The Health Effects of In Utero Exposure to Cash Transfers*

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Abstract

We study the effects of in utero exposure to a large cash transfer program on the health of children. Using data from South Africa, we use the age-eligibility threshold of the Older Person's Grant and the variation in age differences between children and a co-resident elderly to show that in utero exposure to the cash transfer led to a 0.26 SD increase in height-for-age and 0.11 SD increase in weight-for-age of children. Among older children, we leverage the variation in the timing of the start of benefits to show important out-sized benefits of in utero exposure compared to starting later in early life. These results are robust to a variety of different checks including controlling for endogenous household formation and household fixed effects. Given the importance of early child health in determining long-term outcomes, our results suggest that extending child-specific benefits to pregnant mothers can have long-term positive impacts.

Keywords: Cash Transfers, In Utero, Children, Health, South Africa
JEL Codes: I15, I38, J13

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1 Introduction

Studies across disciplines show lasting effects of in utero exposure to shocks highlighting the importance of the mother's environment during pregnancy (Aizer, Stroud and Buka, 2016; Cowan and Tefft, 2012). While evaluations of exposure to cash transfer programs during early life show positive effects on children (Milligan and Stabile, 2011), research on the longer-term effects of positive income shocks to mothers during pregnancy is less common, especially in developing countries.

In this paper, we study the effect of a child's in utero exposure to the Older Person's Grant—a large unconditional cash transfer program directed towards the elderly in South Africa. We show that children who were fully exposed to the cash transfer program in utero had a 0.26 SD higher height-for-age and 0.11 SD higher weight-for-age on average with smaller estimated effects for partial in utero exposure. These reflect significant improvements in the health of the children that predict better outcomes in adulthood (Currie et al., 2010; Case and Paxson, 2008; Guven and Lee, 2013; Hoddinott et al., 2013). Importantly, our empirical approach provides variation in the timing of the start of exposure to the grant throughout the gestation and early years of life of the older children in our sample: we show that starting exposure while in utero has large cumulative effects compared to starting later in early life emphasizing the importance of better economic conditions during gestation.

Our study setting is South Africa where inter-generational households are common and many children live in households with elderly. In nationally representative data, nearly a third of children six and under and a quarter of pregnant women live with a beneficiary of the Older Person's Grant highlighting its reach beyond its nearly four million direct beneficiaries.[1] While low-income mothers or primary caregivers of children are eligible to receive the Child Support Grant after the birth of the child (currently ZAR 480 per month), the Older Person's Grant is significantly larger at above ZAR 1,800 (approximately 140% of median income per capita) and is not tied to the composition of the household. This grant is shown to improve household-level economic well-being significantly increasing household income and food expenditure, on average, while reducing reported hunger by half (Case and Deaton, 1998; Alloush, Bloem and Malacarne, 2023).

[1] With nearly 4 million direct elderly beneficiaries, we estimate, using nationally representative data, that 45% of them live in a household with at least one child six and under and that 4-5% live with at least one woman who is pregnant. These numbers are for women who report a pregnancy when surveyed.

To estimate the effect of in utero exposure to the grant, we use the discontinuity of receipt of the grant at the age eligibility threshold (60 years) and determine in utero exposure based on the difference in age (in months) between the oldest member of the household and the child.[2] We find that this added cash while the mother is pregnant has important effects on the health of children especially among those living in poorer and rural households. By investigating the effect of the grant based on when the child's exposure began, we show out-sized cumulative effects of starting in utero or before suggesting that children whose exposure starts later in early life do not catch up to those exposed in utero.

We conduct a series of robustness checks that produce results very similar to those from our main specification. These include controlling for endogenous household formation by restricting the analysis to children whose mother and co-resident elderly were living together at least two years before the child was born, and controlling for household fixed effects by using within household variation among children in the timing of the grant to estimate the effect of in utero exposure. We also investigate potential mechanisms through which in utero exposure to the grant can affect children. We find that compared to pregnant women living in a household with an elderly just below the age eligibility cutoff, pregnant women living with an elderly who recently started receiving the grant live in households with higher income and expenditure per capita and lower levels of food insecurity. They also are less likely to show signs of psychological distress and less likely to report smoking or consuming alcohol.

Our work is motivated by and contributes to different strands of scientific literature. In work outside of economics, there is clear evidence on the importance of gestational periods and early life conditions (Forsdahl, 1977; Barker, 1990). According to the *fetal origins hypothesis* (Barker, 1990), conditions experienced in utero can have serious and long-term health implications which can affect individuals' future cognitive and economic well-being (Almond and Currie, 2011).[3] The effects of in utero exposure to shocks can be observed well into adulthood—most of the research is focused on negative shocks such as: violence towards the mother (Aizer, 2011); increased stress (Aizer, Stroud and Buka, 2016; Quintana-Domeque and Ródenas-Serrano, 2017); pandemics (Almond, 2006); radiation exposure (Almond, Edlund and Palme, 2009; Black et al., 2019); consumption of alcohol

[2]This is akin to a regression discontinuity approach with two running variables (Reardon and Robinson, 2012; Papay, Willett and Murnane, 2011).

[3]Almond and Currie (2011) provide a detailed discussion of the fetal origins hypothesis.

(von Hinke Kessler Scholder et al., 2014; Nilsson, 2017); deaths in the family (Persson and Rossin-Slater, 2018); air pollution (Bharadwaj et al., 2017; Knittel, Miller and Sanders, 2016; Sanders, 2012); droughts (Shah and Steinberg, 2017); job loss among parents (Lindo, 2011; Carlson, 2015); and low nutrient intake by mothers due to fasting (Almond and Mazumder, 2011; Van Ewijk, 2011; Majid, 2015; Greve, Schultz-Nielsen and Tekin, 2017). Exposure to these shocks in utero is shown to have negative impacts on outcomes such as birthweight, height-for-age, cognitive test scores, language skills, and lifetime earnings.

The literature on positive in utero shocks and their favorable effects on health and other human capital indicators is relatively limited and mostly conducted in developed country contexts. A few exceptions include: Shah and Steinberg (2017) show that positive rainfall shocks in utero increase the human capital of children in India, and Amarante et al. (2016) and Barber and Gertler (2008) who show that conditional cash transfers to pregnant mothers reduced the incidence of low birthweight. In a review of conditional cash transfers (CCTs) in developing countries, Glassman et al. (2013) find a significant impact on birthweight while also finding that CCTs have positive effects on health service utilization including antenatal checkups and in-facility delivery. In Nicaragua, Barham, Macours and Maluccio (2013) show that a CCT led to higher cognitive skills later in life.[4]

In recent work, Reader (2023) shows the a one-time conditional cash transfer in the third trimester to pregnant mothers in England and Wales led to small improvement in birth outcomes. In Spain, González and Trommlerová (2022) show that cash transfers to women that began before their pregnancy led to a reduction in low birthweight while, in the United States, Hoynes, Miller and Simon (2015) find that a treatment to pregnant mothers with a total value of approximately $1,000 through the Earned Income Tax Credit led to a 2-3% reduction in low birthweight. Other work shows a positive effect of exposure to food stamps in the last trimester of the pregnancy on birthweight (Almond, Hoynes and Schanzenbach, 2011). The expansion of food stamps to children while they are in utero (and early in their life) led to significant improvements later in life in health and

[4]Other studies focus on cash transfers in the first years of life (after birth) and find significant effects on the health of children. For example, Shei (2013) finds that Brazil's Bolsa Familia led to a 9.3% reduction in overall infant mortality rates. Cash transfers are also associated with a lower disease burden: studies in Zambia, Colombia, and Mexico find a lower incidence of diarrhea among children (Attanasio et al., 2005; Handa et al., 2013; Huerta, 2006; Gertler, 2004). In a systematic review of 15 cash transfer programs, Manley, Gitter and Slavchevska (2012) find that exposure of children to cash transfer programs in early life has small a effect on height-for-age. The authors attribute this improvement to consumption of animal source foods, increased diet diversity and reduced incidence of diarrhea (Manley et al., 2020).

employment outcomes (Bailey et al., 2020; Hoynes, Schanzenbach and Almond, 2016).[5] We add to this stream of literature and look at the impact of in utero exposure to a cash transfer program in South Africa on the health outcomes of children beyond birthweight while also specifically comparing starting exposure in utero versus later in early life.

In South Africa, income support is shown to positively affect children's health.[6] The work of Duflo (2003) shows that receipt of the Older Person's Grant during childhood (known then as the Old-age Pension) increased height-for-age in girls under two, especially when the recipient of the grant was the grandmother. Our work adds to studies on the Older Person's Grant in South Africa showing specifically the effect it can have on children when exposed in utero versus during childhood. In contrast to Duflo (2003), we find that the effect of in utero exposure does not differ for male or female children and among male or female elderly recipients.

Our work contributes to several different streams of research highlighted above but it differs in a number of important ways. First, the cash transfer we study is not directed at the mother and is unconditional, it is monthly, large, and can last throughout the entire pregnancy and into childhood. Our work also shows effects on outcomes of children several years into their life. We study the specific added benefit of beginning exposure in utero: compared to other studies, we are able use the variation in start timing of exposure to the grant to show that starting benefits in utero has large and lasting effects.

From a policy perspective, our results suggest that there may be large benefits to expanding the Child Support Grant in South Africa to pregnant mothers. We show that even partial in utero exposure to the Older Person's grant at the household level likely has important health benefits on the children—benefits that have been shown to predict better outcomes later in life. As more countries around the world design and implement social protection programs, our work strongly suggests that child-specific benefits should start during pregnancies and/or basic income support among the poor prior to pregnancies can have important inter-generational health effects.

The remainder of this paper is structured as follows: in Section 2 we discuss our setting, the Older Person's Grant and the data we use in our analysis. In Section 3, we describe

[5]Exposure to health insurance in utero and in early childhood affects adult health outcomes (Miller and Wherry, 2019)—with more pronounced effects for in utero exposure. Recent work illustrates that exposure to medicaid in utero has impacts that can be seen in the next generation (East et al., 2023).

[6]For example, Aguero, Carter and Woolard (2007) use the roll-out of the Child Support Grant (CSG) to show that children who were exposed to the CSG for longer had higher average height-for-age z-scores.

our main empirical approach. In Section 4, we show our main results and in Section 5 we show robustness and heterogeneity of these results. In Section 6 we explore potential mechanisms through which the program could be affecting children's health. Finally, Section 7 concludes.

2 Data and Study Setting

In this section we first discuss our data and the local context. We then highlight South Africa's flagship cash transfer program—the Older Person's Grant.

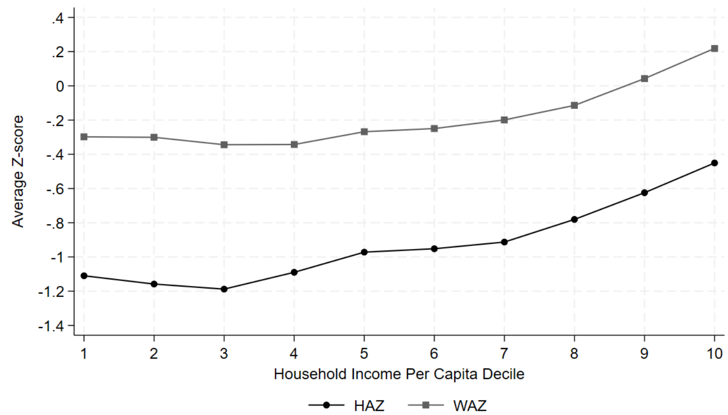
2.1 Data

We use data from the five rounds of the longitudinal National Income Dynamics Study (NIDS) survey fielded in 2008, 2010, 2012, 2014, and 2017.[7] The survey is nationally representative with a sample of over 28,000 individuals in 7,300 households across the country. The study collects detailed data on poverty and well-being; household composition and structure; fertility and mortality; migration; labor market participation and economic activity; human capital formation, health, and education; vulnerability and social capital.

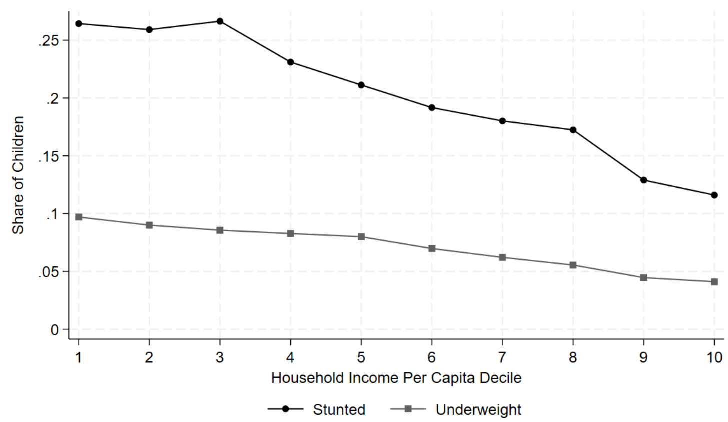
Four questionnaires are administered as a part of NIDS: a household module, an adult module, a child module, and a proxy module. For our purposes, we use the child module to obtain the anthropometric data recorded for children. We specifically focus on anthropometric z-scores for height-for-age (HAZ) and weight for age (WAZ) available in NIDS. The data records height-for-age for individuals up to 19 years of age, weight-for-age for children up to 10 years of age. For children aged 5 and below, the Z-scores scores are calculated using the WHO international child growth standards (WHO, 2006), and for children older than 5 years, the WHO growth standards for school-aged children and adolescents are used (Onis et al., 2007).

In Figure 1(A), we see that average HAZ and WAZ increase with per capita income deciles of the households. The overall height-for-age Z-score levels in South Africa are low for all income deciles by international WHO standards; among the lowest 6 deciles, the average HAZ is nearly a whole standard deviation lower than normal. This is also reflected in stunting levels shown in Figure 1(B), where the bottom 3 deciles having stunting rates

[7] This data is publicly available at http://www.nids.uct.ac.za/ (SALDRU, 2017)



(A) Average height-for-age and Weight for Age Z-scores increase with Income.



(B) Stunting and Underweight status declines with income.

FIGURE 1: Average height-for-age in South Africa is low for all income deciles in South Africa with a clearly increasing pattern. Weight for Age patterns are not as stark.

above 25%.

2.2 Older Person's Grant

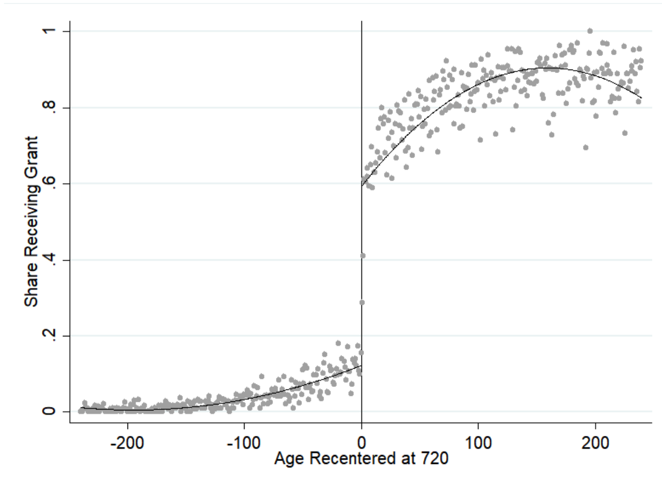
The Older Person's Grant (previously known as the Old-age Pension) is South Africa's flagship cash transfer program directed towards the elderly. It is means tested and South African citizens and residents become eligible at age 60. The amount given is relatively large, now nearly 1,800 Rands. Most age eligible fall below the means test (nearly 80%) which is in practice based on the income of the person and their spouse (Abel, 2019). Nearly 32% of children live with someone who is receiving the grant—a number that is higher among lower-income households and in rural and more traditional areas.

Early seminal work by Case and Deaton (1998) shows this grant is an effective tool at redistribution: it has fairly good coverage of poor households with elderly. It also is shown to have important inter-generational consequences as it reaches a lot of poor children who live in households with elderly persons (Duflo, 2000, 2003). Recent work shows that the grant has large effects on food consumption and hunger, and helps households deal with large shocks (Alloush, Bloem and Malacarne, 2023). A series of studies document behavioral changes in response to this grant. For example there are documented household composition changes (Edmonds, Mammen and Miller, 2004; Hamoudi and Thomas, 2014); changes in employment patterns (Ranchhod, 2006; Abel, 2019; Jensen, 2004); and changes in bargaining power with the household (Ambler, 2016).

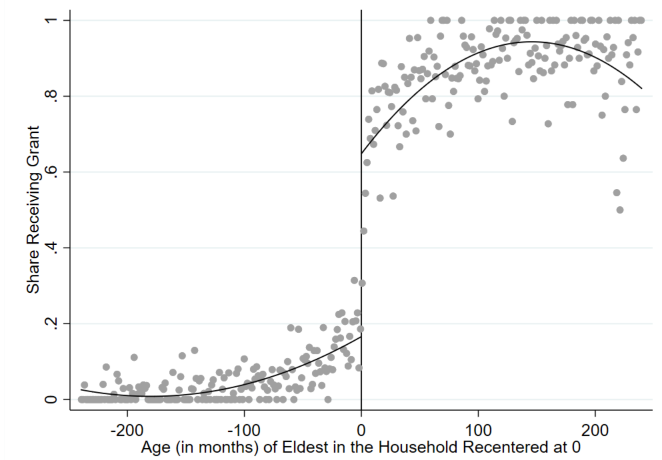
Our estimation approach, which we discuss in Section 3, takes advantage of the discontinuity in probability of grant receipt based on the age of the elderly in months. An individual's age in months is calculated from the month and year in which the survey took place and their month and year of birth. We show in Figure 2(A) a jump in grant receipt at the cutoff of 720 months (60 years) at the individual level. In Figure 2(B), we restrict our sample to households with children six and under. We then plot the receipt of the Older Person's Grant at the household level based on the age of the oldest person in the household. We see a similar jump at age 60 of the oldest member of the household.

We are interested in the impact of the grant on the health outcomes of children, so it is important that there is a significant overlap between our sample of interest and the grant beneficiaries. In our nationally representative sample, we find that nearly 30% of the children age 6 and under and 24% of women who report being pregnant in the survey live in households where there is at least one Older Person's Grant beneficiary. Out of the 7,021 households where the oldest person is between 55 and 65 years old, 44% have at least one child aged 6 and under and 4% have a woman who reports a current pregnancy.

While many children in South Africa live in households with an Older Person's Grant beneficiary, our sample of children is not representative of all children in South Africa. For the purpose of empirical identification, we restrict our sample to children living in households where the oldest person is near or recently turned 60 years old. These children live in households that are poorer, larger, and more rural than the average South African household. This is clear in Table A.1 in the Appendix showing descriptive statistics of our



(A) Among all individuals, receipt of the Old Age Grant jumps at age 60 (720 months).



(B) Among households with children 6 and under, the figure shows receipt of the Old Age Grant by the age of the eldest person in the household.

FIGURE 2: Age Eligibility Threshold

sample and those for the whole NIDS sample which is nationally representative.

3 Estimation Approach

In order to overcome issues related to endogeneity of receipt of the Older Person's Grant, studies look at the effect of this unconditional cash transfer by restricting the analysis to age ranges around the age-eligibility threshold (Duflo, 2003; Edmonds, 2006; Ambler, 2016). The identifying assumption is that households with an individual within a reasonable age range above or below 60 are similar except for grant receipt. More recent work has used narrow age ranges (as small as 1 year on each side) and a local randomization regression discontinuity approach to estimate the effect of this grant on measures of household and individual well-being (Alloush, Bloem and Malacarne, 2023).

Our analysis uses a similar approach with two running variables to place the children in our sample into four groups with different levels of exposure to the grant: full in utero exposure, partial in utero exposure, after-birth exposure, and no exposure at all.[8] We restrict our sample to children who are close to the thresholds in both of our running variables. Our approach is akin to a local randomization approach which is appropriate in cases where the data set is small, the running variable is not continuous or only takes a few values, such as ours, and where matching techniques or multiple RD cutoffs are analyzed (Cattaneo, Titiunik and Vazquez-Bare, 2016). Local randomization relies on the key assumption that for a given sample, there is a neighborhood around the cutoff where treatment status is assumed to be as-if randomly assigned such that two conditions hold for all units in that window: (1) the distribution of the score/running variable is known in the window (all units in the window have the same probability of receiving all score values), and (2) potential outcomes are unaffected by the score except through the treatment in that given window—i.e. the exclusion restriction (Cattaneo and Titiunik, 2022).

Our first running variable is the age of the oldest person in the household where we restrict our sample to children living with elderly around the threshold grant-eligibility age of 60. This is similar to other studies on the Older Person's Grant (Alloush, Bloem and Malacarne, 2023; Abel, 2019; Ardington, Case and Hosegood, 2009). Children in households where the oldest person is currently 60 years old (720 months) or above is in a household likely receiving the grant (see Figure 2(B)).

Because we are interested in exposure of children to increased resources in the household at different stages (for example in utero or after birth) through the grant, our secondary running variable is constructed using the difference in age between the child and their currently co-resident elderly. Our secondary running variable ϕ_i is the difference in age (in months) between a child and the oldest person living in the household, centered

[8] We use our two running variables to define four groups. However, for reasons discussed later in this section, our setting does not lend itself to a proper RD analysis with multiple running variables as in Papay, Willett and Murnane (2011), Matsudaira (2008), and Reardon and Robinson (2012).

around the age of grant eligibility (720 months). We define:

$$\phi_i = EldestAge_i - ChildAge_i - 720$$

where ϕ_i can take negative, zero, and positive values. A negative value indicates the number of months by which a child has missed in utero exposure. For example, if the grandparent is 732 months (61 years) old and the child is 24 months (2 years) old, then ϕ_i will take the value of -12 which denotes no in utero exposure and that it was missed by 12 months. In this case, the child began exposure to the grant at 12 months. ϕ_i will equal zero for all those children whose age in months is exactly equal to the duration that the oldest member in the household has been eligible for the grant. In this case, exposure began at or near birth. A positive value between 1 and 8 (inclusive) indicates partial in utero exposure, and 9 or more reflects full in utero exposure—the oldest person in the household was already 60 years old when the pregnancy began.

We impose a number of restrictions on the sample to improve comparability. First, we restrict the sample to children with a current co-resident eldest person in the household whose current age is 58 and above. Within this sample, we use the two running variables to identify four groups of children that allow us to show the effect of exposure to the grant in utero. These groups are illustrated in Figure 3. The first comparison group of children are those with no exposure to the grant because they currently live in households where the oldest person is not yet eligible for the grant (age 58 or 59).[9] The second group have likely been exposed to the grant because the oldest person is above 60, but their exposure began after-birth as the age difference between them and the oldest person in the household is less 720 months ($\phi \leq 0$) and the elderly became eligible for the grant after the child was born. The third group of children are those with partial in utero exposure where the oldest person in the household is above 60 and the difference in age is between 720 and 729 months ($1 \leq \phi \leq 8$). The last group are those with full in utero exposure who reside in a household where the oldest person turned 60 years old before the child was likely conceived and their mother was potentially exposed to the grant throughout her entire pregnancy.[10]

[9] This is our main comparison group. We chose two years in an ad hoc way balancing sample size with comparability. The results are not sensitive to this choice and are similar when using 1 year, 3, or 5.

[10] Figure 2 suggests that it takes a month or two for the individual to begin receiving the Older Person's Grant after turning 60—our results are robust to varying the centering by 1-3 months in our specification.

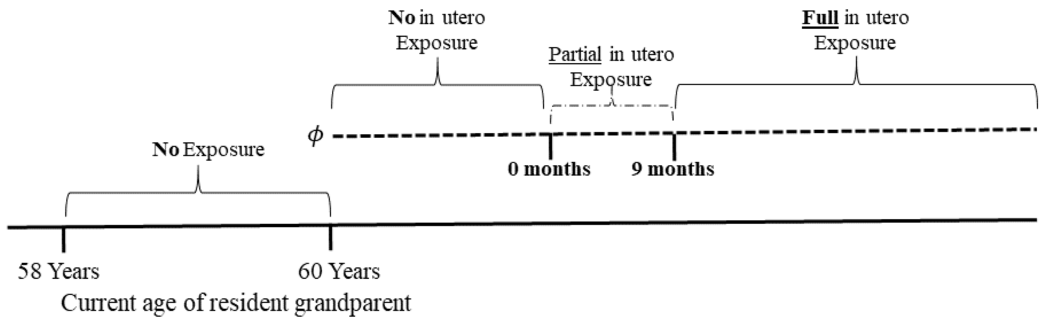


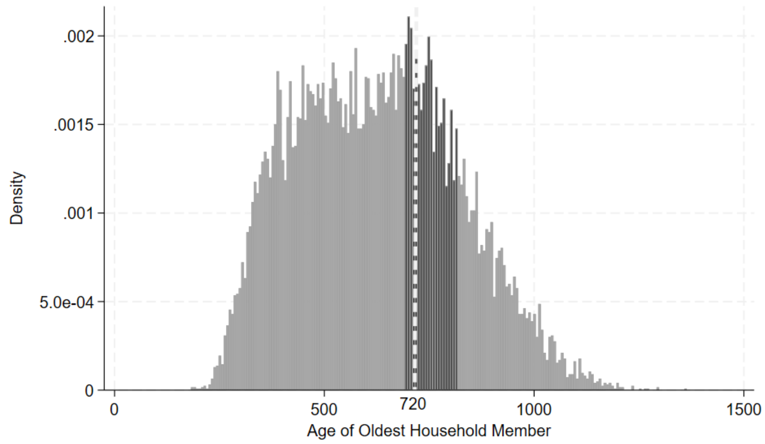
FIGURE 3: Groups based on two running variables

We show distributions of our two running variables in Figure 4. Neither one of the distributions suggest manipulation.[11] ϕ, as currently constructed, is not equally distributed across the children in our sample. Younger children are more likely to have oldest members who have been eligible for the grant for a long period of time. On the other hand, among older children, more started their exposure after birth. We thus impose additional restrictions: we restrict the sample to children with elderly up to 68 year and 9 months old so that the oldest children in our sample (children 6 years and 11 months old) can have members who were eligible for the grant at most 1 year before the birth of the child (shaded area in Figure 4 A). For our second running variable, we drop those who have a $\phi > 21$ taking out children whose oldest household member had been eligible for more than 1 year before the pregnancy began.[12] The age range of the elderly differs by the age of the child. For example, for a child who is exactly 3 years old (36 months), the age range of the elderly will be 58 to 64 and 9 months while for a 2 year old, the range would be 58 to 63 and 9 months. The restriction means that the relevant elderly turned 60 at most 1 year before the pregnancy. Thus, in terms of comparability, the youngest children likely have the best comparison group since the households are likely quite similar. Our main results impose these restrictions shown in darker shades in Figure 4, however, we show results without restrictions on ϕ in the Appendix.

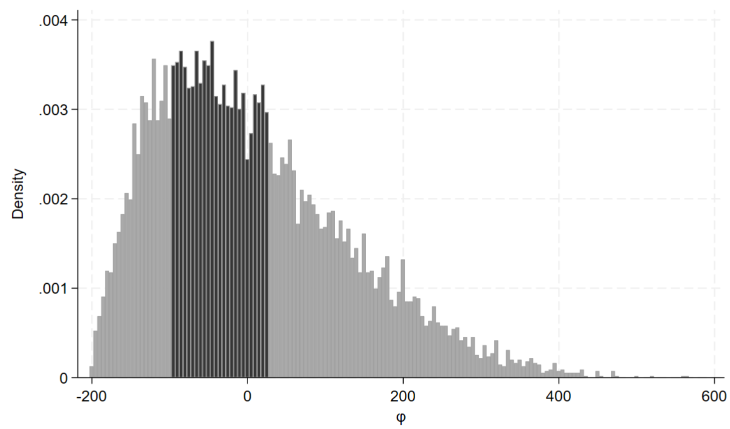
Our basic specification uses these sample restrictions and two variables to determine

[11] We conduct tests suggested Cattaneo, Jansson and Ma (2019) to test for manipulation finding no evidence of manipulation in either running variable.

[12] Again we make this choice for comparability with statistical power in mind, however, the results are not sensitive to this choice.



(A) Among households with children 6 and under, the distribution of ages for the eldest in the household.



(B) Among households with children 6 and under, the distribution of the difference in age between the child and the eldest person in the household.

FIGURE 4: The overall distributions of our two running variables for all children 6 and under. The darker shades indicate our main sample restriction close to the relevant thresholds.

exposure at different stages splitting the children into the four groups. We estimate the following equation:

$$y_{iwd} = \alpha + \beta_1 \mathbb{1}_{oldestage_{iwd} \geq 720} \mathbb{1}_{\phi_{iwd} \leq 0} + \beta_2 \mathbb{1}_{0 \leq \phi_{iwd} \leq 9} + \beta_3 \mathbb{1}_{9 \leq \phi_{iwd}} + \mathbf{X}_{iwd}\Theta + \delta_w + \gamma_d + e_{iwd} \quad (1)$$

where y_{iwd} is an anthropometric measure for child i in wave w in district d. To identify the effect of exposure to the grant, we have indicators for each of the groups defined above with no exposure as a comparison group—with β_3 being our coefficient of interest showing the effect of full exposure in utero to the grant compared to no exposure at all and β_2 which shows the effect of partial exposure.[13] We control for child, caregiver, elderly, and household characteristics in $\mathbf{X}_{iwd}$. δ_w and γ_d are wave and district fixed effects, respectively.

Despite having ϕ_i as a running variable, it doesn't lend itself to normal RD analysis. While 0 is a threshold score that fuzzily determines exposure in utero versus after birth, the intensity of in utero exposure does not jump at 0—for each value of ϕ the length of in utero exposure increases. A more appropriate analysis would be to compare children whose ϕ is 9 and above to 0 and below to show the added value of full in utero exposure to the grant. As a robustness check, we show results for such an RD specification where we remove those whose ϕ is between 0 and 8.

Threats to identification—In our empirical setup, there are several threats to our identification strategy. Most importantly, if our approach leads to systematic unobservable differences across our groups, then our no exposure sample is not well suited as a counterfactual for children in the two treated groups. For example, strategic mothers may time a pregnancy with the expectation of the oldest person's receipt of the grant. This makes the children in the full and partial in utero exposure group unobservably different from those in the no exposure or partial exposure groups. Along similar lines, since we are using current household structure to proxy what it was when the child was in utero, household restructuring that occurs after an elderly becomes eligible for the grant means that our control group (households with elderly who are not yet eligible for the grant) are different from those in our treated group.[14]

We first alleviate these concerns by always showing results where our comparison group are children who were exposed to the grant after birth alongside our main specification. We also conduct a number of robustness checks: First, we show results for households that are stable where the mother and the elderly were living together at least two years before the birth of the child. Second, we show results with household fixed effects using variation within household in the timing of exposure to the grant—that is, we compare within households children who were born at different times and had different exposure

[13] In some results that show heterogeneity, we combined these two groups into an any exposure group.

[14] Moreover, studies have documented changes in household composition, labor supply, and bargaining power due to the grant. While we are unable to disentangle the effect of the grant from other changes within the household, we try to control for observable household composition and employment variables. However, we still consider our estimates as reduced-form net effects of a child being exposed to the grant in utero and throughout their early life through an elderly in their household.

to the grant. Third, we show regression discontinuity results using ϕ as a running variable (excluding partial exposure) showing the effect of full in utero exposure versus exposure after birth. Fourth, we show results estimated using matching methods within our narrow subsample of children. Fifth, we show that our results are robust to changing the width of windows around the age-eligibility threshold and our running variable ϕ. Consistency of the overall results across these different subsamples and specifications give us confidence in the main results of the paper.

It is possible that our approach will lead to attenuated estimates. First, in our narrow ranges it takes some time for age-eligible elderly to start receiving the grant. If we shift our definitions of in-utero exposure by a 1-3 months as a robustness check, we find very similar results. More importantly, in our main specification, we are using potential exposure of the child to the grant. First, co-residence is determined in the current survey and it may well be that when the child was in utero, they were not living with the elderly. In addition, control group children may have been exposed to the grant because of a now deceased co-resident. As mentioned above, we conduct a robustness check restricting our sample to children whose mother and eldest person were living in the same households at least two years before birth finding very similar point estimates. In addition, we show effects with younger children where this classification error is less likely. Finally, while age determines eligibility, take up of the old age grant in our sample is not 100%. When we restrict our samples to children who live with current beneficiaries (with the assumption that current benefit status is a good predictor of the benefit status when the child was in utero conditional on the elderly being above 60 years old at the time), we see that the point estimates are slightly larger.

4 Results

We present our main results in Section 4.1. In Section 4.2, we show that the timing of the start of exposure matters. Finally, in Section 4.3, we highlight some heterogeneity.

4.1 Main Results

Panel A in Table 1 presents results of our main specification. Columns 1 through 3 highlight how children in our sample who were fully exposed in utero to an the old person's

TABLE 1: Main Results

Dep var	Height-for-Age			Weight-for-Age		
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Main Sample					
Infant/Toddler	-0.023	-0.023		0.002	-0.019	
	(0.056)	(0.075)		(0.052)	(0.070)	
Partial In Utero	0.159*	0.190	0.216**	0.047	0.035	-0.003
	(0.090)	(0.125)	(0.097)	(0.084)	(0.117)	(0.089)
Full In Utero	0.202**	0.259**	0.300***	0.107	0.106	0.096
	(0.081)	(0.128)	(0.098)	(0.075)	(0.120)	(0.089)
Observations	2,987	2,987	2,230	2,987	2,987	2,230
	Panel B: CSG Sample					
Infant/Toddler	0.013	0.018		0.044	0.004	
	(0.065)	(0.087)		(0.061)	(0.081)	
Partial In Utero	0.204**	0.264*	0.267**	0.033	-0.009	-0.073
	(0.103)	(0.143)	(0.112)	(0.096)	(0.134)	(0.103)
Full In Utero	0.277***	0.361**	0.405***	0.213**	0.164	0.140
	(0.092)	(0.147)	(0.113)	(0.086)	(0.138)	(0.103)
Observations	2,309	2,309	1,722	2,309	2,309	1,722
District & Year Fixed Effects	✓	✓	✓	✓	✓	✓
Child Controls	✓	✓	✓	✓	✓	✓
Household Controls		✓	✓		✓	✓
Caregiver Controls		✓	✓		✓	✓

Notes: *** p<0.01, ** p<0.05, * p<0.1: Robust standard errors in parenthesis. Potential exposure to the Older Person's Grant through a currently co-resident elderly in utero shows large effects on height and weight for age. Child controls include child age (in months) and sex, household controls include elderly age and sex, household composition variables and ϕ—one of our two main running variables. Caregiver controls include their education levels, employment status, marital status, and age. We also control for whether the child is receiving the Child Support Grant in Panel A. Panel B shows results restricted to children currently receiving the Child Support Grant.

grant through an elderly currently living in their household show higher levels of height-for-age at the time of the survey. In all of our specifications, we flexibly control for the age of the child in months, sex of the child, and the age of the child's main caregiver (in addition to district and year fixed effects). In column 2, we additionally control for household, relevant elderly, and caregiver characteristics. The results in column 2 suggest that full in utero exposure increases height-for-age by 0.26 standard deviations when compared to no exposure to the grant. Partial exposure shows slightly smaller point estimates across the specifications. Children who live with elderly who became eligible for the grant after they are born do not show a statistically different height-for-age compared to those who live with elderly that are not yet receiving the grant.

Column 3 restricts the sample to children who were exposed to the grant at some point in their life. This removes those who were never exposed because their grandparent is not yet 60 years old. The comparison group in this specification are children who were potentially exposed to the grant after birth (likely in addition to the child support grant).[15] Still the positive differences of those who had in utero exposure are clear. The results in Panel A suggest a 0.3 SD increase in height-for-age for those fully and a 0.22 SD increase for those partially exposed to the grant in utero. We note that these results reflect cumulative exposure to the grant from the time they were in utero and not simply a one-time exposure to the grant as in Reader (2023), for example.

The estimated effect on weight for age is not as pronounced. The results show an increasing pattern with duration of in utero exposure to the grant, however, the estimates are not always statistically significant. Weight for age is approximately 0.11 SD higher among those exposed to the Older Person's Grant fully in utero compared to those who were never exposed. For partial exposure, the results show a 0.04-0.05 SD difference that is not statistically significant.

While in our specification in Panel A we control for current receipt of the Child Support Grant, we additionally show results for our main specifications while restricting our sample to children who are receiving the grant in Panel B.[16] This reduces our sample size, however, this restriction also makes the sample poorer making it more likely that the relevant elderly in the household passes the means test and had been receiving the Older Person's Grant when the child was in utero.[17] Moreover, the poorer population is more likely on the margin to benefit from this grant when it comes to the health variables of interest. While not statistically different from the results in Panel A, the estimated effects of full and partial exposure to the grant are larger for height-for-age and weight-for-age. Children who were fully exposed in utero to the grant show at least 0.28 SD higher height-for-age.

We further investigate if the poor are more likely to benefit from the grant by running our main specification among the different non-grant income per capita deciles. Figure

[15] This is likely a better comparison group as the relevant elderly are closer in age. In results not shown, we further restrict the comparison group sample to children who started exposure to the grant in their first two years of life ($-24 \leq \phi < 0$) and the results are similar if a little larger than those shown in Table 1.

[16] In addition to the Older Person's Grant, another significant transfer program operational in South Africa is the Child Support Grant (CSG) which was introduced in 1998 with the aim of alleviating child poverty and is targeted to mothers or caregivers in low-income families to support children from birth till 18 years of age.

[17] The Child Support Grant is means tested based on the primary caregiver. The primary caregiver should have a maximum yearly salary of 52,800 ZAR (or double that if married) which is a stricter requirement than that of the Older Person's Grant.

A.1 in the Appendix clearly shows larger point estimates for the lower four quintiles while showing a near zero effect for the top quintile. This further suggests that, on the margin, children in poorer households are more likely to benefit if exposed in utero. Moreover, given that our specification does not require the elderly to be treated, this also broadly follows that the richer 20% of elderly do not usually receive the grant.[18]

Going Beyond ITT—The analyses, so far, have focused on a specification that is akin to intent-to-treat effect wherein we take advantage of the age eligibility of the eldest person in the household. In Table A.2 in the Appendix, we restrict our analysis to elderly who are currently receiving the grant. This removes children in households with no grant beneficiary from our analysis, so that the relevant comparison group for partial and full in utero exposure is the group of children who were exposed only after their birth. We run our regressions with the full set of controls for the main and Child Support Grant recipient samples. We find slightly larger effects of full and partial in utero exposure on height-for-age. The effect on weight-for-age is again positive, but like the other specifications, not consistently statistically significant. These results suggest that our main estimates are likely lower bound estimates for the effect of the grant.

The estimated coefficients are relatively large and it is important to contextualize and compare them to prior work. First, we note that the treatment we are studying in this paper is relatively large: it is a monthly transfer equivalent to 140% of median income per capita that leads to 20-30% more income per capita and a large reduction in reported adult hunger at the household level while the child is in utero and for their entire life until the survey. Among the poorer half of our sample, average height-for-age z-score is approximately -1. The effects we document are large but do not come close to closing the gap with international norms. In Duflo (2003), Duflo (2000), and Case (2004), the estimated effect of exposure to the Older Person's Grant in early life on the height-for-age of children is between 0.7 and 1.16 SD—larger than our estimates. Two things are clearly different in our work: the baseline conditions in South Africa have improved since the mid 1990s and importantly, most children in our control group receive the Child Support Grant—this was not the case in the time period of the data used in those papers.

Outside of South Africa, Andersen et al. (2015) show that participation before age two in *Juntos*, a conditional cash transfer program in Peru, led to a 0.52 SD increase in height-

[18]In all of these analyses, we are implicitly making assumptions on the economic well-being of the households when the child was in utero using current data.

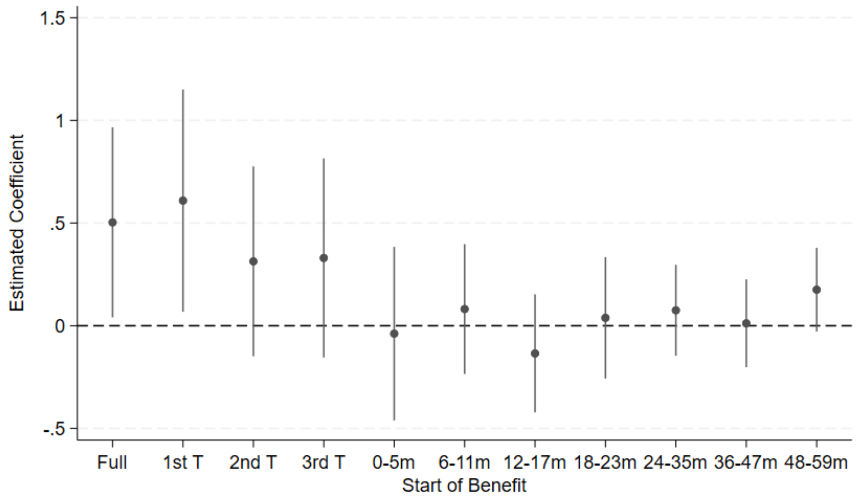
for-age among boys. Barham, Macours and Maluccio (2013) show that early recipients of a conditional cash transfer in Nicaragua were 0.4 SD taller in the short run—however when the control late-adopters started receiving the CCT, they caught up after a few years. A systematic review suggests that, among vulnerable populations, exposure to nutrition education and complementary nutrition assistance program led to increases in height-for-age by 0.25 and 0.39 SD, respectively (Glassman et al., 2013). Our result sizes are in line with other large interventions that target vulnerable populations (Siddiqi, Rajaram and Miller, 2018).

4.2 Timing of Exposure Start

A main way our analysis differs from others on this topic is that we have variation in when the children in our sample began exposure to this monthly grant. To explore this important dimension, we restrict our analysis to older children (5 and 6 years old) in our sample and we bin full in utero exposure, beginning exposure in each of the three trimesters in utero, then every 6 months for the first 2 years of life, and every 12 months after that.[19] A child is in a bin if their potential exposure to the grant through the oldest person in the household began at that before likely conception, at a specific stage in utero, or in their early life. The comparison group in this setup are children who are the same age but have still not been exposed to the grant because the oldest person in their household is either 58 or 59 years old at the time of the survey.

Figure 5 shows that compared to 5 and 6 year old children who were never exposed to the grant, those whose resident elderly became age-eligible for the Older Person's Grant before or at any stage while the child was in utero have a higher height-for-age z-scores. To estimate the results for this figure, we run the same regressions that we do for our main results however with expanded mutually exclusive exposure bin dummy variables while still controlling for the same set of child, caregiver, and household characteristics. Children with a resident elderly who became eligible for Older Person's Grant after their birth do not show statistically significant differences with those who are yet to be exposed to it. This may be because most of these children and certainly the most vulnerable ones are receiving the Child Support Grant after birth. Figure A.2 in the Appendix shows that this translates into less stunting among these children. When we restrict the sample to Child Support

[19]For reference, we show the estimated effects by age group of the child including specifically the average estimated effect of in utero exposure for 5 and 6 year old children in Table A.3 in the Appendix.



(A) Timing of exposure start—Height-for-Age Z-score.

FIGURE 5: Children exposed to the cash transfer program in utero show better outcomes. Figures conditional on the children receiving the Child Support Grant and in the bottom four deciles are shown in Appendix Figure A.4. The main observed differences are for height-for-age not weight-for-age (see Figure A.3). Figure A.2 we show a similar figure showing the effect on stunting. Bars show 95% confidence intervals.

Grant recipients or poorer households, we see similar patterns with estimates that are on average slightly larger for in utero exposure (results shown in Appendix Figure A.4).

In line with most of our earlier results in this paper and the mixed results in the literature, we do not see clear statistically significant differences for the weight-for-age outcome. Figure A.3 in the Appendix suggests some positive effects for in utero exposure, however, the patternsw are not as clear as they are for height-for-age.

We note here that we cannot differentiate between the timing of the start of exposure and the overall duration of exposure to the grant since, for a given current age, those who began exposure earlier have been exposed to the grant for longer and are in households that received more overall cash from the grant by the time of the survey.[20] However, the results show a likely non-linearity in the effect of in utero exposure which suggests that being exposed to the grant in utero has added benefits beyond simply longer exposure.

[20]One potential way to control for this is to control for overall number of months exposed to the grant—however, this would mean systematically comparing children who are of different ages to each other without flexibly controlling for their age in months as currently do.

4.3 Heterogeneity

In this section, we explore the differential effects of the grant, if any, along multiple dimensions. We focus on the strong effects we find for height-for-age and combine partial and full exposure into an any exposure treatment variable. The estimated effect of any in utero exposure is 0.22 SD increase in height-for-age for our whole sample.

Rural/Urban—To see if the extra income from the grant is more effective in areas that are poorer to begin with, we redo the analysis on urban and rural sub-samples separately. We present the results in Figure 6. We find that the overall positive results are being driven by the rural sample where the effect of any in utero exposure is large and statistically significant (0.39 SD). There are a number of different factors that can explain this: first, inter-generational households are more common and stable in rural areas and thus the elderly and the child are more likely to have been living in the same household when the child's mother was pregnant. Second, rural household are poorer on average, are farther away from health resources, and increased economic well-being within the household can be especially helpful to mothers.

Does this mean that this program is not effective urban areas or is this difference masking other heterogeneity? In Appendix Figure A.5 we show the same heterogeneity figure by restricting to poorer and poorer households. When we restrict the analysis to households in the poorest 4, 3, 2 non-grant income per capita quintiles successively, we see that the overall effect becomes larger and the difference between rural and urban samples all but disappears. So among the poor, the impact of in utero exposure to the grant is similar in rural and urban areas.

Male/Female Children—We investigate whether the effect of in utero exposure depends on the sex of the child. While the difference is not statistically significant, we see that the point estimate for effect of in utero exposure is larger for male children. This fits with the *male fragility* hypothesis which posits that male fetuses are more susceptible to prenatal shocks (DiPietro and Voegtline, 2017; Kraemer, 2000; Mulmi et al., 2016). However, again, when we restrict our sample to the poorest households, the difference between the two remains and is relatively larger.

So far, we have included the sex of the oldest person in the household as a control variable but other work suggests that the grant's sex differ by the gender of the beneficiary. For example, in our context, Duflo (2003) shows that pensions received by grandmothers

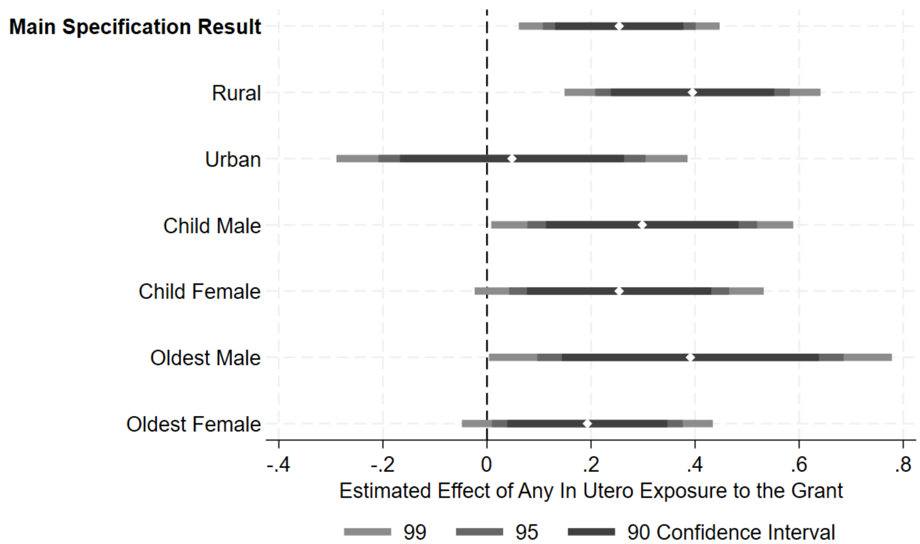


FIGURE 6: Heterogeneity of the results.

translate into improved health and nutrition for female children in the household. On the other hand, pensions when received by grandfathers showed no improvement in the health status of of children. In a similar vein, several studies on intra-household bargaining and resource allocation have shown that cash when targeted to women translates into better health outcomes for children as women are more likely to spend money in ways that benefit children (Duflo, 2003).

To investigate this link, we run separate regressions based on the sex of the oldest person in the household.[21] Our results show that the improvement in height-for-age, while positive and significant in both the receiver male and female households, is in fact greater in the former at 0.38 SD relative to 0.2 SD. Unlike the other dimensions of heterogeneity, the difference, while not statistically significant, remains relatively constant when restricting to poorer samples. While this finding seems to go against conclusions in other work, in our analysis we use the oldest person in the household regardless of their familial relation to the child while others focus specifically on grandparents of the children. Moreover, one explanation for the larger results among elderly male recipients maybe have to do with household composition and labor force participation of other household members—if a female is the eldest and within the range, even if she is not yet receiving because she is

[21] In rare households where both a male and female member are exactly the same age (in months) and the oldest—we assign them to the sub-sample of receiver female households.

not yet 60, it is more likely that there is another male in the household who is earning an income. If the elderly in question is male, there may be less contribution by others in the household to the overall income.

Overall, while we find some small differences in point estimates, the overall trend is that among the poor, the impact of in utero exposure to the grant is evident across different sub-samples and in the 0.15 SD to 0.6 SD range.

5 Robustness

In this section, we test the robustness of our main results. First, in Section 5.1, we show results for sub-samples where the mother and the elderly were likely living together at the time of the pregnancy. Next, in Section 5.2, we show results that use within household variation in exposure to the grant to estimate the effect of in utero exposure. Third, we show results using a regression discontinuity design. In Appendix B, we show two additional results: we use matching methods within our sample to estimate the effect of in utero exposure showing qualitatively similar results. And, we show that our main specification results are robust to considering different age ranges among the elderly.

5.1 Endogenous Household Formation

In our main results, we are agnostic about if the mother and the relevant elderly are co-residing at the time of the pregnancy. This brings up two main concerns: First, we may underestimate the effect of exposure if the mother and the elderly were not living together during the pregnancy. However, if they are currently living together, it may well be that that extra resources to that elderly person could have benefited the mother during pregnancy even they were not co-residing at the time. Second, studies in South Africa and elsewhere suggest that the grants directed towards the elderly encourages other family members to live with the elderly for the monetary benefit (Edmonds, Mammen and Miller, 2005; Hamoudi and Thomas, 2014). In our case, if the pregnancy or where a pregnant woman decides to live is tied to or influenced by an elderly's eligibility status, the in utero exposure of a child to the grant would become non-random.

We check the robustness of our results to possible endogenous household formation in three ways. First, using the panel nature of the data, we restrict our sample to children

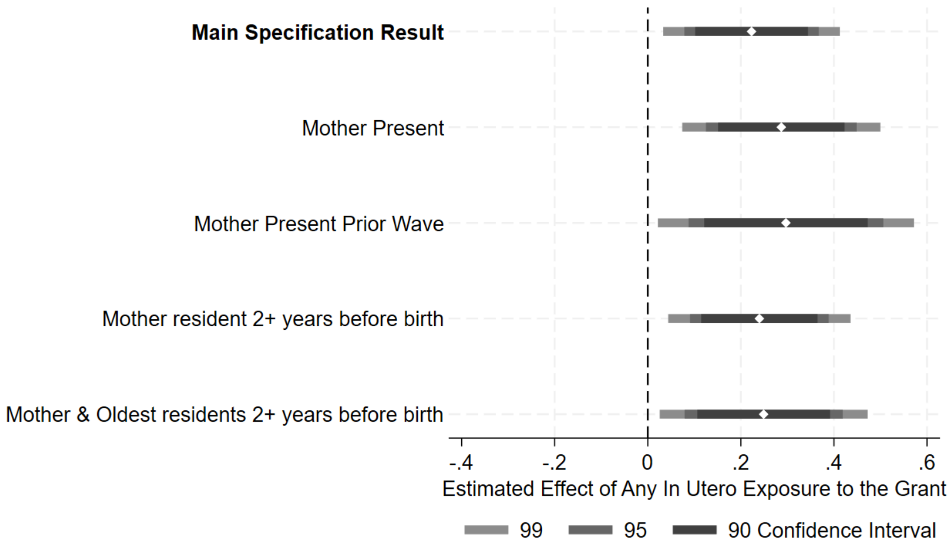


FIGURE 7: The estimated coefficient on the effect of in utero exposure to the grant remains relatively unchanged when we restrict to different sub-samples that capture stability in the household.

whose mother was present in the household this wave and in the prior wave as a proxy for stability in a mother's place of residence.[22] Second, we restrict sample to children in households where the mother became a member of the household at least 2 years prior to giving birth or has never moved. Finally, we also add the information on when the relevant elderly moved to the household to identify the sample of children whose mother and relevant elderly were members of their current household for at least 2 years before the child was born.

We focus on the consistent effect we find on height-for-age and use any in utero exposure as our treatment variable (as we do in the heterogeneity results). The results in Figure 7 show the estimated effect of in utero exposure to the grant for the different sub-samples. Our main results continue to hold and that the point estimates are robust to different restrictions on co-residence. The results among these sub-samples suggest that our estimated effects in Table 1 are not driven by endogenous household formation where mothers are moving in with the eligible elderly to get better care while pregnant.

[22]This drops children of households in the refresh sample of any wave and all children in the first wave of NIDS since we do not have information about their mother's residence in the last wave.

5.2 Household Fixed Effects

Households potentially have unobservable characteristics that may affect the health of the children that are also related to timing of pregnancies. If these unobservable characteristics are unaccounted for, this could lead to bias when estimating the effect of in utero exposure to the grant. While we cannot take into account time varying household level unobservables, we are able to conduct analysis controlling for household fixed effects and effectively comparing children within the same household who were exposed to the grant at different stages in their gestation or early lives.

In our sample of interest, we identify the children who are in the same household but belong to different treatment groups. To do this, we first identify households with multiple-children in our sample as we want to exploit within-household variation, much like the methodology of Yamauchi (2008). We estimate a model with indicators for different levels of exposure while controlling for child-level variables and household fixed effects. In this specification we drop children who are in households without other children age six and under. This reduces our sample size significantly and our statistical power.

We show these household fixed effects results in Table 2. Our comparison group is always those who started their exposure to the grant later in their life. If one child in the household has been fully or partially exposed to the Older Person's Grant in utero, then the other children cannot be never exposed. We find that when compared to potential exposure of a co-resident children only after birth, children who were exposed in utero had higher levels of height-for-age on average—about 0.20 SD which is similar to point estimates we have with our main specification. The point estimate is slightly larger when we control for primary caregiver characteristics. We do not find any observable impact on weight-for-age when we do this intra-household comparison.

While the estimated coefficients are not statistically significant, they are similar in magnitude to those estimated using our main empirical approach. It is worth noting that in this analysis, we are systematically comparing younger children to older co-resident children. Our empirical approach is such that within household variation can only come from younger children benefiting because the elderly has become eligible for the grant after the older child was in utero but before the younger child was. Still, the qualitatively similar estimates show that our main results are robust to controlling for household fixed effects.

TABLE 2: Household Fixed Effects

Dep var	Height-for-Age		Weight-for-Age	
	(1)	(2)	(3)	(4)
Any In Utero Exposure	0.196	0.233	-0.004	-0.007
	(0.157)	(0.162)	(0.155)	(0.150)
Household Fixed Effects	✓	✓	✓	✓
Child Controls	✓	✓	✓	✓
Caregiver Controls		✓		✓
Observations	987	979	972	964

Notes: *** p<0.01, ** p<0.05, * p<0.1: Robust standard errors in parenthesis. Potential exposure to the Old Age Grant through a grand parent in Utero shows impacts on height-for-age even when comparing within households.

5.3 Regression Discontinuity using ϕ

In this section, as a robustness check, we apply a regression discontinuity approach to our running variable ϕ. We present these results with caution because an RD specification is not necessarily appropriate in this setting because our running variable ϕ does not clearly separate full in utero exposure to no in utero exposure at a specific value—there is increasing duration of in utero exposure as the ϕ goes from 0 to 9. We restrict our analysis to those were exposed fully in utero or only after birth defined by our running variable ϕ which is the difference in age in months between the child and the oldest person in the household centered around age 60. We remove those partially exposed from the analysis.

Figure 8 shows the graphical result which suggests a jump in height-for-age when the child is fully exposed in utero compared to if they start exposure after birth. The estimated coefficient using the RD approach is 0.24 which is statistically significant at the 10% level ($p - value = 0.071$). This is based on a local linear regression with MSE-optimal single bandwidth selection with all the controls we have used in our main specifications. Different methodological choices on how the bandwidth is selected (for example, allowing for different bandwidths on each side), the polynomial degree (2nd or 3rd), and different sets of controls lead to coefficient estimates between 0.18 and 0.52. Not all are statistically significant, however, the magnitude of the coefficients are in line with our main results.

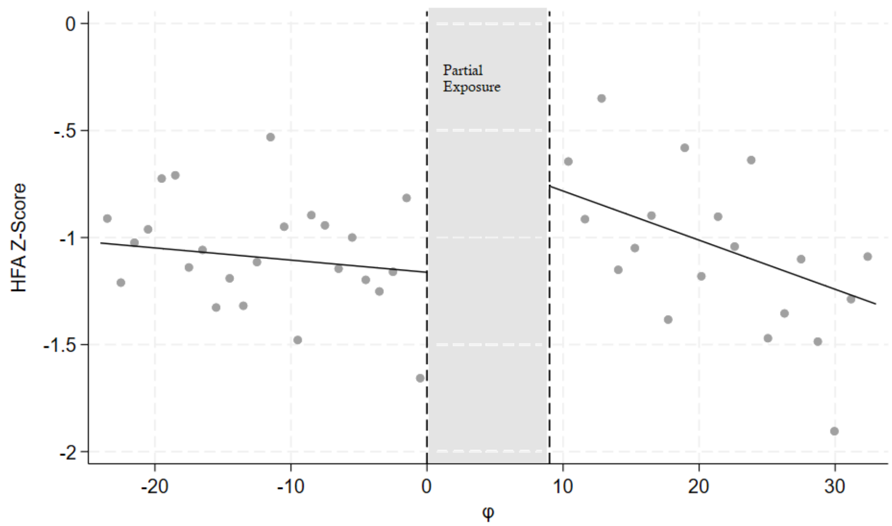


FIGURE 8: Applying a regression discontinuity approach to our running variable ϕ the difference in age (in months) between the child and the oldest person in their household. Our outcome variable is height-for-age. The comparison here is full exposure in utero versus beginning exposure to the grant after birth. We remove those partially exposed in a donut-style specification. This is comparable to column 3 results in Table 1.

6 Potential Mechanisms

We investigate potential mechanisms through which the observed effects occur. It is important to note that South Africa has high rates of poverty and inequality (Leibbrandt, Finn and Woolard, 2012). The rates of food insecurity (reporting an adult going to bed hungry) is around 20%. The population receiving the Older Person's Grant is generally poorer on average and our sample of inter-generational households is poorer still. Among households with pregnant women in the 2008 Wave 1 of NIDS, nearly 40% reported an adult hunger. What is different during the mother's pregnancy when she is exposed to this grant that affects the health of the child well into their life?

In work on conditional cash transfers during pregnancies, nutrition and access to and use of pre-natal care have been shown to change (Glassman et al., 2013). Moreover, nutritional deficiency, smoking, and alcohol consumption during pregnancy are also shown to have negative effects on the health of children (Amosu and Degun, 2014; Abu-Saad and Fraser, 2010; Bharadwaj, Johnsen and Løken, 2014; Almond and Mazumder, 2011).[23] In as

[23] Almond and Mazumder (2011) provide a thorough discussion on the health literature related to low nutrient intake and meal skipping. It is clear that fasting during Ramadan results in a nutritional deficiency that is different from one that might be present due to poverty, however, it is notable that reporting hunger and skipping meals is common in our South African sample.

much as we can show that pregnant women in households receiving the grant are exhibiting differences in these outcomes, we may be able to point to mechanisms through which the grant improves the health of children later in their life.

For this analysis, we apply the local randomization method also used to study the effect of the Older Person's Grant on household and individual outcomes in Alloush, Bloem and Malacarne (2023). However, under 5% of households who have an elderly near the age-eligibility cutoff have a person who reports being pregnant at the time of the survey and thus our sample size is small and we have lower statistical power. We restrict our analysis to a window of 5 years around the age cutoff of 60. In essence, we are comparing the outcomes of households with pregnant women with an elderly above 60 to similar households with elderly just under 60—an approach common when studying the Older Person's Grant (Duflo, 2003; Abel, 2019; Ambler, 2016; Edmonds, Mammen and Miller, 2005; Hamoudi and Thomas, 2014).[24]

We show two sets of results—one with households with pregnant women only, and the other for households with children six and under. At the household level, we look at total income, total expenditure, food expenditure, expenditure on protein, expenditure on health (all per capita), and reported adult hunger.[25] Noting the small sample sizes, we can see that pregnant women living in households with an elderly above 60 are in households with significantly higher income per capita and lower levels of hunger. We also see higher expenditure levels including on food and health, however, they are not statistically different from 0 for households with pregnant women.

For the pregnant women within households with an elderly just below or just above the cutoff, we find that those in households with an elderly above 60 are less likely to report that in the last week they had: difficulty sleeping, feelings of fearfulness, feelings of depression, or that they could not get going. They are also less likely to say that they had diarrhea and vomiting recently, and are less likely to say they consume alcohol and smoke regularly. Despite the sample size, the coefficients on alcohol consumption and

[24]Our sample size is 383 total households with a pregnant adult woman who also have an elderly within 5 years of 60 across all five waves of NIDS. As in Alloush, Bloem and Malacarne (2023) and Alloush and Wu (2023), we control for relevant household and individual characteristics when using individual-level outcomes.

[25]Similar to Alloush, Bloem and Malacarne (2023), we also use DHS data to conduct the analysis related to hunger since NIDS does not have information on hunger with the exception of Wave 1. We also find similar point estimates when using the General Household Survey datasets from 2009-2017 on hunger and income among households with pregnant women.

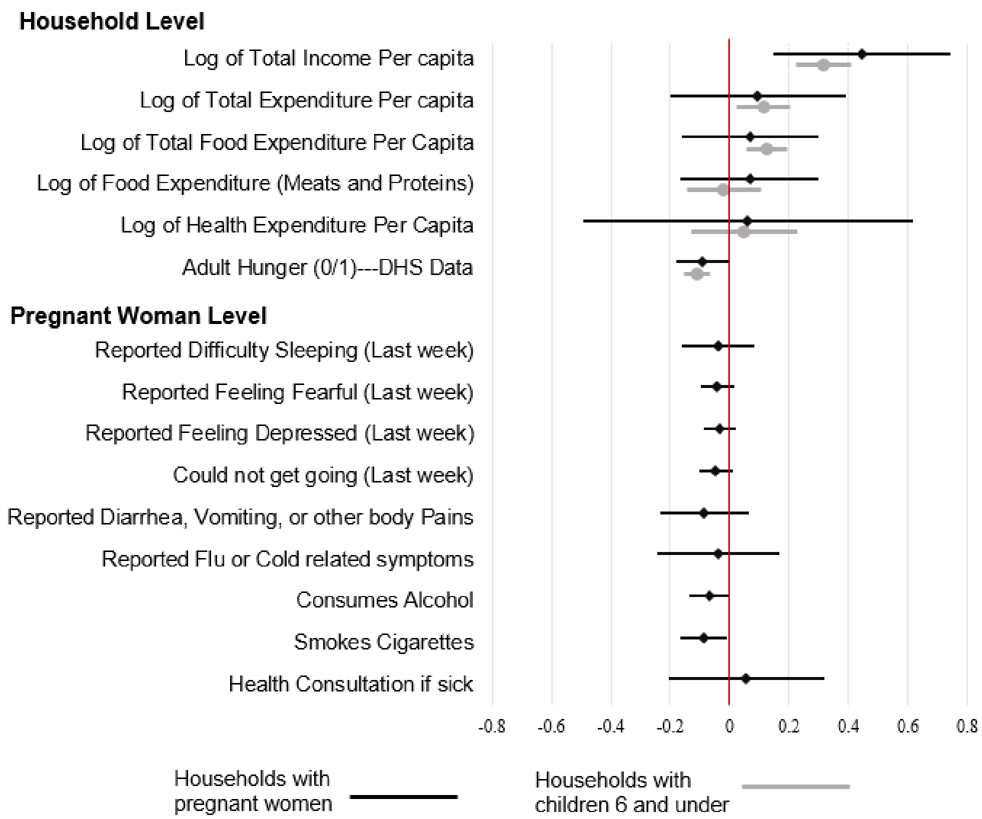


FIGURE 9: Exploring the potential mechanisms through which the grant affects child outcomes. We show results of a local regression discontinuity approach for households with pregnant women who have an elderly within 2 years of the age eligibility threshold. We show results at the household and pregnant woman level. We also show results at the household level for households with children 6 and under.

smoking are statistically significant and meaningfully large compared to baseline alcohol and smoking levels among pregnant women. We do not find a statistically significant increase in health consultations among pregnant women.

Noting the sample size issues and the limited variables we are able to study, we can see that among households with pregnant women and an elderly near the threshold, general economic well-being outcomes improve most notably adult hunger which is nearly halved. We note that other studies also emphasize nutrition and food consumption as an important mechanism through which in utero exposure to positive or negative shocks operate (Amarante et al., 2016; Block et al., 2021). We do not have individual-specific hunger or consumption measures, however we have information on health-related behaviors. For the pregnant women in these households, the overall trend in the results suggest better overall conditions for a pregnancy such as better psychological well-being and reduction in smoking and alcohol consumption at the extensive margins.

7 Conclusion

The conditions faced in utero are shown to have large effects on individuals after they are born and well into their lives. Cash transfer programs are shown to benefit children in a myriad of ways. We contribute to the literature by showing that exposure to a cash transfer program in the household through an elderly while in utero has important health benefits for children early in their life. We find that full in utero exposure led to a sizable increase in height-for-age for children—a significant improvement in health measures. We show suggestive evidence that in utero exposure has added impact beyond just longer exposure. Finally, we find that decreased hunger and less smoking and alcohol consumption during pregnancy may be mechanisms through which the grant acts.

Our identification relies on the as if random allocation of children into the four groups based on two running variables: the age of the eldest person in the household and the difference in age between that person and the child. Our results are robust to controlling for endogenous household formation concerns and household fixed effects. Still, there are threats to our identification. Strategic timing of pregnancies by mothers according to the grant eligibility of their co-resident elderly would violate this assumption. Moreover, our methodology likely attenuates the effect for three main reason: we are basing exposure on current co-residence and it may be that the mother of the child was not residing with the elderly during the pregnancy. Second, we do not know if the elderly was actually receiving the grant at the time the child was in utero. Third, our groups are determined using current co-residents and it may be that a deceased elderly would have placed them into a different group in the relevant periods in utero or early life. Moreover, while we attempt to control for household composition and employment patterns, we cannot rule out that the eligibility for the Older Person's Grant had an effect on the health of the child through channels outside the grant and its added income. For example, increased bargaining power or more time in the household for an elderly could have led to different health decision-making during the pregnancy of the mother.

With the caveat that our sample is not necessarily representative of all children in South Africa, our results suggest that there may be large benefits to expanding the Child Support

Grant in South Africa to pregnant mothers. We show that even partial in utero exposure to a grant may have important health benefits to the children.

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Appendix A

Tables

TABLE A.1: Comparing Sample Children with the National Average

Variable	(1) National Mean/SE	(2) Our Sample Mean/SE	T-test P-value (1)-(2)
African	0.855	0.878	0.000
	(0.003)	(0.005)	
Rural	0.472	0.607	0.000
	(0.004)	(0.007)	
Household Size	6.550	8.096	0.000
	(0.026)	(0.054)	
Number of children aged 14 and less	3.149	3.670	0.000
	(0.015)	(0.033)	
Number of adults over the age of 65	0.260	0.092	0.000
	(0.004)	(0.004)	
Number of females aged 15+	2.206	2.797	0.000
	(0.011)	(0.020)	
Number of males aged 15+	1.174	1.608	0.000
	(0.008)	(0.020)	
Household has Flush Toilet	0.425	0.339	0.000
	(0.004)	(0.007)	
Poor Quality Roof/ Not Tile	0.905	0.904	0.830
	(0.002)	(0.004)	
Rooms Per Person	0.753	0.752	0.930
	(0.004)	(0.007)	
Total Non Grant Income per Capita	1304.300	886.310	0.000
	(22.026)	(20.937)	
Gender of Child is Male	0.494	0.492	0.831
	(0.004)	(0.008)	
Children's Age in Months	36.725	37.538	0.019
	(0.155)	(0.307)	
Mother lives with the child	0.836	0.705	0.000
	(0.003)	(0.007)	
Father lives with the child	0.288	0.127	0.000
	(0.003)	(0.005)	
Age of the caregiver	33.957	38.219	0.000
	(0.093)	(0.237)	
Caregiver is employed	0.301	0.205	0.000
	(0.003)	(0.006)	
Caregive has at least secondary education	0.686	0.593	0.000
	(0.003)	(0.007)	
Eldest person's age	588.877	740.554	0.000
	(1.549)	(0.519)	
Eldest is Male	0.375	0.370	0.523
	(0.004)	(0.007)	
N	17710	4402	

Notes: The value displayed for t-tests are p-values.

TABLE A.2: Households With Current Grant Beneficiary

Dep var	Height-for-Age		Weight-for-Age	
	Overall	*CSG*	*Overall*	*CSG*
	(1)	(2)	(3)	(4)
Partial In Utero	0.221**	0.277**	-0.024	-0.039
	(0.109)	(0.125)	(0.099)	(0.114)
Full In Utero	0.292***	0.408***	0.050	0.109
	(0.108)	(0.126)	(0.099)	(0.114)
District & Year Fixed Effects	✓	✓	✓	✓
Child Controls	✓	✓	✓	✓
Household Controls	✓	✓	✓	✓
Caregiver Controls	✓	✓	✓	✓
Observations	1,829	1,424	1,829	1,424

Notes: Robust standard errors in parenthesis. Potential exposure to the Old Age Grant through a elderly in Utero shows large effects on height-for-age for subsamples of children whose relevant elderly and currently receiving the Older Person's Grant.

TABLE A.3: Effect of the OPG by current age of child

Dep var	Height-for-Age			Weight-for-Age		
Age Range	[0,2]	[3-4]	[5,6]	[0,2]	[3-4]	[5,6]
	(1)	(2)	(3)	(4)	(5)	(6)
	Panel A: Main Sample					
Partial In Utero	0.236	0.217	0.518**	-0.151	0.074	0.302
	(0.219)	(0.159)	(0.237)	(0.201)	(0.156)	(0.244)
Full In Utero	0.599***	-0.070	0.489*	0.186	0.034	0.066
	(0.205)	(0.141)	(0.286)	(0.188)	(0.138)	(0.294)
	Panel B: CSG Sample					
Partial In Utero	0.140	0.262	0.591*	-0.262	-0.062	0.332
	(0.262)	(0.184)	(0.303)	(0.224)	(0.182)	(0.309)
Full In Utero	0.531**	0.030	0.603	0.154	0.098	0.268
	(0.236)	(0.161)	(0.373)	(0.202)	(0.159)	(0.381)

Notes: *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Robust standard errors in parenthesis. Specifications include all controls in Table 1 Column 2.

Figures

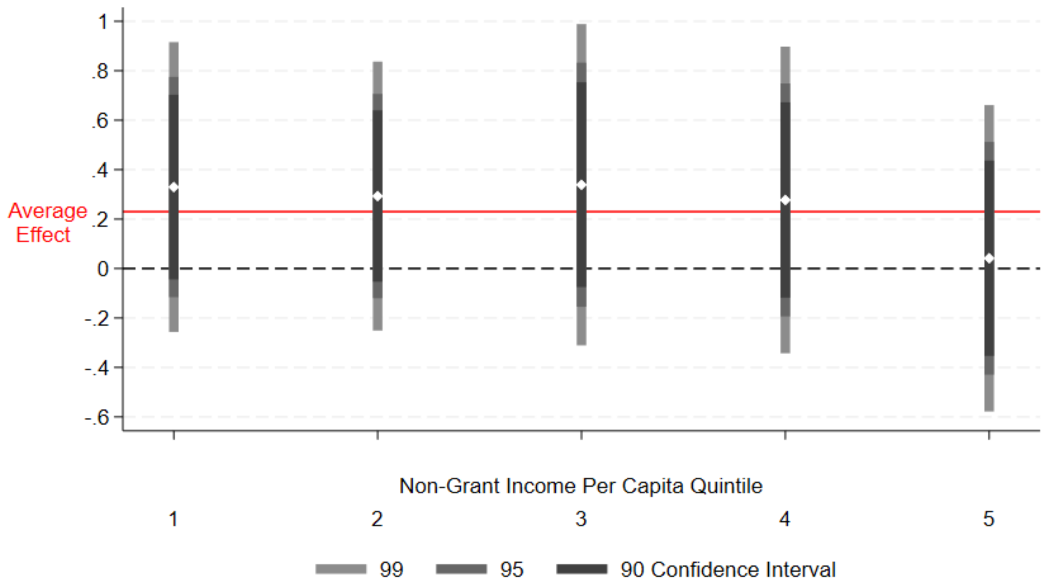
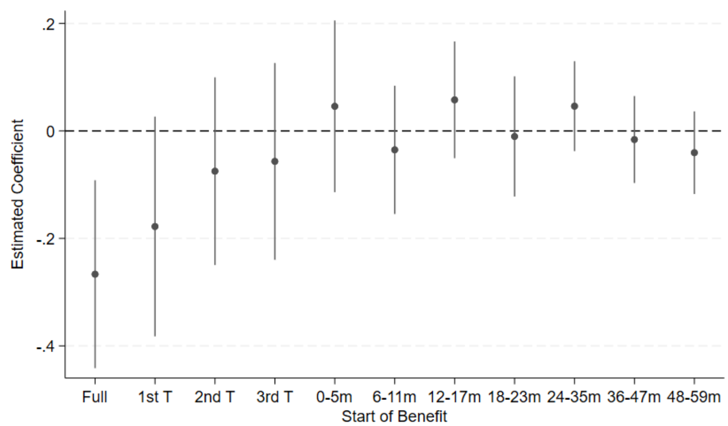
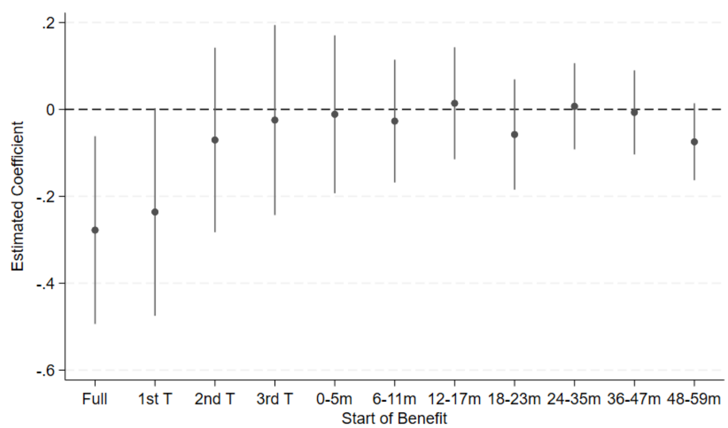


FIGURE A.1: Estimated Effect of Full Exposure to the Grant by Non-grant Income Per Capita suggests larger effects among the poorest 4 quintiles with near 0 effect for the richest.

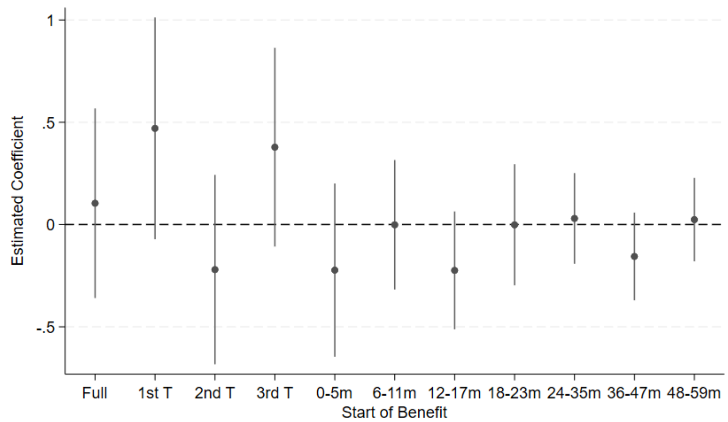


(A) Length of exposure effects on 5 and 6 year old children—Stunting ($HAZ \leq -2SD$).

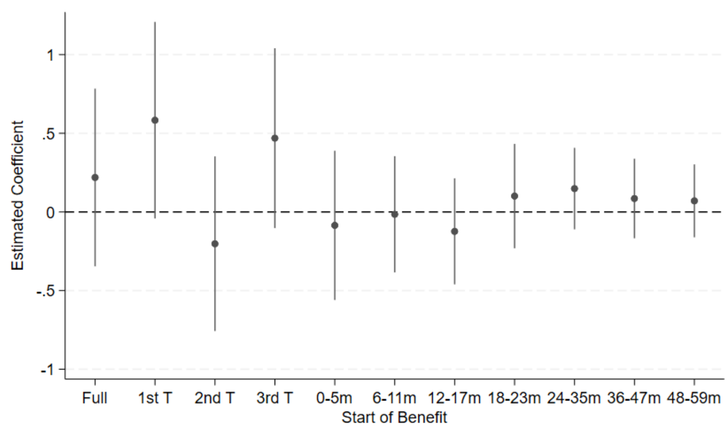


(B) Length of exposure effects on 5 and 6 year old children currently receiving the Child Support Grant—Stunting ($HAZ \leq -2SD$).

FIGURE A.2: A similar figure to Figure 5 showing the effect on stunting.

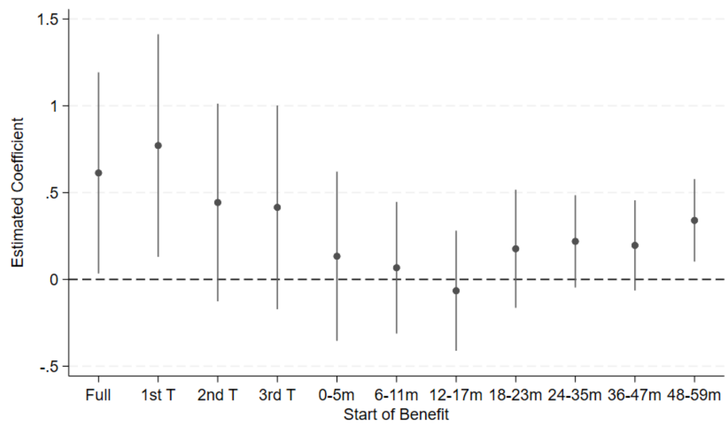


(A) Length of exposure effects on 5 and 6 year old children—height-for-age.

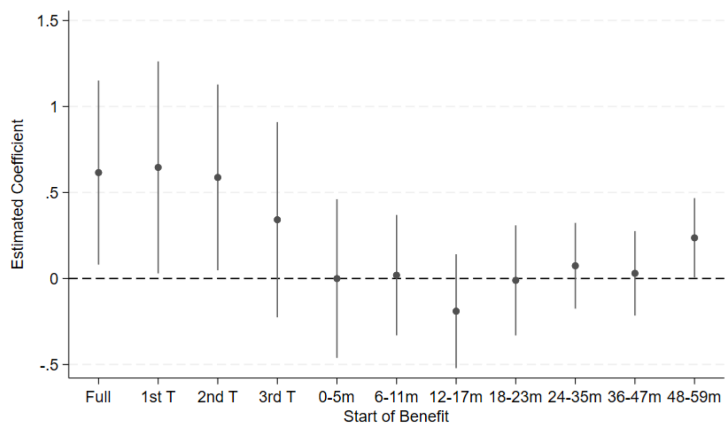


(B) Length of exposure effects on 5 and 6 year old children receiving the Child Support Grant—Weight for Age.

FIGURE A.3: Children exposed to the cash transfer program early do not clearly show better outcomes for weight-for-age. Figures is conditional on the children receiving the Child Support Grant.

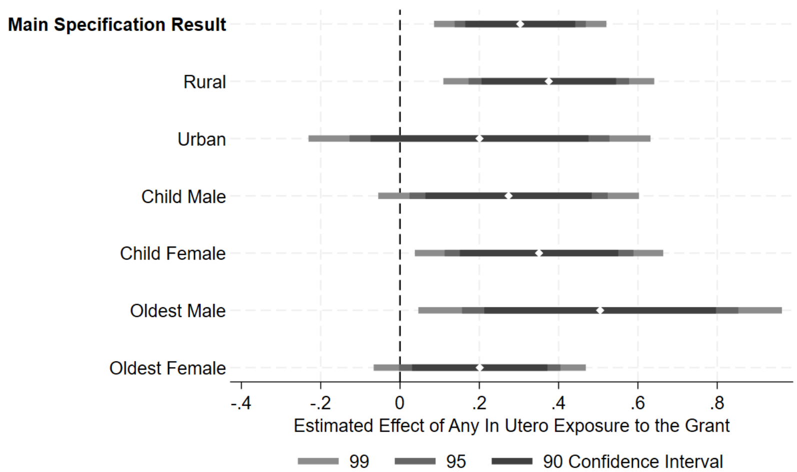


(A) Length of exposure effects on 5 and 6 year old children—Height for age among current Child Support Grant beneficiaries.

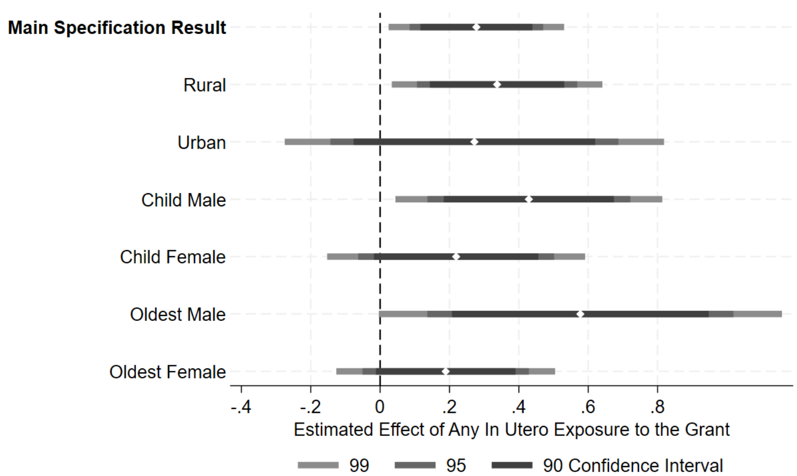


(B) Length of exposure effects on 5 and 6 year old children—Height for Age among bottom 4 quintiles.

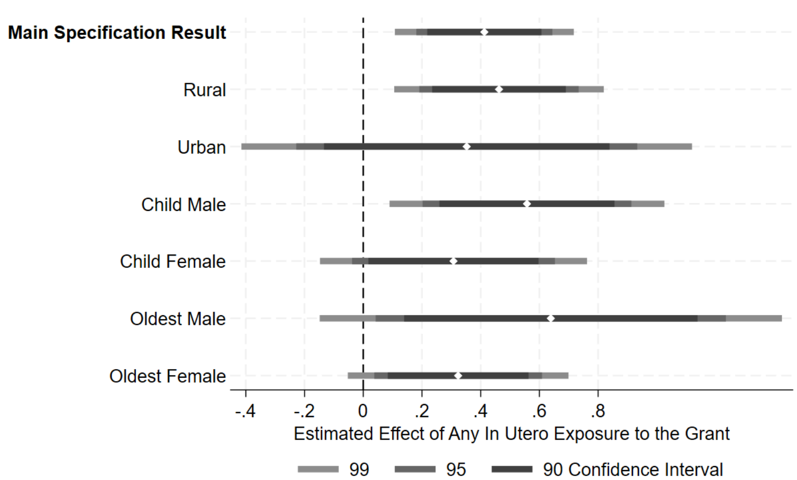
FIGURE A.4: A similar figure showing a similar pattern for more vulnerable households.



(A) Quintiles 1-4.



(B) Quintiles 1-3



(C) Quintiles 1-2.

FIGURE A.5: Heterogeneity by non-grant income per capita quintiles.

Appendix B

Matching Methods

Our grouping approach leads to imbalance across the age of children and elderly in the groups. While we control for many relevant observable characteristics in our specifications, we try to alleviate concerns by using empirical specifications that more explicitly match observations in our analysis. We use nearest neighbor matching methods (Abadie and Imbens, 2006) within our sample. We match on a host of controls but do exact matching for race, sex, and age of the child, rural, and residence status of the child's parents, and age of the oldest person the household.

We first draw nearest neighbor control observations from both those never exposed to the grant and those exposed after birth. We show results for full in utero and both full and partial in utero exposure. We can see that the results for height-for-age are qualitatively similar to those we estimate with our main empirical approach, but the effect on weight-for-age is much smaller, and insignificant throughout. In Panels B and C, we instead draw nearest neighbors from either those never exposed or those exposed after birth. The results do not change in a meaningful way: in utero exposure (full and partial) have a significant effect on height or age. The results are slightly smaller than those we estimated using our main specification.

We note that the results in this section varied based on choices within the nearest neighbor framework. Most importantly, our estimates were larger if we threw out observations where exact matched neighbors were not found. In Table B.1, we show the results that are relatively smaller on average with the intention of being conservative in what we present as robustness checks of our main approach.

TABLE B.1: Matching Methods

Dep var	Height-for-age		Weight for Age	
	(1)	(2)	(3)	(4)
Panel A: Control drawn from never exposed & exposed after birth				
Full In Utero	0.127		0.015	
	(0.092)		(0.085)	
Full & Partial In Utero		0.146**		0.025
		(0.041)		(0.067)
Observations	2,742	3,004	2,742	3,004
Panel B: Control drawn from never exposed				
Full In Utero	0.169*		0.088	
	(0.100)		(0.091)	
Full & Partial In Utero		0.151*		0.063
		(0.080)		(0.073)
Observations	1,132	1,394	1,132	1,394
Panel C: Control drawn from exposed after birth				
Full In Utero	0.109		-0.014	
	(0.095)		(0.088)	
Full & Partial In Utero		0.144*		0.017
		(0.076)		(0.070)
Observations	1,979	2,241	1,979	2,241

Notes: Robust standard errors in parenthesis. Potential exposure to the Old Age Grant through a grand parent in Utero shows large effects on height-for-age. Nearest Neighbor matching using observed child, caregiver, oldest person, and household characteristics. Each panel draws the control differently and the treatment is also defined in two ways. Full In Utero drops observations that only have partial in utero exposure, and Full and Partial In Utero combines observations with any and full exposure to the grant.

Expanding Age ranges

In our main specification, we restrict the analysis to children living with elderly who were eligible at most two years before the pregnancy of the mother and in our control group, the elderly were at least 58 years old or the children in the control group missed out on exposure to the grant by two years. This effectively restricts our age range of considered elderly to approximately 58-68. However, our results are qualitatively robust to changing the age ranges we consider for the elderly. As we show in Table B.2, increasing the range of ages of the elderly leads to point estimates that are smaller than those in our main results. However, for height-for-age, the estimate remain positive and statistically significant. On the other hand, narrowing the age range decreases our sample size, yet the results remain similar to our main results for height and weight for age outcomes.

In results not shown, we find that the estimated effects are robust to trimming for outliers in the data and to shifting our running variable by 1-2 months allowing time for the elderly to apply and start receiving the Older Person's Grant. While there the differences in the point estimates with some of these adjustments, the main conclusion that in utero exposure to the grant had an at least 0.15 SD positive effect on height-for-age is unchanged.

TABLE B.2: Robustness to different age ranges

Dep var	Height-for-age		Weight-for-Age	
	Elderly Age 55-70	*Elderly Age 59-67*	*Elderly Age 55-70*	*Elderly Age 59-67*
	(1)	(2)	(3)	(4)
Infant/Toddler	-0.068	-0.036	-0.029	0.025
	(0.047)	(0.073)	(0.045)	(0.073)
Partial In Utero	0.120	0.167	0.001	0.012
	(0.088)	(0.108)	(0.084)	(0.108)
Full In Utero	0.175**	0.224**	0.101	0.144
	(0.078)	(0.104)	(0.075)	(0.103)
District & Year Fixed Effects	✓	✓	✓	✓
Child Controls	✓	✓	✓	✓
Household Controls	✓	✓	✓	✓
Caregiver Controls	✓	✓	✓	✓
Observations	4,328	2,530	4,268	2,499

Notes: Robust standard errors in parenthesis. Potential exposure to the Old Age Grant through a grand parent in Utero shows large effects on height-for-age for different age ranges showing that our choice of age range isn't driving our results.