Universal Cash Transfers Reduce Childhood Obesity Rates

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Abstract

We evaluate the impact of universal income on childhood obesity. While the goals of implementing universal income are many, its influence on childhood obesity is of particular interest given the growing obesity epidemic and its future threat to global public health. We use evidence from Alaska's universal income program, the Permanent Fund Dividend (PFD), which has provided annual, unconditional, and universal income to Alaskan residents for over thirty-five years. We use both survey and administrative data to evaluate how the availability of unconditional resources at an early developmental stage, in terms of PFD payments to the child, affects a child's body mass index (BMI). Using date-of-birth eligibility cut-offs as an identification strategy, we find that an additional one thousand dollars in PFD payments decreases the probability of an Alaskan child being obese by as much as 4.5 percentage points. Extrapolating a similar payment to the United States, we find that 66 thousand annual cases of childhood obesity

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could be averted, on average, resulting in medical cost savings of approximately $310 million. These findings highlight just one of the potential social benefits of universal income and the potential it has as a tool for addressing the obesity epidemic.

Keywords: Permanent Fund Dividend; Unconditional cash transfer; Welfare effects; Childhood Obesity; Universal Income.

1 Introduction

There has been increased interest in universal basic income (UBI) and its role in our economy's future and the welfare of its citizens. Many politicians and thought leaders have argued for the implementation of a universal and unconditional cash transfer program on a national scale (Alba, 2016), citing its potential to improve economic security (Thigpen, 2016) or as a substitute for existing welfare programs (Murray, 2008). Universal transfers are provided to all residents on a long-term basis, regardless of income, while unconditional payments are those distributed with no "strings attached" (Marinescu, 2017). Several countries, such as Finland and India, have recently implemented UBI experiments (Khosla, 2017; Authors and Research at Kela, 2016). The United States has also shown interest in UBI, as demonstrated by an ongoing random control trial aimed at understanding the effectiveness of universal income on people's well-being across several dimensions, such as employment, social networks, and health (Weller, 2017). On the political front, the Democratic Party nominee for the 2016 US presidential election, Hillary Clinton, considered integrating a UBI proposal into her campaign platform (Matthews, 2017). The program was intended to be named "Alaska for America" given the inspiration it drew from the Alaska Permanent Fund Dividend (PFD), which is an annual universal and unconditional income payment provided to all Alaska residents. While skeptical of costs, conservative thinkers have also written favorably about UBI's potential as a replacement for complex means-tested and strings-attached programs Tanner (2015).

Despite the growing interest in UBI, there is little accumulated knowledge regarding its effects on the well-being of recipients. In this paper, we evaluate the impact of universal and unconditional cash transfers on childhood obesity and investigate whether a UBI program could combat the United State's obesity crisis. Although universal income is expected to influence well-being in several different ways, we focus on childhood obesity given the growing obesity epidemic and its future threat to global public health (Lancet, 2011).

We use the Alaska PFD to evaluate how universal and unconditional income affect childhood obesity. The PFD is the world's only continuous universal income program, providing ongoing annual PFD payments to all residents (subject to minor eligibility rules) since 1982. The PFD amount varies year-to-year according to the investment earnings of the Alaska Permanent Fund, the state's sovereign wealth fund, and establishes an income floor below which the cash income of residents cannot fall. This cash payment represents a non-negligible portion of Alaskans' earnings, and is particularly important in rural areas where economies lack economic bases and are still a mixture of subsistence and a small formal economy (Goldsmith, 2010). The program is very popular and the public expects it to run in perpetuity. The PFD is distributed to all residents of the state—both adults and children, as well as green-card holders and refugees—regardless of income or wealth, making it universal. Further, residents are not required to meet any conditions before receiving the PFD, nor are they restricted in how they spend the PFD, making it unconditional. Thus, the Alaska PFD is the closest example to a UBI program worldwide and provides a unique opportunity for understanding how unconditional and universal payments influence well-being.

While the goals of UBI are many, its influence on childhood obesity is of particular interest given that the obesity rate in the U.S. has more than doubled (from 5.0% to 12.4%) among children aged 2-5 years since 1980 (Ogden et al., 2014). Childhood obesity has been associated with type II diabetes mellitus, hyperlipidemia, atherosclerosis, hypertension, depression, nonalcoholic fatty liver disease, and obstructive sleep apnea (Daniels, 2006; Dietz, 1998; Krebs et al., 2003; American Academy of Pediatrics, 2003). Additionally, there is evidence that obese children are considerably more likely to be obese as adults, which may negatively affect labor market outcomes (Lindeboom et al., 2010; Cawley, 2015). Childhood obesity is also responsible for significant health care costs (Biener et al., 2017): the incremental lifetime direct medical cost from the perspective of a 10-year-old obese child relative to a 10-year-old normal-weight child ranges from $12,660 to $19,630 (Finkelstein et al., 2014).

Income, and how it interacts with obesity, is an important part of almost all policy interventions. In theory, additional income could lead to an increase or decrease in childhood obesity. Higher income, for example, can prevent weight gain by allowing parents to substitute healthier, more costly, food for cheaper energy-dense food or by increasing demand for a child's health care. On the other hand, additional income could promote weight gain by allowing children to consume more calories and spend more time in sedentary pursuits (Cawley, 2015). Several studies have found that conditional cash transfers improve health and nutritional outcomes for children in early life (Rasella et al., 2013; Reis, 2010; Schmeiser, 2012; Fernald et al., 2008; Rasella et al., 2013); however, it is likely that these benefits are achieved in part due to the conditions imposed by the program. Existing studies of unconditional income payments and obesity have found mixed results: Swedish lottery payments have been shown to reduce obesity across income groups (Cesarini et al., 2016), but dividends from a tribal casino have been found to increase obesity among the poorer households with non-offsetting reduction in obesity for wealthier households (Akee et al., 2013). These payments, however, do not stem from a universal program and focus on obesity outcomes for young adults, as opposed to children.

The Alaska PFD presents an ideal setting to understand the impact of unconditional, anticipated, and universal cash on children's obesity at a very early age. Indeed, the PFD may be more conducive to influence childhood obesity compared to other cash transfer programs. The PFD payments we study are assigned to the child; thus, a labeling effect may induce parents to spend this cash disproportionately on the child relative to other sources of income (Kooreman, 2000). The income effect of the PFD may also induce mothers to reduce their labor supply (Bibler et al., 2019), which has been shown to reduce childhood obesity by increasing maternal time with children (Jo, 2018). Finally, the PFD is universal and is thus distributed across the entire income distribution, including segments of the population for which obesity may be more responsive to income payments (Lakdawalla and Philipson, 2009; Jo, 2014).

We determine the causal effect of universal income receipt on childhood obesity by exploiting quasi-experimental variation in the cumulative amount of PFD received by a child.

We find that a one-thousand dollar PFD payment significantly decreases the probability of being obese as a child by as much as 4.5 percentage points, which equates to a 22.4% reduction in the number of obese 3-year-old Alaskans. Consistent with theory (Lakdawalla and Philipson, 2009), the effect of the PFD on obesity is nonlinear in household income: middle-income households are particularly responsive to the PFD payments while there is no detectable response from high- and low-income households. Extrapolating our results to the United States as a whole, we find that a one-thousand dollar investment per child could avert approximately 66,000 annual obesity cases, on average, resulting in obesity-related medical expenditure savings of $310 million before those children turn 18. Importantly, our results suggest that UBI could have far-ranging benefits to society and has potential for combating the growing obesity epidemic.

Data and Research Design

Identification Strategy

The influence of income on childhood obesity is challenging to identify empirically: if household income is determined by unobserved factors that also influence a child's weight, then the estimated relationship between income and obesity will be spurious (Kuehnle, 2014). We are able to address this issue by exploiting two forms of quasi-experimental variation in income. First, an Alaskan resident adult may sponsor a newborn child to receive a PFD if the child is born before December 31st of the qualifying year. Because of this rule, a child born on December 31st will receive one more PFD than a child born one day later on January 1st (Fig. 1). So long as a child's date-of-birth has no independent effect on obesity, the additional PFD amount received from being born before the eligibility cut-off can be considered exogenous. Second, the PFD has seen considerable variation in size over the last two decades: the PFD has averaged ~$1,600 per person, with a high of ~$3,200 in 2008 and low of ~$900 in 2012 (all in nominal terms). As a result, the cumulative amount of PFDs received by a particular age will differ across children. The exogenous nature of these two sources of income variation supports a causal interpretation of our estimated effect of the PFD on childhood obesity.

Data

Our analysis relies on linked survey and administrative data called the Alaska Longitudinal Child Abuse and Neglect Linkage Project (or ALCANLink), an ongoing project which combines two surveys conducted by the Alaska Department of Health and Social Services—the Pregnancy Risk Assessment Monitoring System (PRAMS) survey and the Childhood Understanding Behaviors Survey (CUBS)—with administrative data from vital records and the Alaska Permanent Fund Dividend Division.[1] The PRAMS survey samples one-sixth of all mothers delivering live births in Alaska and collects information on pre- and post-natal behaviors and outcomes of mothers and their newborn children. The survey is administered by mail two to six months after birth (with follow-up by phone) and has historically had a ˜65% response rate. CUBS is an Alaska-specific program developed as a 3-year follow-up survey to the PRAMS survey to understand the behavior and outcomes of toddlers. It is administered two months after their child's third birthday to all PRAMS survey respondents who remain in-state.

Our data is a subset of the ALCANLink project, covering children who were the subject of a CUBS follow-up survey. These data cover children born between January 2009 and December 2011, have mothers who were sampled by (and responded to) the PRAMS survey two to six months later, and have mothers who received and responded to CUBS between 2012-2015. The time period of coverage for the current data contained in ALCANLink was chosen principally for administrative reasons. Data from the Permanent Fund Division allow us to observe the application status of each child in each year between birth and their CUBS survey, which provides the information to calculate the accumulated dollars of dividend

[1] We obtained these confidential data via data use agreement with Alaska DHSS.

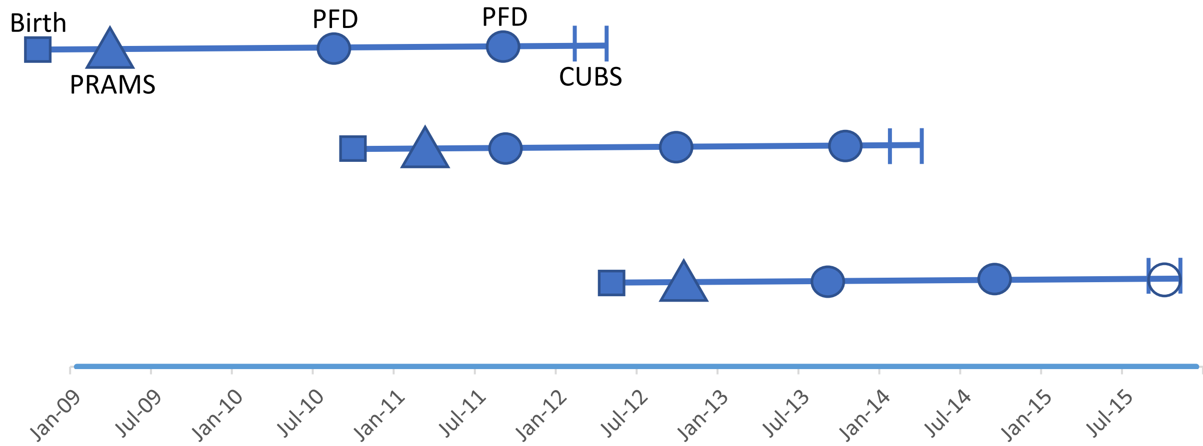

Figure 1: Timeline showing the relationship between date-of-birth, survey design, and accumulated PFD income. PRAMS is a survey is administered 4-6 months after birth, CUBS is a survey is administered 2-7 months after 3rd birthday. Top case: child born Jan-Feb will only receive 2 PFDs before mother returns CUBS survey. Middle case: children born Aug-Dec will receive 3 PFDs before mother returns CUBS survey. Bottom case: children born Mar-July may receive 2 or 3 PFDs, depending on the CUBS survey date.

received by each child. Figure 1 illustrates how birth timing and the date a mother returns the CUBS follow-up survey determines the number of PFDs that children accumulate before a mother records a child's obesity at age three.

Empirical Model

We use a child's body mass index (BMI) at the age of three, as reported by a child's mother in CUBS, to estimate the effect of the PFD on childhood obesity. We adopt the conventional measure of childhood obesity, which is based on BMI referenced to the Centers for Disease Control and Prevention (CDC) growth charts. The CDC defines four weight categories for children's BMI: underweight, normal weight, overweight, and obese, with category cutoffs based on the 5th, 85th, and 95th percentiles, respectively, of the U.S. population in the 1970s. We estimate the probability of being obese at age three as a function of the total amount of PFDs (in thousands of dollars) the child received on or before a mother completes CUBS and a vector of demographic control variables, including birth-weight, early nutrition (e.g., breastfeeding), and child and mother characteristics (see Tables SI.2, SI.3, and SI.4 for a full list of control variables). To explore whether the effect of the PFD on childhood obesity varies across income groups, we interact the total amount of the PFD received by a child with a categorical variable indicating household income (less than \$25,000; between \$25,000 and \$75,000; and above \$75,000).

We estimate the probability of being obese at age three ($t = 3$) using the following model:

$$P(Ob_{i,t=3} = 1) = \Lambda\big(\beta TotalPFD_i + \gamma X_i\big), \tag{1}$$

where Ob_i is a binary variable equal to one if a child is obese (i.e., BMI is $\geq$95th percentile cutoff) and zero otherwise; $TotalPFD_i$ is the total amount of PFDs (in 1,000 dollars) the child received on or before a mother completes CUBS; X_i is a vector of control variables: demographics, early nutrition (e.g., breastfeeding), and child and mother characteristics; $\Lambda(\cdot)$ denotes the logit function; and the parameter β is the coefficient of interest. We do not use birth-month fixed effects given that a significant portion of our variation stems from the number of PFDs received, which is driven by birth month. The marginal effect of the PFD is the reduction in the probability of being obese at age three from a marginal increase in the PFD:

$$R = P(Ob_{i,t=3} = 1)[1 - P(Ob_{i,t=3} = 1)]\beta. \tag{2}$$

Cost-Saving Projections

We estimate the difference in medical expenditures of the average cohort of Alaskan- and U.S.-born obese 3-year-olds, relative to their cost had they not been obese. We measure this difference over a 15-year horizon, from four through seventeen years of age. To determine the effect of the PFD on obesity-related medical-cost savings, we hypothetically reduce the amount of PFD received by a three-year-old by one-thousand dollars and predict how many additional obesity cases are created at age three, how these persist into adolescence, and how a child's cumulative medical expenses are impacted by the age of seventeen.

The expected medical-cost savings for a child at age $t > 3$ from a marginal increase in the PFD are:

$$c \times \Big[P(Ob_t = 1|Ob_{t=3} = 1) - P(Ob_t = 1|Ob_{t=3} = 0)\Big] \times \hat{R} \tag{3}$$

where c is the annual medical cost of being obese (relative to not being obese), $\hat{R}$ is the reduction in the probability of being obese at age three given a marginal increase in the PFD, and the expression in the brackets represents the relative influence of a child's obesity status at the age of three ($Ob_{t=3}$) on the likelihood of being obese at age t. We estimate a child's medical-cost savings between the ages of four and seventeen from the PFD for a cohort of size N by summing the savings in Eq. 3 across all N individuals and ages.

Estimates of the relative medical cost of being obese c are taken from the literature (Biener et al., 2017) and $\hat{R}$ is the predicted marginal effect of the PFD on a child's obesity status (Eq. 2). The probability of a child being obese at age three, $P(Ob_{t=3} = 1)$, is determined for Alaska from the CUBS sample in combination with the PRAMS survey-design weights, and for the U.S. as a whole from the CDC estimates (NCHS, 2017). These probabilities for an individual three-year-old are then multiplied by the average size of the 2009-2011 Alaska and United States birth cohorts, 11,000 and 4.0 million respectively (Martin et al., 2011, 2012, 2013).

To project a child's obesity status over a 15-year horizon, we utilize a standard modeling approach from the literature and calculate transition probabilities to and from obesity-status categories. Our estimated transition probabilities are based on a child's initial obesity status and their mother's BMI (Whitaker et al., 1997):

$$P(Ob_{i,t} = 1|Ob_{i,t=3}) = \Lambda\big(\gamma_1 Ob_{i,t=3} + \gamma_2 BMI_i^{mtr}\big)t, \tag{4}$$

where $Ob_{i,t=3}$ denotes a child's obesity status at age three; BMI_i^{mtr} denotes the BMI of the child's biological mother, averaged over the child's observed lifetime; and γ is a vector of parameters to be estimated. Since CUBS is not a longitudinal study, we do not observe the long-run obesity outcomes of the children in our sample. Instead, we estimate Eq. 4 using the National Longitudinal Survey of Children and Young Adults. Confidence intervals for our estimated medical-cost savings are obtained via a bootstrapping procedure (See *Supplementary Information* for additional details regarding the cost-savings projections).

Results

The accumulation and investment of universal and unconditional income generates significant and meaningful reductions in childhood obesity in our sample. We find that an additional $1,000 in accumulated PFD reduces the relative probability of being obese as a three-year-old to 0.691, which is equivalent to reducing the average probability of being obese by 5.2 percentage points, all else equal (Table 1, column 1). This effect is significant using both classical inferential hypothesis testing and permutation testing (Fig. 2). The estimates in Table 1 are sample average treatment effects and do not account for the over-sampling of low-birth-weight children and Alaska Native mothers on the part of the survey design. Using survey sample weights slightly reduces the marginal effect of the PFD to 4.5 percentage points (Table 3). Our results hold even when using different constructions of obesity status by comparing obese children to only normal weight children (column 2); obese *and* overweight children to both normal and underweight (column 3); or overweight and obese to only normal weight (column 4). Furthermore, the marginal effect of the PFD increases by ~1 percentage point when moving from columns (1-2) to columns (3-4), which implies that the PFD also lowers incidences of overweight status. The estimated effect also holds across several different specifications of the control variables (Table SI.5) and robustness checks (*Materials and Methods*).

We find evidence of a nonlinear relationship between household income and the effect of

Table 1: Un-weighted Estimated Effect of Total PFD ($1,000s) on the Probability of Being Obese and Overweight as a Three-year-old Child

Risk of being: Compared to:	≥95th <85th (1)	≥95th 5th-85th (2)	≥85th <85th (3)	≥85th 5th-85th (4)
Logit coefficient	-0.370^{***}	-0.380^{**}	-0.360^{***}	-0.349^{***}
	(0.140)	(0.152)	(0.117)	(0.120)
Odds ratio	0.691^{***}	0.684^{**}	0.697^{***}	0.705^{***}
	(0.096)	(0.104)	(0.082)	(0.085)
Marginal effect	-0.052	-0.058	-0.065	-0.064
Observations	885	698	885	830

Logit coefficients, odds ratios, robust std. errors (in parentheses), and the average marginal effect of accumulated PFDs on the probability of being obese. Un-weighted estimates shown reflect over-sampling low birth weight children and Alaska Native mothers. Columns (1) and (2) are estimates of the effect of an additional $1,000 PFD accumulation on the risk of being classified obese (BMI ≥ 95th percentile for sex/age) relative to all other weights (BMI¡85th percentile), column 1) or only normal weight children (5th-85th percentile, column 2). Columns (3) and (4) are estimates for both obese and overweight children relative to all other weight classes (3) or only normal weight children (4). Control variables include characteristics mothers, children, and early nutrition at birth or before first PFD receipt (See SI for complete list). *p<0.1; **p<0.05; ***p<0.01

the PFD on childhood obesity (Table 2). Specifically, we find that the strongest obesity-reduction effect is for middle income families (those households earning between $25,000-$75,000 per year). We find no evidence of an effect of the PFD for low and high income families. The same analysis across a more refined disaggregation across income groups reveals a relatively smooth U-shaped relationship between the PFD effect and household income, where the effect peaks at incomes between $50,000-$75,000 (Table SI.13; Fig. SI.2).

To get a sense of the economic significance of our results, we simulate how the estimated effect of the PFD on childhood obesity might persist through adolescence and reduce associated medical expenditures for an average Alaskan child, an average cohort of Alaskan-born children, and an average cohort of U.S.-born children (Table 3; see *Materials and Methods* and *Supplementary Information* for more details). While obesity in adolescence has been shown to persist into adulthood, we focus only on the benefits accrued before age 18 since these are incurred soonest after our treatment effect. Additionally, while many studies have shown that there are substantial market and non-market costs associated with obesity apart from direct medical expenses (Dee et al., 2014; Goettler et al., 2017), we focus narrowly on the medical costs since the indirect costs are typically measured for adults.

Obesity rates for Alaskans and U.S born three year olds between 2012 and 2014 were 0.203 and 0.094, respectively, which translates into 2,230 Alaskan and 376,000 U.S obesity cases. Using the re-sampling strategy described in *Materials and Methods* and *Supplementary Information*, we re-estimate our un-weighted, in-sample treatment effect (-5.2 percentage points) to an Alaskan 3 year old population effect (-4.5 percentage points). Extrapolating the estimated marginal effect of the PFD to the Alaska population, we find that 500 cases of obesity were averted from an additional $1,000 in PFD payments, which is equivalent to a 22.4% reduction in the number of obese three-year-olds. Applying the same proportionate decrease to the United States results in ˜66,000 averted cases of childhood obesity. Drawing from the literature (Cawley, 2010), obese children incur $1,400 more in medical expenses per year relative to children who are not obese, on average. Assuming that all averted three-year-

Table 2: Odds Ratios of Estimated Effect of Total PFD ($1,000s) on the Probability of Being Obese and Overweight as a Three-year-old Child for low, middle, and high income terciles

Risk of being:	≥95th	≥95th	≥85th	≥85th
Compared to:	<85th	5th-85th	<85th	5th-85th
	(1)	(2)	(3)	(4)
PFD	0.888	0.935	0.914	0.958
	(0.186)	(0.254)	(0.191)	(0.212)
PFD x 25-75K	0.5	0.461**	0.546**	0.518**
	(0.148)	(0.161)	(0.148)	(0.146)
PFD x >75k	1.056	1.063	0.916	0.89
	(0.367)	(0.422)	(0.283)	(0.284)
Observations	885	698	885	830

Odds ratios and robust std. errors (in parentheses). Estimates presented are the results of PFD x Income tercile interactions. Un-weighted estimates shown reflect over-sampling low birth weight children and Alaska Native mothers. *p<0.1; **p<0.05; ***p<0.01

old obesity cases remained non-obese through the age of seventeen, a $1,000 universal income payment would result in medical-cost savings of $10.3 million and $1.4 billion for the average Alaska- and U.S.-born cohort, respectively, which equates to $920 and $350 per person. If we assume instead that obesity is not fully persistent (i.e., the effect of the initial cash transfer on obesity decays with age), we find medical-cost savings that are approximately one-quarter of the previously estimated size—$2.3 million and $310 million for the average Alaska- and U.S.-born cohort, respectively, which translates into 21 and 7.8 cents in savings for every dollar spent.

Table 3: Childhood Medical-Cost Savings from a $1,000 Universal Cash Transfer

				Medical Cost Savings, 4-17	
	Obesity at 3yos	Effect of $1k at 3yo	Obesity Cost Biener et al. (2017)	Fully Persist	Linear Age Decay
Individual	0.203	-0.045	$1,365	$920	$210
95% CI	[0.177,0.228]	[-0.091,-0.005]	[794,2011]	[80,2050]	[10,500]
AK Cohort	2,230	-500		$10.3m	$2.3m
95 CI	[1951,2511]	[-1003,-51]		[1.1,22.7]	[0.1,5.5]
USA Cohort	376K	-66K		$1,400m	$310m
95 % CI	[376,376]	[-118,-9]		[200,2800]	[20,660]

95% confidence intervals are in brackets.

Robustness Checks

The causal interpretation of our results relies on the quasi-experimental nature in how PFD payments are accumulated over a child's first three years. Nonetheless, there are four potential threats to our identification strategy, which we discuss briefly here and more completely in the *Supplementary Information*.

First, a parent may forget or opt out of applying for a child's PFD for reasons that may be related to the child's weight. Second, parents could also be strategic in timing their child's conception in order to be eligible for an additional PFD. If these decisions are associated with a child's home and nutritional environments, then the estimated effect of the PFD will be biased. To address the first concern, we condition on whether a sponsor always applied for the PFD when a child was eligible; to address the second concern, we control for whether the pregnancy was intentional or unintentional, as well as the birth method (e.g., by cesarean section). We find that neither of these controls influence the results in a meaningful way (Table SI.6). We also use the number and dollar value of PFDs a child is *eligible* for as instruments for the total accumulated value of PFDs that a child *actually* receives (Table SI.7). The resulting estimates are comparable to those reported in Table 1.

Third, there is evidence that birth season is associated with a mother's characteristics (Buckles and Hungerman, 2013); for example, winter births are disproportionately realized by teenage and unmarried women. Thus, children may be systematically heavier or lighter depending on the month in which they are born. While we control for a mother's age, marital status, race, and income to address this concern, we separately restrict the sample to children born in the first and fourth quarters of the year (October to March) (Table SI.9). These specifications produce results that are similar in both magnitude and precision to those in Table 1.

Fourth, there are several federal tax benefits—e.g., Earned Income Tax Credit, child tax credit, dependent deduction—that a child born before December 31st will qualify for when filing taxes the following spring (2-3 months after birth). In contrast, a child born after

January 1st will not qualify for such benefits until the following year. To avoid conflating these benefits with the similarly-timed PFD, we construct a flexible series of control variables that account for tax benefits and the timing of tax rebates. The corresponding estimates suggest that such tax benefits are not conflated with the estimated effect of the PFD in a meaningful way (Table SI.11)

As a final robustness check, we compare our estimates to a reference distribution of placebo effects, where the amount of PFD accumulated by a child at the age of three is artificially reassigned across all subjects in the sample. Obtaining similar or larger estimates when the accumulated PFD is artificially reassigned across subjects would be evidence that we have found our effect by chance (Abadie et al., 2010). Such permutation tests are based on the fact that, under the null hypothesis of no effect, arbitrarily reassigning accumulated PFD across subjects should have no influence on the incidence of obesity. We present the results of this test in Figure 2. As the Figure shows, our estimate (the point) lies below the 0.5 percentile (is more negative) than the distribution of placebo effects.

Discussion

The use of universal and unconditional cash transfers to address the fast-pace of economic change has gained momentum, but we have yet to understand its consequences on health and well-being. We contribute to furthering this understanding by focusing on an issue that is expected to be a significant threat to global public health (Lancet, 2011). Indeed, obesity has become an epidemic throughout the world, with the United States leading the way with an obesity rate of approximately 36.5% among U.S. adults between 20112014. According to Cawley (2010), the estimated annual cost of treating obesity in the U.S. for the adult non-institutionalized population is $168.4 billion, or 16.5% of national spending on medical care.

We find that a one-thousand dollar unconditional and universal income payment decreases the probability of being obese as a child by 4.5 percentage points, which equates to a 22.4% reduction in the number of obese 3-year-old Alaskans. The averted obesity cases result in average medical-cost savings between 20 and 92 cents per PFD dollar by the age of 17, depending on how the effect of the cash transfer is assumed to persist over time. Likewise, medical-cost savings for the United States as a whole are expected to be between 7.5 and 35 cents per dollar of universal income, on average. These estimates represent a lower bound since they do not account for lifetime medical-cost savings, they do not include additional medical-cost savings that might be realized from receiving PFD payments beyond the age of three, and they ignore the indirect effects of obesity, which tend to be larger than the direct ones that we estimate (Dee et al., 2014). We note, however, that our extrapolated estimates contain both policy uncertainty regarding the details of a hypothetical national program and statistical uncertainty (though they are significant at conventional levels). The nationally-extrapolated estimates should thus be interpreted as illustrative of the potential obesity-related benefits of universal income, rather than the final word.

The magnitude of our estimates are larger than some previously reported in the literature on benefit transfers and obesity (e.g., Jo, 2018; Schmeiser, 2012; Akee et al., 2013; Cesarini et al., 2016). However, these differences can be largely explained by three distinct feature of the PFD. First, while classic economic theory assumes the fungibility of money, evidence from the behavioral economics literature suggests that mental accounting might drive PFD recipients to experience a labelling effect, whereby money is mentally assigned to particular forms of consumption based on how it is acquired. Because the PFD payments we study are assigned to the children (rather than the parents or the household), parents may spend this cash disproportionately on children relative to other sources of income. Indeed, previous research has demonstrated that "child benefit" payments issued in the Netherlands are disproportionately spent on child expenditures (Kooreman, 2000). Second, the PFD is distinct from wage subsidy payments, such as the earned income tax credit, which tend to draw mothers into the labor force, and in turn, decrease a mother's home production, particularly activities like preparing healthy meals or physical activities with children (Jo, 2018). In contrast, the PFD has been demonstrated to have the reverse effect, allowing mothers to substitute unearned for earned income and decrease their labor supply (Bibler et al., 2019). Third, our study population is younger and has a higher baseline obesity rate than those of past studies. In general, younger children (particularly under the age of three) are much more responsive to changes in nutrition than older children (Schroeder et al., 1995; Martorell, 2017). Finally, the PFD is distributed to households across the entire income distribution, and thus, our sample is comprised of families with relatively larger household incomes. The samples of previous studies are comprised of relatively poor families with average incomes ranging from $19,000-$24,000 per year (Schmeiser, 2012; Akee et al., 2013; Cesarini et al., 2016). Consistent with our findings, these studies find a small (if any) effect of unearned income or wage subsidy payments on obesity for this income group. In contrast, the average household income in our study is $45,000, with approximately 40% of our sample lying in the household income category ($25,000-$75,000) that is responsible for driving our estimated effect. Thus, the universal nature of the PFD is a rare opportunity to explore how all segments of the population respond to cash transfers, not just those portions of the population that have been targeted in previous programs.

Identifying the mechanisms through which additional income reduces obesity is of great interest for policy (Currie, 2009; Kuehnle, 2014). Unfortunately, our data do not allow us to conduct a thorough evaluation of how additional PFD resources are used by families.

While our study has important implications for universal income programs, we are somewhat limited by the nature of survey data, such as non-response bias and measurement error. For example, we find that not reporting height and/or weight (used to calculate our BMI measure) tends to be correlated with observable characteristics such as race and income. Our extrapolation of the effect of universal income receipt from the Alaskan-born cohort to the United States also makes the assumption that these populations are otherwise similar. Future research would benefit from administrative data with more systematic collection.

Our investigation documents the causal relationship between universal cash transfers and childhood obesity. The medical cost savings we estimate are considerably larger than those found in most school interventions (Cradock et al., 2017), but are much smaller than the ones obtained from sugar sweetened beverage excise tax, and nutrition standards Gortmaker et al. (2015) It is important to note, however, that the reductions we observe are a byproduct of the unconditional cash transfer and not one of its stated goals; thus, the benefits we identify are only a small portion of the intended effects of universal income and should not taken as a complete cost/benefit accounting of such a policy. Nevertheless, our results make it clear that universal income has the possibility of improving children's health, which can have long-lasting monetary and non-monetary benefits. It is also encouraging that these health improvements are a result of a non-targeted obesity intervention. It is therefore possible that universal and unconditional cash transfers have far-ranging benefits to society that go beyond those intended by a UBI program.

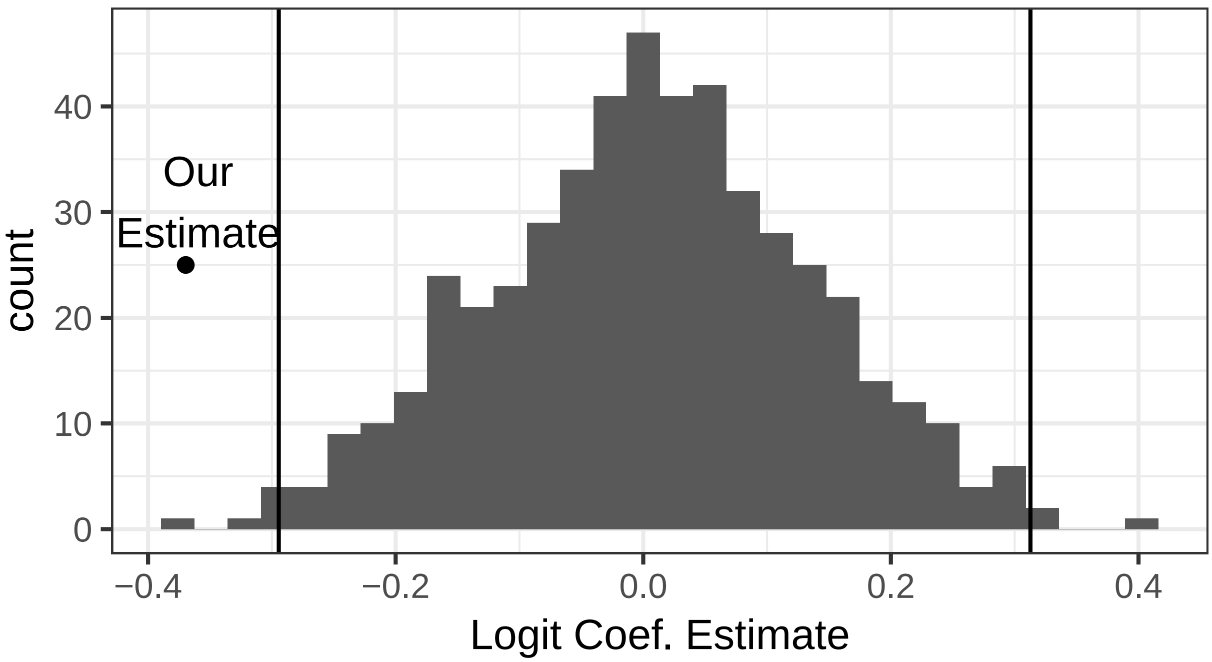

Figure 2: Our estimated unweighted logit coefficient (Point) from Table 1 (col. 1), distribution of 500 placebo effects, and 0.5 and 99.5 percentiles of placebo effects (vertical lines). Placebo effects estimated by randomly re-assigning each child's accumulated PFDs by age 3.

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