sweetened beverage consumption.

Sodas and obesity | Klick and Helland write, "Another problem ... is the authors' failure to recognize that the consumption of sugar-sweetened beverages explains a very tiny fraction of the BMI increase observed in their study." In fact, we have never argued that sugar-sweetened beverage consumption alone explains most of the obesity epidemic. Even so, an increase in BMI of 0.24 units with an increase in

one serving per day has major potential significance from a population perspective. Excessive sodium intake is not the only cause of stroke, but that does not provide justification to ignore the public health significance of salt.

Ad hominem | Finally, Klick and Helland write, "While their presentation [pertaining to use of the one-serving-per-day unit] is not wrong, it is certainly a more provocative way to frame the results — something that would be expected from activists, but not from scholarly researchers." For reasons indicated above, we believe that our choice of units is scientifically appropriate. Furthermore, we have no conflicts of interest related to food or beverage companies, and understand that this is not the case for Klick and Helland who received at least indirect support from the American Beverage Association.

Klick and Helland assert "the trivial importance of soda consumption in the growing obesity epidemic." This belief has no foundation in science.

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Response

We are glad to hear that two prominent public health scholars acknowledge that sugar-sweetened beverage consumption is not a primary driver of the upward trend in obesity in the United States. We do disagree with David Ludwig and Steven Gortmaker's implication that beverage taxes have significant potential in the fight against this epidemic.

Regarding the authors' incomplete transition analysis, we know that while more than half of the children in their sample (total sample 548) increased their consumption of sugar-sweetened beverages (312) during the period of study, almost as many children went from being obese to being non-obese (35) as went from being non-obese to obese (37). Also, more than 65 percent of the children were never obese during the course of the study.

Looking at the body mass index results, the authors' analysis suggests that while average BMI went up by 1.5 points (rising from 22.23 to 20.73, as shown in their report's Table 1), even the least conservative

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model presented in their report's Table 2 suggests that the average change in sugar-sweetened beverage consumption (average consumption goes from 1.22 servings to 1.44) explains a BMI increase of only 0.05 points (0.22 servings change × 0.24 effect of one-serving increase on BMI). That is, even using the largest estimated effect in Ludwig and Gortmaker's paper, the effect of the observed increases in average sugar-sweetened beverage consumption explains only about 3 percent of the observed change in BMI in their sample. If beverage consumption is any part of the increasing BMI story, it is not more than a bit part.

It is possible that any effects of beverage consumption operate more intensively on some individuals than on others Thus, it is appropriate to analyze obesity transitions in both directions. While the authors analyze transitions into obesity, they report no results concerning transitions in the opposite direction. To provide a complete and accurate picture of what is going on here, we suggested in our article that it would have been valuable to examine the movement out of obesity too, since almost as many children transitioned out of obesity during their study as became obese. Recall that the majority of children increased their sugar-sweetened beverage consumption in this time period. If the conclu-

sions drawn by the authors are robust, we should observe that those transitioning out of obesity were systematically more likely to be in the minority of children who decreased their consumption of sugar-sweetened beverages. The authors did not perform (or at least present) this analysis even though it would have been easy to do so and would have served as valuable evidence one way or the other regarding the relationship between sugar-sweetened beverage consumption and obesity.

With respect to the authors' choice of what unit change they used to frame the policy implications of their results, a one-standard-deviation change is often a useful benchmark. However, it may be less useful in a distribution such as the one they were analyzing. Specifically, if one-quarter of their sample increased consumption by more than four times the average change and there were not similarly extreme reductions in consumption among other subjects, this suggests a highly right-skewed distribution. In such a skewed distribution, a standard deviation is a less useful unit of reference. With linear models, even very small effects can be made to appear large if authors posit a large enough change in a given explanatory variable. In our view, this is what Ludwig and Gortmaker have done. This was not an ad hominem attack. It is a difference in judgment and style that we stand by.

On a parting note, we did disclose in our article that we have indirectly received a nominal amount of funding from the American Beverage Association. We do not believe this creates a conflict any more than does, say, taking grant funding from the Robert Wood Johnson Foundation, which has a stated commitment to promoting taxes on items such as sugar-sweetened beverages and which funds a large number of studies done in this area. In any event, all of our analysis of the literature in our *Regulation* article was descriptive and is easily evaluated for accuracy.

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