Social Protection and Perinatal Depression: Evidence from South Africa*

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Abstract

We study the intra-household effects of South Africa's Older Person's Grant on perinatal depression. We document two stylized facts: First, depression risk declines with increased wealth and women show higher levels of depression risk than men across all wealth deciles. Second, among women, depression risk increases during pregnancy and only slowly declines in the months after delivery. Next, leveraging the age-eligibility threshold of the Older Person's Grant, we show that the grant reduces the risk of perinatal depression among co-resident women. These results demonstrate the possible spillover benefits of social protection programs already operating at scale.

Keywords: Cash transfers, postpartum depression, mental health, South Africa
JEL Codes: I15, I38, J13

*We have no conflicts of interest to disclose. Data is available to download from the NIDS website; we will provide replication material online. All errors are our own.

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1 Introduction

Depression affects over 300 million adults globally (WHO, 2023), and is one of the largest contributors to disability-adjusted life years worldwide (WHO, 2013; IHME, 2019). Depression is more prevalent among women and over 17 percent of women globally experience postpartum depression—i.e., depression arising after giving birth (Piccinelli and Wilkinson, 2000; DeRubeis, Siegle and Hollon, 2008). Moreover, antenatal depression—i.e., depression arising among pregnant women—tends to be even more prevalent than postpartum depression (Woody et al., 2017; Gopalakrishnan, 2024). In South Africa, our data reveals that nearly 28 percent of women who are pregnant or have recently given birth report symptoms indicating an elevated risk of perinatal depression.[1]

Depression is not inevitable nor irreversible. Existing research investigates how carefully targeted interventions can help alleviate postpartum depression (Baranov et al., 2020), there is limited evidence on whether or how existing social protection programs, currently running at scale, affect perinatal depression. This is a critical gap in knowledge because depression is challenging to diagnose and timely interventions are difficult to implement at scale, especially in low and middle income countries where mental healthcare is often constrained by both supply and demand side factors (Gopalan et al., 2014; Wakida et al., 2019). Thus, documenting the effect of large-scale social protection programs, that primarily exist to achieve other objectives, on perinatal depression could identify spillover effects of policies that help low-income new mothers especially in contexts where mental healthcare is limited.

In this paper, we study how South Africa's Older Person's Grant program influences perinatal depression in inter-generational households. The Older Person's Grant is one of the most well-established social protection programs in the world. It is a means-tested unconditional cash transfer program for recipients who are at least 60 years old. Grant recipients receive a relatively large monthly cash transfer that amounts to nearly twice the national income poverty line.[2] Although the grant does not target pregnant women or new mothers, 25 percent of women who report a pregnancy or have recently given birth in our nationally representative data live with a recipient of the grant, thus, this existing social protection program affects about a quarter of the nearly one million women who

[1] We use the term "perinatal depression" to refer to the combination of both antenatal and postpartum depression (i.e., depression that occurs during pregnancy or shortly after birth). The term "perinatal" can refer to a very specific and narrow time window around the time of birth (i.e., beginning around the 20th week of pregnancy and ending around the 4th week after birth). Additionally, although terms with the "partum" suffix typically relate maternal health and terms with the "natal" suffix typically relate to child health, we follow recent literature (Woody et al., 2017; WHO, 2023; Gopalakrishnan, 2024), and the call for a "unifying term" (WHO and USAID, 2015), and use the term "perinatal" more generally to refer to the time before and after birth. When we take this definition to our data, we define perinatal as including pregnancy though the sixth month after birth.

[2] In 2024, this amounts to 2,180 South African Rands per month.

give birth in South Africa every year.

We estimate the effect of the grant by comparing rates of depression risk among pregnant women and women who recently gave birth living with older household members who are very close in age to the age-eligibility threshold of the Older Person's Grant—applying the local randomization variation of the regression discontinuity design (Cattaneo and Titiunik, 2022). Our core identifying assumption is that living with a member who is slightly older or slightly younger than 60 years old is as-if random around the threshold and thus unrelated to other factors that determine depression risk among women who are pregnant or have recently given birth. This assumption implies that the only pathway through which having a household member who is just above 60 years old can affect depression risk is, at least initially, through grant eligibility and receipt. We show balance between grant-eligible and grant-ineligible women and their households to support this assumption. A fundamental threat to this identification assumption is possible endogenous selection into motherhood, at either the extensive or intensive margins, among women living in households with an older person approaching the age-eligibility threshold of the Older Person's Grant. Buffering against this threat, we find no differences in the probability of pregnancy, the probability of employment among mothers, the age of children, or the number of children within households on either side of the age-eligibility threshold.

Our results show that the grant plays an important role in reducing perinatal depression in South Africa. We first show the increased depression risk among pregnant women and women who recently gave birth in our data. Specifically, depression risk increases by between 10 and 15 percentage points during the perinatal period. Then we show that, for households with women who are pregnant or had given birth within the last six months, grant receipt effectively raises household income per capita by nearly 20 percent. Our main results show that perinatal women who live with someone who is slightly older than 60 years are approximately 10 percentage points less likely to be at risk of depression relative to similar women who live with someone who is slightly younger than 60 years. A fuzzy local randomization estimation approach shows that grant receipt reduces perinatal depression risk by 15 percentage points. Our preferred specifications use a window of five years around the age-eligibility threshold of the oldest member of the household, however, we show that our results are qualitatively consistent when using smaller or larger windows around the age-eligibility threshold. Additionally, we conduct a series of robustness checks that include accounting for endogenous household formation, endogenous changes in fertility, the receipt of additional benefits targeting parents, and the death of a child. We also conduct several sensitivity checks that include varying postpartum duration, the threshold defining depression risk, and adding control variables accounting for characteristics of the mother and the household. Across each of these checks, we find that the results re-

main qualitatively similar. Taken together, our results show that the Older Person's Grant produces important spillover effects on the mental health of pregnant women and women who recently gave birth by reducing the increased risk of depression associated with pregnancy and childbirth observed in our data.

Addressing perinatal depression is important for at least two main reasons. First, better mental and emotional health is an important end in itself but is often overlooked and left under-diagnosed and untreated, especially in low and middle income countries (WHO, 2013). Additionally, existing evidence points to possible long-term consequences of perinatal depression—see, e.g., reduced probability of employment (McGovern, Rokicki and Reichman, 2022) and increased probability of experiencing poverty (Rokicki et al., 2022). Moreover, treating postpartum depression with targeted psychotherapy reduces depression and improves women's financial empowerment up to seven years post-treatment (Baranov et al., 2020). Second, in many settings, mothers are the primary caregiver and compromised mental health can affect her parenting (Parsons et al., 2012; Dadi, Miller and Mwanri, 2020). Again, psychotherapy interventions for postpartum depression lead to increased parental investments in children and translate to higher levels of socio-emotional skills among children (Baranov et al., 2020; Sevim et al., 2024).

Our analysis in this paper is related to several papers that study the effect of cash transfers on mental health outcomes among women who recently gave birth (Ozer et al., 2011; Macours, Schady and Vakis, 2012; Powell-Jackson et al., 2016; Okeke, 2021). With the exception of Paxson and Schady (2010) these studies each find that conditional cash transfers reduce depressive symptoms among new mothers. Our study, however, is fundamentally different, as it examines a social protection program operating at scale without relying on a formal diagnosis of depression and the targeting of pregnant women and new mothers, while still enabling a timely and effective intervention that can reduce mental health risk. This is important for at least three reasons. First, because the Older Person's Grant primary aims to target older people and households in South Africa tend to be multi-generational, the financial assistance included in the grant can effectively reach pregnant women, not just women who recently gave birth. Critically, antenatal depression tends to be more prevalent than postnatal depression (Yin et al., 2021; Gopalakrishnan, 2024), and experiencing depression during pregnancy can contribute to a higher risk of depression after the birth of a child. Second, most existing studies evaluate a conditional cash transfer program with conditionalities that include attending pre-birth or post-birth visits at healthcare facilities. We study unconditional financial assistance and therefore our estimates do not conflate the financial assistance and the necessary conditional behavior. Third, most of the work in this literature evaluates temporary cash transfers.[3] By contrast, South Africa's

[3]Both Powell-Jackson et al. (2016) and Okeke (2021) evaluate one-time cash transfer programs; Macours, Schady and Vakis (2012) study a pilot of a re-occurring cash transfer program that lasted just over one year, and Paxson and Schady (2010) study a re-occurring cash transfer program that ultimately phased out.

Older Person's Grant provides recipient households with a sustained income source, leading to a more certain long-term shift in the household's budget constraint.

Our findings contribute to at least three areas of active research. First, we contribute to the literature studying policies and interventions to reduce perinatal depression. Cognitive behavioral therapy is a popular intervention to address perinatal depression—along with other forms of depression, stress, and anxiety (Baranov et al., 2020). In addition to the cash transfer literature discussed above, research shows that maternal mental health also benefits from alternative forms of financial interventions, such as, for example, paid parental leave policies (Bilgrami, Sinha and Cutler, 2020; Heshmati, Honkaniemi and Juárez, 2023). We add to this literature by studying the effect of an existing and well-established social protection program which has primary objectives unrelated to maternal mental health. Our results combined with existing evidence showing positive effects on child health due to in utero exposure to the Older Person's Grant (Alloush and Riaz, 2026), point to the benefits of financial support for both children and parents, and the importance of the timely distribution of this support—specifically before the birth of a child. These results carry implications for existing policies, such as extending South Africa's Child Support Grant to pregnant women (Ohrnberger et al., 2020; Chilonda, 2022) or other large-scale social protection programs especially in settings where targeting psychotherapy programs at scale faces challenging constraints.

Second, we add to the literature studying the effects of South Africa's Older Persons Grant (Case and Deaton, 1998; Duflo, 2000, 2003; Bertrand, Mullainathan and Miller, 2003; Edmonds, Mammen and Miller, 2004; Hamoudi and Thomas, 2014; Ambler, 2016; Abel, 2019; Alloush, Bloem and Malacarne, 2024). We document spillover effects benefiting non-recipient members of recipient households. These spillover effects are similar to those found by Duflo (2000, 2003) when analyzing child health outcomes within households receiving the Older Person's Grant.

Third, our research contributes to a growing literature documenting the link between economic and psychological well-being (Haushofer and Fehr, 2014; Haushofer, 2019; Alloush, 2024; Ridley et al., 2020). Our paper examines this link in a specific, and important, sub-population: pregnant women and women who recently gave birth. Our results highlight that the Older Person's Grant, which improves economic conditions in the household, reduces the risk of depression in a time when women are especially likely to experience depressive symptoms. We discuss several mechanisms through which our results could operate.

The remainder of this paper is organized as follows. In the next section, we briefly introduce the Older Person's Grant and describe the data we use for our analysis. In Section three, we discuss our estimation approach and document the necessary identification assumptions required for our analytical approach. Section four presents our main results;

including the effect of grant receipt on household income and the effect of both grant eligibility and grant receipt on perinatal depression. Section five, reports robustness and sensitivity checks. Finally, in section six, we conclude.

2 Data and the Older Person's Grant

We use data from five survey waves of the longitudinal National Income Dynamics Study (NIDS) fielded in 2008, 2010, 2012, 2014, and 2017 (SALDRU, 2018). The survey is nationally representative with a sample of over 28,000 individuals in 7,300 households across South Africa.[4] These rich data include detailed information on poverty and well-being, household composition and structure, fertility and mortality, migration, labor market participation and economic activity, health outcomes, and education attainment. The NIDS includes four questionnaires: a household module, an adult module, a child module, and a proxy module. For our main outcome variable, we use the questions on mental health in the adult module asked of individuals 15 years of age and above. Our use of five waves of a large and nationally representative survey allows us to conduct analysis on a very narrowly defined sub-population: pregnant women and women who gave birth up to six months prior to the enumeration of the survey who live in households where the oldest person is near 60 years old.

2.1 Descriptive Statistics

The NIDS measures the mental health of an individual via the ten-item Center for Epidemiological Studies Depression (CES-D) scale. The questionnaire asks individuals to report if they felt or behaved in a certain way in the past week by indicating the frequency with which a feeling or behavior occurred. The frequency includes four response categories ranging from (i) rarely/none of the time, (ii) some/little of the time or occasionally, (iii) a moderate amount of time, or (iv) all of the time. The CES-D score is constructed by assigning each frequency a value from zero through three such that the sum total of the ten questions is at most 30 and a higher score corresponds to more depressive symptoms. A threshold score of ten is typically used to screen for depression (Andresen et al., 1994), and several studies validating the use of the CES-D in South Africa suggest that threshold scores of ten through 12 are appropriate (Baron, Davies and Lund, 2017; Hamad et al., 2008; Johnes and Johnes, 2004; Myer et al., 2008).[5] To measure depression risk, we define our dependent variable as a binary variable taking the value one if the score equals or

[4] Normal levels of attrition occur, especially among wealthy households. The sample is refreshed to attempt to keep each wave nationally representative.

[5] The specific questions used to measure depressive symptoms in the NIDS data are displayed in Table A.1 in the Supplemental Appendix.

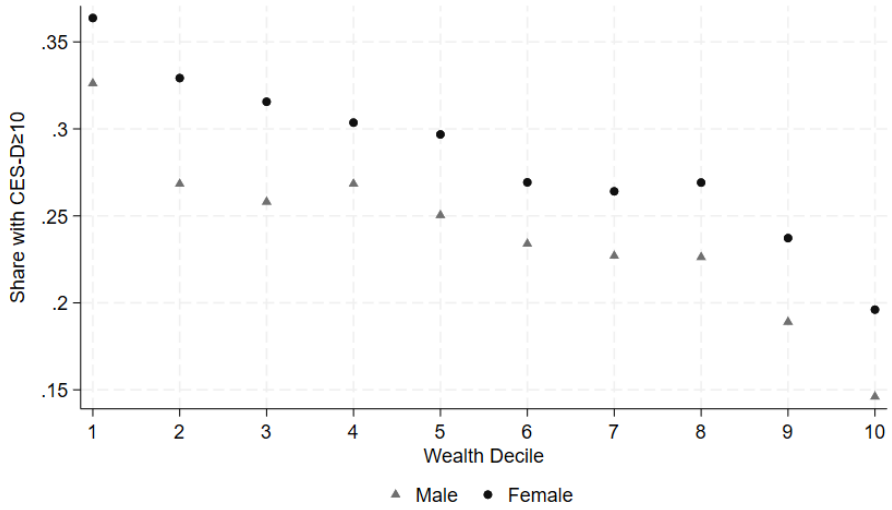


FIGURE 1: Depression Risk and Wealth by Gender—Proportion of those at risk of depression (i.e. those with the CES-D score of ten and above) across wealth deciles for men and women show two clear patterns: Risk decreases with wealth and women consistently have a higher probability of a high CES-D score when compared to men.

exceeds ten, and zero otherwise.[6]

In the NIDS data, pooled across all years, the average CES-D score is 6.99 with a standard deviation of 4.53, and 26.69 percent are at risk of depression with a CES-D score of ten or higher. In Figure 1, we show how the share of individuals with CES-D scores above ten differs by wealth. We see a clear decline with wealth for both men and women. The share of individuals with a CES-D score above ten is almost double among those in the poorest wealth decile compared to those in the richest. A similar pattern can be observed when using other measures of economic well-being, including household income per capita and food expenditure per capita, motivating the hypothesis that better economic environments might play a role in alleviating depressive symptoms.[7] Additionally, we also observe that women are consistently more likely to have CES-D scores above ten than men across all wealth deciles—a result that is documented in many other contexts (Bracke, 2000; Piccinelli and Wilkinson, 2000; DeRubeis, Siegle and Hollon, 2008).[8] Moreover, the average CES-D score of new mothers is seven and about 28 percent have a CES-D score of ten or above, which increases by eight percentage points to 35 percent in the poorest households. These statistics show that mothers in poverty are at a higher risk of depression than mothers with

[6]Henceforth, we refer to this as depression risk. The use of a binary dependent variable allows us to avoid challenges relating to the point identification of estimated effects with an ordinal dependent variable (Bloem and Oswald, 2021). We check the robustness of our results to other common cutoffs such as 11 and 12.

[7]In our panel, accounting for individual fixed effects in a simple demeaned regression, shows that about 40-50 percent of the observed differences across wealth remain.

[8]Figure A.1 in the Supplemental Appendix shows that the mean of the CES-D score is also higher among women than among men.

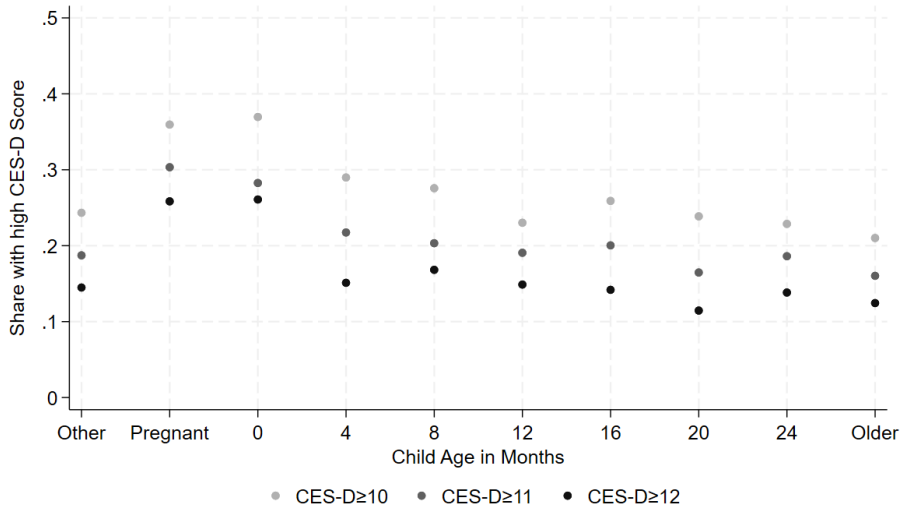


FIGURE 2: Female Depression Risk Relative to their Child's Birth—Depressive symptoms spike during pregnancy and decline slowly after delivery. The "Other" category represents women without children, the "Older" category represents mothers with children older than 24 months old. The sample includes all women who live in households where the oldest person is younger than 60 years old.

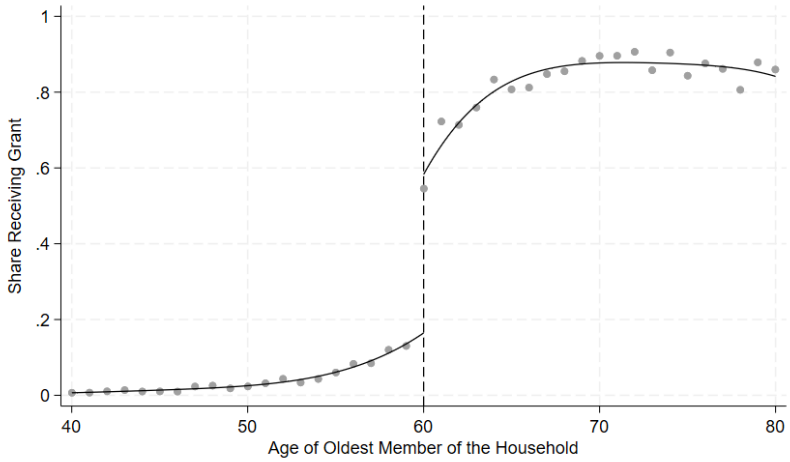
access to additional financial resources.

In addition to a disproportionate burden of depression risk on women in general, the period just before and after childbirth is a particularly vulnerable time when the risk of depression is more pronounced. In Figure 2 we show how the share of CES-D scores above a given threshold vary relative to childbirth. Approximately 20 percent of women who are not pregnant or who are not mothers report CES-D scores of ten or above. For pregnant women, this share increases by over 10 percentage points. As time progresses beyond the time of childbirth, this share declines slowly.

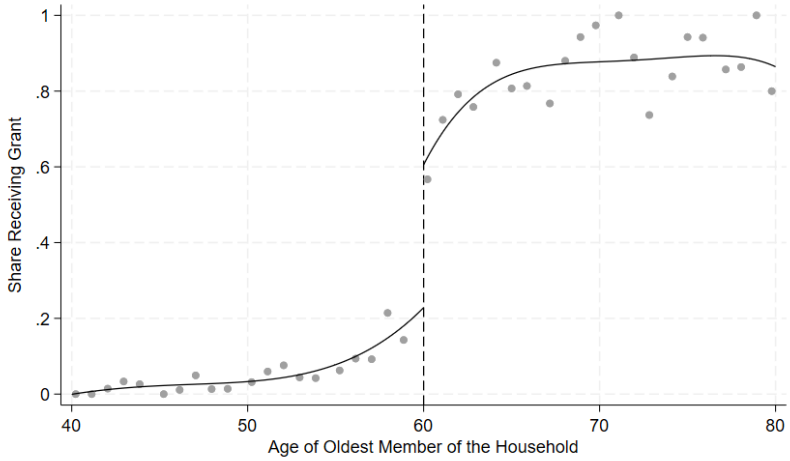
2.2 South Africa's Older Person's Grant

We focus on the Older Person's Grant—South Africa's flagship social protection program. It is a means-tested non-contributory pension scheme paid out to older people every month after the age of 60.[9] While the value of the grant in 2024 was 2,180 South African Rands per month—between 2008 and 2017, during the span of our panel, the monthly transfer was between 1,200 and 1,800 South African Rands per month. This is a relatively large transfer which equates to nearly 140 percent of the median per capita income in South Africa and is almost double the national income per capita poverty line. The reach of the program is large with nearly four million direct beneficiaries and nearly four times as many indirect

[9]The age-eligibility was changed between waves 1 and 2 for men and the age-eligibility was lowered from 65 to 60. We account for this change by centering the running variable using the different windows around the age-eligibility threshold.



(A) Grant Receipt: All Households.



(B) Grant Receipt: Households with Pregnant Women or New Mothers.

FIGURE 3: Discontinuity in Grant Receipt—Grant receipt jumps when the age of the oldest member of the household turns 60 years old. This observation holds for all households and the subset with a pregnant woman or a mother who gave birth within the previous six months.

beneficiaries typically living in the same inter-generational households including mothers and their children. In our data, we find that over 25 percent of women who are either pregnant or have recently given birth live with an Older Person's Grant beneficiary. With nearly one million live births per year in South Africa, the grant indirectly affects nearly a quarter of a million women a year during perinatal stages.

Existing research documents the important effects of the Older Person's Grant among recipient individuals and households. For example, in early work, Case and Deaton (1998) show increases in food expenditure due to the grant and Duflo (2000) shows that the grant has important spillover effects on the health of children within recipient households. Receipt of the grant leads to small changes in household composition (Hamoudi and Thomas, 2014; Edmonds, Mammen and Miller, 2005) and can influence labor supply although with

important heterogeneity including a reduction in labor supply at the extensive margin among women with children (Ranchhod, 2006; Abel, 2019; Jensen, 2004). More recently, Alloush, Bloem and Malacarne (2024) show increases in several household-level measures of economic well-being including a sharp reduction in reported hunger during the COVID-19 pandemic among grant recipients. These changes within the household, including large reductions in hunger and improvements in child outcomes, suggest strong resource sharing norms, especially in poorer households.

The Older Person's Grant has a sharp age-based eligibility criterion where eligibility starts at age 60. There is also an income and wealth-based means test which nearly 80 percent of older people satisfy. The age-eligibility criterion creates a jump in the probability of grant receipt at age 60, a discontinuity we leverage in our analysis.[10] Households with an eligible older person see a large increase in the probability of grant receipt—we can see this clearly in Panel A of Figure 3 where among all households in our data the probability that the household reports receiving the Older Person's Grant increases sharply when the age of the oldest member of the household reaches 60. Panel B of Figure 3 shows a similar jump in the share receiving the grant when we restrict our sample to only include households that have a woman who is pregnant or has given birth in the previous six months. In the next section, we outline how we use this discontinuity to estimate the effect of this grant on perinatal depression among co-resident women.

3 Estimation Approach

We leverage the age-eligibility threshold of the Older Person's Grant at age 60 which creates a discontinuous jump in the probability of grant receipt. The running variable in our analysis is age (in years) of the oldest member of the household which takes discrete integer values making the *local randomization* approach from the regression discontinuity literature suitable. With this approach, instead of estimating the treatment effect *at the limit*, the identifying assumption is that units in a window around the threshold are as-if randomly assigned to treatment (Cattaneo, Frandsen and Titiunik, 2015). This approach follows that used in Alloush, Bloem and Malacarne (2024) to estimate the effect of the Older Person's Grant on food insecurity during the COVID-19 pandemic. Here, we focus on a sample women who are pregnant or recently gave birth who are living with an older person near the age-eligibility threshold.

In order to use this approach to estimate the effect of the grant on perinatal depression risk two assumptions must hold for all units in a window around the threshold. The first assumption is that the assignment mechanism of the score is known inside this window;

[10] Many other studies leverage this discontinuity to study the effect of the grant including Ranchhod (2006), Edmonds, Mammen and Miller (2005), Abel (2019) and Ambler (2016).

for example, this condition holds when all units have the same probability of receiving all score values in the window. The second assumption is an exclusion restriction that prevents the potential outcomes from being a function of the score inside the window (Cattaneo and Titiunik, 2022). The main challenge in the local randomization approach is, therefore, the choice of this window—a narrow window will improve balance between treatment and comparison units, but comparisons within this narrow window may not be adequately statistically powered. A wider window may lead to challenges to the exclusion restriction assumption. We show results for a range of windows around the age-eligibility threshold, although for our main results, we use a window of five years around the eligibility threshold.

Given our interest in studying perinatal depression, the onset of which is either before or after a women gives birth, we define our analytical sample as either pregnant women or new mothers. Pregnant women are identified directly in our data.[11] We identify new mothers in our data as those who had a child in the last six months. For this, we use birth information on the youngest child of each woman and identify her as a new mother if the birth of her youngest child was at most six months prior to the survey date.[12] While postpartum depression can start within a few weeks after childbirth, it can occur up to one year after giving birth (Okeke, 2021); we check the robustness of our results to several modifications of this definition, such as increasing the time frame from six months to one year.[13]

Within our restricted sample of women who are pregnant or recently gave birth who live with an older person near the age-eligibility threshold of 60 for the Older Person's Grant, we begin by estimating the effect of the grant on women's perinatal depression risk with the following regression specification:

$$Y_{iw} = \alpha + \beta_1 1_{oldestage_{iw} \geq 60 \ years} + \mathbf{X}_{iw}\Theta + \delta_w + e_{iw} \tag{1}$$

where y_{iw} is a measure of depression risk for individual i in survey wave w, and $1_{oldestage_{iw} \geq 60}$ is an indicator for whether the oldest member of the household is older than 60 (and thus age-eligible for the grant). $\mathbf{X}_{iw}$ is a host of observed individual and household characteristics while δ_w is a survey wave fixed effect.[14] e_{iw} is the unobserved error term.

By comparing women in households where the oldest member is just above 60 to

[11] These are women who know they are pregnant and disclose it during the individual interview.

[12] At this stage, we do not distinguish between women who experienced the death of a child from those who have not, but we check the sensitivity of our results to this in Section 5.

[13] Our choice of six months to define postpartum duration is motivated by studies that find the risk and intensity of depression to peak between three and six months after birth (Andrews-Fike, 1999; Cooper and Murray, 1997).

[14] We progressively add control variables to our specification to control for the mother's age, mother characteristics (i.e., marital status, race, and education attainment), household characteristics (i.e., household size and number of children), and geographic characteristics (i.e., rural–urban status).

women in households where the oldest member is just below 60, we produce a result akin to an intent-to-treat (ITT) estimate of the effect of grant eligibility since age 60 makes the older person eligible for grant but they do not necessarily receive it.[15] Our main results instead use a fuzzy local discontinuity design where we use age-eligibility of the oldest member of the household as an instrument for household-level receipt of the grant within our restricted sample of women who live with an older person near 60 years of age. We do this in the following two-stage specification:

$$G_{iw} = \alpha_0 + \alpha_1 1_{oldestage_{iw} \geq 60 \ years} + \mathbf{X}_{iw}\Theta + \delta_w + e_{iw} \tag{2}$$

$$Y_{iwd} = \beta_0 + \beta_1 \hat{G}_{iw} + \mathbf{X}_{iw}\Psi + \psi_w + \mu_{iw} \tag{3}$$

where G_{iw} is a binary variable indicating if the household reports receiving the Older Person's Grant and Y_{iw} is one of two outcome variables of interest: (i) the log of monthly household income per capita and (ii) a binary variable indicating the individual is at risk of experiencing depression. The variable $\hat{G}_{iw}$ in equation (3) is the predicted value of G_{iw} from equation (2). The indicator variable representing eligibility for the Older Person's Grant is defined as discussed above and we continue to control for survey wave fixed effects as well as the household and individual characteristics as discussed above.

Our preferred specifications use the age window of five on each side of the age-eligibility threshold—we restrict to women whose oldest household member is between the age of 55 and 64. This range is smaller than what is commonly used among studies analyzing the impact of the Older Person's Grant (Ambler, 2016; Edmonds, Mammen and Miller, 2005). As in more recent studies on the Older Person's Grant, we show results for a range of windows from two years to ten years on each side of the age-eligibility threshold.

We present balance tests for the two- and five-year windows in Tables A.2 and A.3 in the Supplemental Appendix. In support of our identification assumptions, we see balance in the narrow two-year window for observable individual- and household-level variables in Table A.2. When we expand the age range of the oldest member of the household to the five-year window in Table A.3, some imbalance emerges. Specifically, women in the grant-eligible households are slightly older and live in larger households that have more children and are less likely to be urban.[16] We show that controlling for age of the mother, number of other children, and household size does not change the estimated effect of the grant in a meaningful way. More generally, our main finding is robust to the choice of window and the inclusion of control variables.

[15] As discussed earlier, approximately 80 percent of older people pass the means test and take up among means-test eligible is over 90% by age 65.

[16] This finding is consistent with existing studies of the Older Persons' Grant showing that receipt leads to an increase in the number of people co-residing with the recipient (Edmonds, Mammen and Miller, 2005; Hamoudi and Thomas, 2014). However, since the oldest member is older, other members will also on average be older and further into their life cycle which means likely more children and larger households.

An additional threat to our identification strategy is some form of manipulation around the age-eligibility threshold. That is, if individuals can influence their eligibility then treatment status will be, in some part, a choice and our results will be biased. In our case, this form of manipulation will be present if there is non-random sorting of pregnant women and new mothers around the age-eligibility threshold. In an additional balance table where we widen our sample to households with both an elderly near the threshold and any women between ages 18 and 40 (Table A.4), we show that grant eligibility does not affect the probability of pregnancy within the household. Moreover, in another study that uses household-level micro-data from South Africa with larger samples, the probability of pregnancy does not jump when the oldest member of the household turns 60 (Alloush and Riaz, 2026). In Figure A.3, we plot the histogram of the running variable for the sample of pregnant women and new mothers and find no evidence of bunching (i.e., there is no spike in mass just to the right of the age-eligibility threshold). As a formal test, we also implement the McCrary density test (*p-value* = 0.892) and find no statistical evidence of manipulation of the running variable within our sample.

Finally, in order to contextualize our results, we estimate an augmented specification that expands the sample to include mothers of older children (up to three years old) who live with an older person near the age-eligibility threshold of the grant. In this supplemental regression specification, we interact the age-eligibility indicator variable with a "perinatal" indicator variable, defined by whether the woman is pregnant or if she has a child who is at most six months old. This allows us to compare depression risk of pregnant women and new mothers to mothers of older children around the age-eligibility threshold by estimating the following equation:

$$\begin{aligned} Y_{iw} = \alpha + \beta_1 1_{oldestage_{iwd} \geq 60 \ years} + \beta_2 1_{perinatal_{iw}} + \\ \beta_3 1_{perinatal_{iw}} \times 1_{oldestage_{iw} \geq 60 \ years} + \\ \mathbf{X}_{iw}\Theta + \delta_w + e_{iw} \end{aligned} \tag{4}$$

where again Y_{iw} is a measure of depression risk. Additionally, the variable $1_{oldestage_{iwd} \geq 60 \ years}$ indicates if oldest member of the household is 60 years old or older and the variable $1_{perinatal_{iw}}$ indicates if the woman is pregnant or has given birth in the last six months. The coefficient β_1 captures the effect of living in a grant eligible household on depression risk (for women who gave birth more than six months ago), whereas β_2 measures perinatal changes in depression risk in grant ineligible households. The coefficient of interest is β_3 on the interaction term which estimates the differential effect of residing with a person eligible for the Older Person's Grant on perinatal depressive symptoms. In this specification, we aim to capture the added depression risk that women experience during perinatal stages and if the Older Person's Grant helps alleviate some of these risks.

In this supplemental analysis, we expand our sample to include women who have already given birth (and thus are already mothers) but did so more than six months ago. We also impose a limit of three years on how long ago the delivery was for mothers and restrict the sample to women in the age range of 18 to 40. Thus, the sample for this interaction estimation approach consists of women who are pregnant, gave birth recently, or mothers who gave birth more than six months ago but no later than 3 years ago. We interpret these supplemental results with caution as they show ITT-type results and include a comparison group of women who may not be a plausible counterfactual for our perinatal women. That is, while we posit that age-eligibility is as-if random around the threshold, we cannot credibly defined that when a mother gives birth is as-if random. However, the results from this regression specification allow us to contextualize the magnitude of our effect estimates by estimating the change in reported depression risk associated with pregnancy and childbirth in our data and directly comparing this with estimates of the effect of grant eligibility for these women.

4 Results

In this section we present our results. First, we show that receipt of the Older Person's Grant at the household level leads to an increase in household income per capita within various sub-sets of the NIDS data including our sample of households that include pregnant women and mothers who gave birth in the past six months. Next, with our main perinatal sample of households, we show that perinatal depression risk meaningfully falls when living in a household that receives the Older Person's Grant. Finally, we review the literature on the Older Person's Gran to highlight a number of potential mechanisms.

4.1 Household Income

We first estimate the effect of the Older Person's Grant on household income. The effect of the grant on household income represents a critical first step for intra-household spillover effects on mental health to materialize. Other studies document a positive shift in economic well-being as a result of the Older Person's Grant. For example, Alloush and Wu (2023) find that grant receipt boosts household income per capita in the range of 14 to 20 percent among households with recipients who were economically inactive before and after receipt of the grant. In Table 1, we document the effect on income in the full sample of households where the oldest member is close to 60 years old and in sub-samples relevant to our study including our main perinatal sample that includes pregnant women and mothers who gave birth in the past six months.

In Panel A of Table 1, we show the estimated effect of age-eligibility on log of household income per capita using the regression specified in equation (1). This is an ITT-type

TABLE 1: Older Person's Grant and Household Income

Dep var: Log Income Per Capita	(1) Full NIDS Sample	(2) Women Aged 18-40	(3) Pregnant or Birth 3 Years Ago	(4) Main Perinatal Sample
Panel A: Grant Eligibility				
Age-eligibility	0.143***	0.096***	0.094**	0.133*
	(0.023)	(0.027)	(0.043)	(0.078)
Panel B: Grant Receipt				
Grant Receipt	0.227***	0.153***	0.146**	0.203*
	(0.036)	(0.042)	(0.067)	(0.118)
First Stage F-statistic	3,956.1	2,796.4	987.0	312.1
N	5,429	3,903	1,356	428

Notes: *** p<0.01, ** p<0.05, * p<0.1: Standard Errors clustered at the district level are in parenthesis. The dependent variable is log (monthly) income per capita with the top one percent winsorized. The regressions control for wave fixed effects and use a window size of five with oldest members of the household between 55 and 64.

specification where we do not consider grant receipt. Rather, we simply compare the income of households with the oldest member just above and below 60. As we note above, approximately 80 percent of older persons in South Africa qualify for the grant based on the means test and among those who qualify take-up is nearly 90 percent after a few years of eligibility (see Figure 3). Here, we use a window size of five restricting our sample to households where the oldest member is 55-64 years old. In column (1), we report results using the full NIDS sample and find that households whose oldest member is between 60 and 64 report income per capita that is roughly 14 percent higher than similar households whose oldest member is between 55 and 59. In column (2), we restrict our sample to households whose oldest member is between 55 and 64 but also have another member who is a woman who is 18-40 years old. In column (3), we restrict the sample further by focusing on households with women who are pregnant or have given birth in the last three years. Finally, in column (4), we show results with our main perinatal sample of households with women who are pregnant or gave birth in the last six months. The results show clearly that age-eligibility for the grant increases household income per capita in the full NIDS samples and various sub-samples of women.

In Panel B, we use the fuzzy local randomization estimation approach, where we use age-eligibility to instrument for grant receipt as specified in equations (2) and (3). Importantly, the results from the first stage regression in Panel B of Table 1 show that our instrument (i.e., an indicator for the household with an oldest household member just above 60 years old) is relevant and predicts household-level grant receipt. In particu-

lar, the presence of an age-eligible older person significantly increases the likelihood of household-level grant receipt by at least 46 percentage points in our restricted samples. The effective F-statistics presented in Panel B of Table 1 for the first stage are large even in the most restricted sample in column (4). The estimated effect of grant *receipt* on income is larger than those estimated for age-eligibility, as expected, given that these results estimate effects among compliers (i.e., households that are age-eligible for the grant and receive it). For the whole NIDS sample, we estimate a roughly 22 percent increase in household income per capita. In our main perinatal sample of women, we estimate a similar 20 percent increase in household income.

We use a window size of five around the age-eligibility threshold. In support of this choice, we show results with larger and smaller window sizes around the age-eligibility threshold. We specifically test the robustness of our results in columns (1) and (4) of Panel B in Table 1 to a range of window sizes. In Panel A of Figure A.4 in the Supplemental Appendix, we show that point estimates for the full NIDS sample are stable for window sizes as small as two and as large as ten.[17] In Panel B of Figure A.4, we show the estimated effect with our main perinatal sample, households with women who are pregnant or recently gave birth. The estimated coefficients for smaller sample sizes are naturally large and noisy but the point estimates of the grant on household income per capita stabilizes at approximately 20 percent for window sizes of five and above. This figure supports our choice of a window size of five around the age-eligibility threshold as our preferred specification.

One note is important to consider when interpreting these results on household income. The NIDS data does not include information on how income is shared within the household. Other studies show that, among households receiving the Older Person's Grant, overall food consumption increases (Case and Deaton, 1998), reported hunger decreases (Alloush, Bloem and Malacarne, 2024), and life satisfaction improves (Alloush and Wu, 2023) among non-recipient members. Each of these results suggests some sharing of grant income with other household members. Such grant income sharing could extend to women who are pregnant or recently gave birth and could lead to intra-household spillover effects that influence perinatal depression risk.

4.2 Perinatal Depression

We now present our main results on the effect of the grant on perinatal depression. Here we show two sets of results: the first are again akin to an intention-to-treat effect of grant eligibility on perinatal depression. The second show the more specific effect of grant *receipt*

[17] The standard errors fall as the sample size increases for larger windows. For the full NIDS sample, the sample size for the smallest window of two is still 2,159 and the sample size is 10,356 for the largest window of ten.

TABLE 2: Older Person's Grant and Perinatal Depression

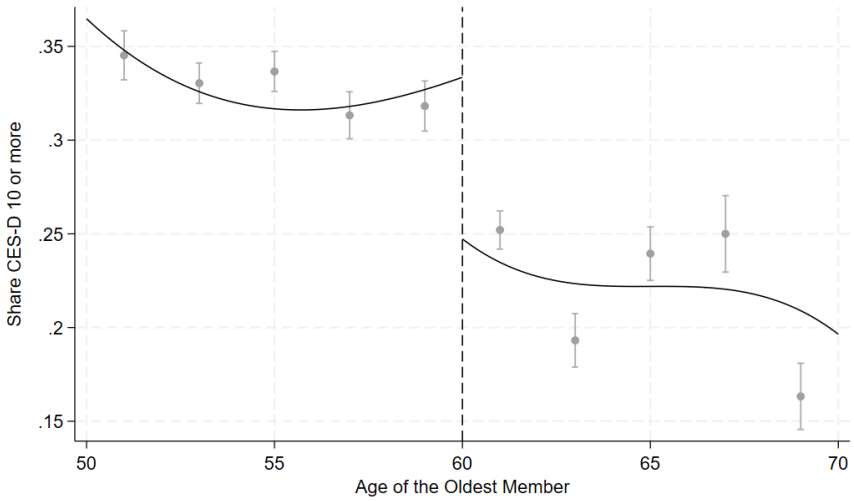
Dependent variable:	CES-D Score≥ 10				
	(1)	(2)	(3)	(4)	(5)
Panel A: Grant Age-Eligibility					
Eligible	-0.099**	-0.102**	-0.098**	-0.100**	-0.104**
	(0.039)	(0.040)	(0.040)	(0.040)	(0.041)
Panel B: Grant Receipt					
Grant Receipt	-0.150***	-0.153***	-0.148**	-0.150***	-0.158***
	(0.057)	(0.059)	(0.059)	(0.058)	(0.059)
First-Stage F-stat	302.1	308.5	293.2	294.0	276.5
Observations	428	428	428	428	428
Survey Wave Fixed Effects	✓	✓	✓	✓	✓
Age Controls		✓	✓	✓	✓
Mother Controls			✓	✓	✓
Household Controls				✓	✓
Region Controls					✓

Notes: *** p<0.01, ** p<0.05, * p<0.1: Cluster robust standard errors in parenthesis. The dependent variable is an indicator variable for depression risk where the CES-D score is ten or above. The regressions control linearly for the Age of the oldest member of the household and use a window size of five with oldest members of the household between 55 and 64.

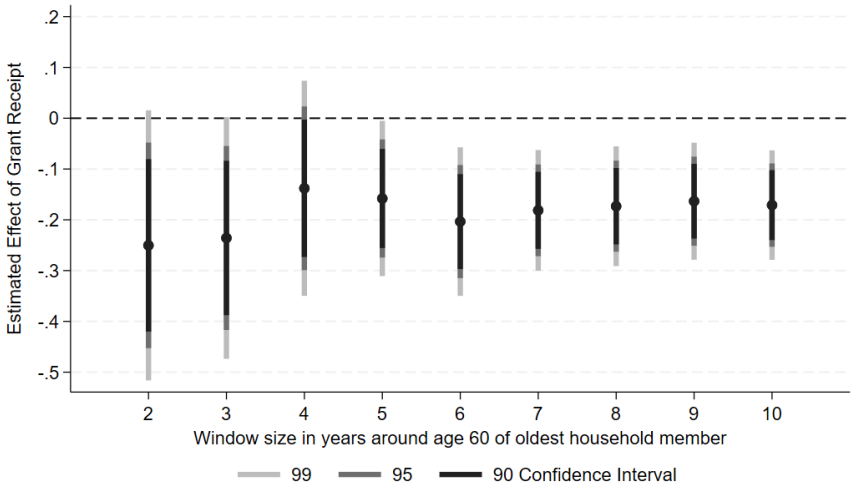
on perinatal depression. In panel A of Table 2, we can see clearly that age-eligibility is associated with an approximately 10 percentage point reduction in depression risk among women who are pregnant or recently gave birth. In column (1), we present our most parsimonious specification with no controls except wave fixed effects. We progressively add controls to our specification including mother, child, and household-level controls. The estimated coefficient is stable despite the relatively small sample size.

In order to more specifically estimate the effect of *receiving* the Older Person's Grant we use the instrumental variable estimation approach specified in equations (2) and (3). Here again we use age-eligibility as an instrument for receipt with the window around the threshold age of 60. The first stage regression in this instrumental variable specification shows strong effects of eligibility on grant receipt where age-eligibility increases probably of grant receipt of over 60 percentage points and effective F-statistics of nearly 300. As expected, the estimated effect of receiving the grant on perinatal depression risk is larger than the estimates of grant eligibility shown in Panel A. The results suggest that grant receipt reduces depression risk by approximately 15 percentage points.

In Table 2, we use a window of five for our sample restricting to women whose oldest household member is between 55 and 64 years old inclusive. In Panel A of Figure 4, we show a plot in the style of a regression discontinuity that illustrates the average rates of perinatal depression risk around the age-eligibility threshold. We see a drop in reported



(A) Rates of Depression Around the Eligibility Threshold.



(B) Effect of Grant Receipt by Window Size Around the Eligibility threshold

FIGURE 4: We show the average rates of perinatal depression risk around the age-eligibility threshold of 60 in bins of size two due to small sample sizes. We then show the estimated effect of grant receipt by window size. We use our specification from column (5) of Table 2 and vary the window size around the age-eligibility age of 60. Despite varying sample sizes, we get point estimates that are consistently between -0.1 and -0.25 indicating a reduction of being at risk of depression. We find a similar reduction in overall CES-D scores in Figure A.6

depression risk suggesting effect sizes similar to what we estimate in Panel A of Table 2. We then show in Panel B of Figure 4 that our estimated effects are robust to our choice of window—the smaller windows with small sample sizes yield larger and more noisy point estimates, but the estimated effect of grant receipt stabilizes between 10 and 20 percentage point reduction with larger windows. This stability in estimates of the grant's effect on perinatal depression risk mirrors the stability in the estimates of the grant's effect on

TABLE 3: Interaction Regression Specification

Dependent variable:	CES-D Score≥ 10				
	(1)	(2)	(3)	(4)	(5)
Eligible	-0.006	-0.008	-0.002	-0.003	-0.000
	(0.022)	(0.023)	(0.023)	(0.025)	(0.023)
Perinatal	0.122***	0.135***	0.136***	0.135***	0.134***
	(0.034)	(0.038)	(0.038)	(0.038)	(0.038)
EligxPerinatal	-0.124***	-0.123***	-0.125***	-0.125***	-0.124***
	(0.040)	(0.040)	(0.040)	(0.040)	(0.041)
Observations	1609	1609	1609	1609	1609
Survey Wave Fixed Effects	✓	✓	✓	✓	✓
Age Controls		✓	✓	✓	✓
Mother Controls			✓	✓	✓
Household Controls				✓	✓
Region Controls					✓

Notes: *** p<0.01, ** p<0.05, * p<0.1: Cluster robust standard errors in parenthesis. The dependent variable is an indicator variable for depression risk where the CES-D score is ten or above. The regressions control linearly for the Age of the oldest member of the household and use a window size of ten with oldest members of the household between 50 and 69. We use the largest window size to increase statistical power for interacted regression specification.

household income per capita shown in Figure A.4 in the Supplemental Appendix.

Effect Magnitude—We now explore the magnitude of these effect estimates by estimating the interaction regression specified in equation (4) using the larger sample of women that includes mothers with older children. We show these results in Table 3. In the first row we report the average change in depression risk for mothers whose youngest child is older than six months old and lives with a grant eligible older person. Among these type of women, we do not find any evidence of differences in reported depression risk associated with grant eligibility. In the second row of Table 3, we find that women who are pregnant or have recently given birth and live in a household where the older person is not yet eligible for the Older Person's Grant are more likely to be at risk of depression. In particular, these perinatal women are between 12 and 14 percentage points more likely to report depressive symptoms beyond the typical threshold used to screen for depression relative to women with older children.[18] Finally in the third row, we find that pregnant women and new mothers residing with an older person who is at least 60 years old, and therefore eligible for the Older Person's Grant, are around 12 percentage points less likely to report depression symptoms exceeding this threshold. Across all rows, these estimates are qualitatively consistent when we add control variables to adjust for age and other mother, household, and region characteristics. These results demonstrate that the magnitude of the effect of grant eligibility is approximately equivalent to the increased

[18]This result is consistent across all window sizes and in alternative samples where we include women whose youngest children are older than 3 or exclude women who gave birth 6 months to 1 or 2 years ago.

risk of depression associated with pregnancy and childbirth in our data.

Generalizability—Our main analytical sample consists of women who are pregnant or have given birth recently living in a household where the oldest member is near age 60. This restricted sample of women is not representative of all women in South Africa. Most often the oldest person in the household is a grandparent or other relatives of the woman. In very rare cases, the older person is the child's father. Our analytical sample of women is poorer, younger, and more rural than a more representative sample of all pregnant women and new mothers in South Africa and the jump in depression risk during perinatal stages is larger in this sample than in the broader sample as we show in Figure A.2 in the Supplemental Appendix. Therefore, our results indicating that the Older Person's Grant reduced reported depression risk should be interpreted with these differences in mind. Specifically, effects among a sample of all pregnant women and new mothers may be smaller than those we estimate in our narrowly defined analytical sample that restricts analysis on households where the oldest member is near age 60. While this discussion does not relate to the internal validity of our results studying spillover effects of Older Person's Grant on the mental health of pregnant women and new mothers, this influences the external validity of our results when considering policy options such as extending South Africa's Child Support Grant to pregnant women. We discuss the appropriate implications of our results in the conclusion section of this paper.

4.3 Possible Mechanisms

We now turn to a discussion of possible mechanisms that could explain our results. While there is a growing literature studying depression among pregnant women and new mothers, the ultimate causes are not well understood, complicating analysis of the specific mechanisms at play in alleviating depressive symptoms. Despite these challenges, several existing studies point to possible mediators for the effect of transfer programs on perinatal depression. First, Okeke (2021) suggests birth outcomes as a mechanism by showing that cash transfers increase the frequency of healthcare visits during pregnancy, which improve birth outcomes and reduce reported depression symptoms. Second, Powell-Jackson et al. (2016) show that cash transfers lead to a reduction in medical debt from hospital births and, in turn, reported depressive symptoms. Third, in a review article on the link between transfers and mental health more generally, Machado, Alves and Patel (2024) list: (i) financial stability, (ii) enhanced nutritional intake, (iii) reduced morbidity, (iv) better schooling outcomes, and (v) improved social contact between the individual and the state as potential mechanisms through which cash transfers improve their recipients' mental health. While each of these mechanisms might seem plausible in our setting, it is important to note that the discussions about these mechanisms in the literature to date is largely descriptive and exploratory, as there is an absence of both necessary data and analytical tools

to identify the specific mechanisms mediating the relationship between cash transfers and measures of mental health—especially among pregnant women and recent mothers.

Next we shift our focus to the Older Person's Grant specifically. The following mechanisms are both well-documented and plausible: First, several studies clearly show that the Older Person's Grant increases overall economic well-being of households with direct recipients. Both Case and Deaton (1998) and Alloush, Bloem and Malacarne (2024) show that the Older Person's Grant increases food expenditures and reduces reported levels of hunger by nearly 50 percent. Recent work by Alloush and Riaz (2026) studies the effect of in utero exposure to the grant on the health of children and finds that these previously reported effects of the grant on food expenditures and a large reduction in food insecurity persist in the sub-set of households with pregnant women.[19] This improvement in both the level of household income and its stability may be important factors leading to better mental health outcomes among household residents including pregnant women and recent mothers who have elevated levels of depression risk.

There are other non-financial mechanisms through which this particular grant could influence perinatal depression risk. Several studies find evidence of grant receipt leads to shifts in labor market participation, with (Ranchhod, 2006) finding increased employment among working-age men, while others find either reductions in hours worked (Abel, 2019; Bertrand, Mullainathan and Miller, 2003) or null effects (Jensen, 2004). An ability to reduce labor supply as needed may be a mechanism through which the Older Person's Grant (and other cash transfer programs) may affect perinatal depression.[20] Moreover, a reduction in the labor supply of the older person directly receiving the grant could allow them to shift their time use and help co-resident women during pregnancy and after delivery (Aguiar and Hurst, 2005; Tanskanen et al., 2021).[21] Furthermore, Edmonds, Mammen and Miller (2005) find evidence that receiving the Older Person's Grant change the composition households and Ambler (2016) identifies changes in bargaining power. While the estimated average household compositional changes are small, additional adults in the

[19]This study uses a much larger sample from the General Household Survey and detailed questions on food insecurity to show a large of effect of the grant and several measures of food insecurity and nutrition. Evidence generated by studying the Supplemental Nutrition Assistance Program (SNAP) in the United States shows that food insecurity is associated with poor mental health and improvement in the former alleviates depressive symptoms (Bergmans et al., 2018; Evans et al., 2024). Similar results showing the adverse psychological consequences of experiencing food insecurity hold in Lebanon (Alloush and Bloem, 2022).

[20]Related to labor supply reduction among parents, a systematic review of parental leave policies suggest strong effects on mental health especially among women Heshmati, Honkaniemi and Juárez (2023); Wells et al. (2025); Bullinger (2019). This improvement in maternal mental health may be attributed to parents getting more time to cope with the demands of parenting and for increased engagement with children (Bullinger, 2019).

[21]Labor supply among older people just below the age-eligibility threshold of 60 is low in South Africa, especially among women. In our sample, we find that a reduction in labor supply at age 60 occurs discontinuously only for women near the age-eligibility threshold. However, when we estimate the effect of grant receipt by the gender of the older person, we find point estimates that are slightly larger when the recipient in a man. Nonetheless, the observed reductions in labor supply at age 60 are small likely because grant receipt is not directly dependent on retirement.

household could potentially lead to increased contributions to household public goods and taking care of other children. Increased bargaining power among the recipients of the Older Person's Grant may lead to household dynamics that improve the living conditions of the relevant women.

The results discussed here from the existing literature help illustrate the likely factors that play a role in facilitating the relationship between household receipt of the grant and reduced perinatal depression risk. It is plausible that the following takes place: the additional financial resources from the Older Person's Grant allow the older person the freedom to both take care of themselves and others within their household, in large part, by purchasing more food and reducing the risk that members of their household experience hunger. We show that financial support, provided via an ongoing social protection program, can limit adverse changes in mental health associated with pregnancy and childbirth.

5 Sensitivity and Robustness Checks

In this section, we test the sensitivity and robustness of our results to different specification choices and address possible sources of bias. First, we address concerns about endogenous household formation, including possible endogeneity in fertility, with three distinct tests. Second, we account for possible effects of South Africa's Child Support Grant by restricting the sample to only include women who are likely not current recipients of the Child Support Grant. Third, we account for potential bias driven by child mortality by excluding women from our sample whose child died after birth. Fourth, we report results that vary the postpartum duration period and find that our results are not sensitive to our choice of six months. Fifth, we differentiate between women who are pregnant vs. those who are postpartum and find larger results among women who are postpartum. Finally, we show results for different CES-D thresholds defining depression risk and find qualitatively consistent results with these alternative thresholds. We summarize the these results in Figure 5 by plotting the estimated effects of grant receipt on perinatal depression risk for each sensitivity or robustness check and find that each of these checks support our main qualitative finding that the Older Person's grant reduces the risk of perinatal depression.[22]

A. Endogenous Household Formation—Previous studies on South Africa's Older Person's Grant show that grant receipt might encourage other family members to live with the older person and fundamentally change the composition of the household (Edmonds, Mammen and Miller, 2005; Hamoudi and Thomas, 2014). Our estimation strategy relies on the as-

[22]Figure 5 reports estimates using our preferred specification with a five year window on each side of the age-eligibility threshold. Figure A.7 in the Supplemental Appendix shows results are qualitatively similar for two and ten year windows around the age-eligibility threshold, though the results are less stable for the two year window given the small sample size.

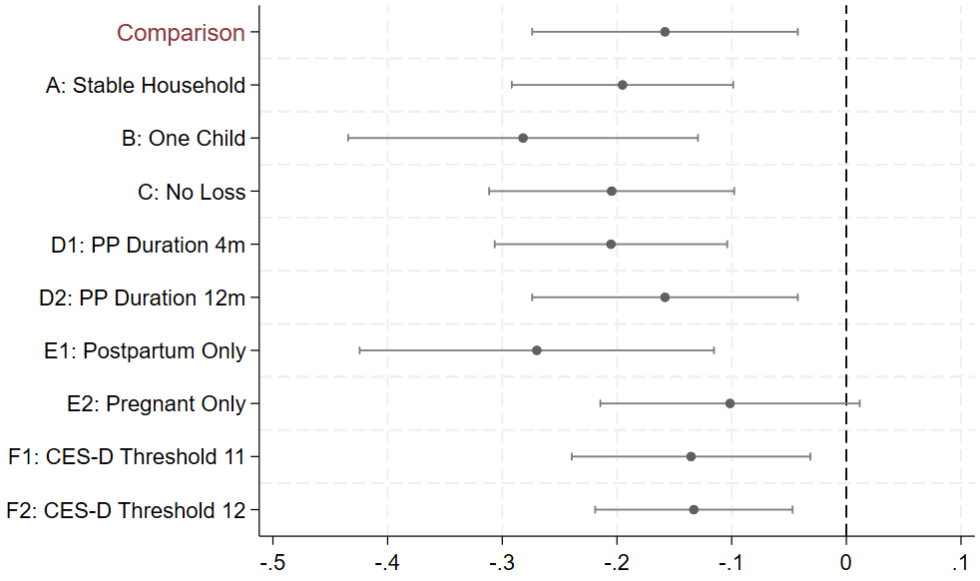


FIGURE 5: Estimated coefficients on grant receipt are plotted for the 5 year window around the threshold. We find the consistent result that grant receipt lowers depressive symptoms among pregnant women and new mothers. The coefficients are numbered in accordance with the section numbers below.

sumption that grant receipt is dictated by the age-eligibility of the oldest person within the household and is as-if random in the window around the age-eligibility threshold. Possible endogenous behavior of expecting or new mothers, such as joining an older person's household or strategically timing their pregnancies around grant eligibility, would violate this assumption. That is, if the decision to choose where to live when pregnant is influenced by grant eligibility, then the estimator in our empirical approach may be biased.

We address these concerns in three ways. First, the McCrary test discussed above suggests that there is no sorting of new mothers around the age-eligibility threshold which partly alleviates this concern. Second, we show in Figure A.8 in the Supplemental Appendix that there is no evidence that the fertility rate among women changes when the oldest household member turns 60 years old. This result mirrors findings of balance in pregnancy on either side of the age-eligibility threshold shown in Tables A.2, A.3, and A.4. Third, we directly test the robustness of our results to possible endogenous household formation by re-estimating our main specification with a restricted sample of women and the relevant older person who have been living in the same household for at least two years prior to the survey observation. This restricted sample, therefore, only includes households with a stable set of household members for the two years prior to survey enumeration (except for, of course, the birth of a child). We find qualitatively similar results with this restricted sample shown in Figure 5 in the "A: Stable Household" row.

B. Child Support Grant—As discussed above, South Africa has an existing program that

aims to provide financial support to households with children. The presence of this program potentially confounds our results. Two factors, however, lead us to believe that the potential for bias from the Child Support Grant is small and likely indistinguishable from zero. First, Tables A.2 shows that the number of children, household size, and probability of pregnancy are balanced across the age-eligibility threshold in the smaller window. This suggests that any additional financial support coming from the Child Support Grant is also likely to be balanced across the age-eligibility threshold for the Older Person's Grant. Second, as noted above, since the Child Support Grant requires the birth of a child as an eligibility criteria there are practical administrative delays in processing this information that lead to a lag in receipt of the Child Support Grant in the first few months after the birth of a child (Luthuli et al., 2022). Therefore, focusing our analysis on pregnant women and mothers who have had a birth just six months prior limits the possible overlap with financial support from the Child Support Grant.

If a woman has multiple children, however, then support from the Child Support Grant could interfere with the estimated effect of the Older Person's Grant. In the results presented so far, we control for Child Support Grant receipt at the household level and find that the results are not sensitive to the inclusion or exclusion of this variable. To further ameliorate concerns, we also show results for the sub-sample of mothers who only have one child or are pregnant with their first child in Figure 5 in the "B. One Child" row. We find somewhat larger estimates in the sub-sample of women who are either pregnant with their first child or only have one child suggesting that, if anything, the Child Support Grant may be attenuating our main results. However, it may be that the impact of the Older Person's Grant is larger among first time and/or younger mothers.

C. Child Mortality—In our main results, we do not distinguish women who have lost their child either during pregnancy, childbirth, or in the first few months after childbirth. These women might be more prone to depressive symptoms than other women. For example, in our data, women who have experienced a death of a child have an average CES-D score of 8.4 compared to an average score of 7.1 for women who did not experience such a loss. In our perinatal sample of women, approximately 10 percent of women report that they have experienced the death of a child. To test whether child mortality influences our results, we re-estimate our main results by excluding women who report that they have experienced a death of one of their children. In the "C. No Loss" row of Figure 5, we find that our main findings are qualitatively equivalent when restricting our sample to only include mothers who have not experienced a death of their child.

D. Postpartum Duration—The duration of postpartum depression is not definitive and may vary across individuals. To test the sensitivity of our results to the definition of "postpartum" as six months after childbirth, we expand our definition of a new mother to include a woman who had a child in the past four months and one year, respectively. The

"D1: PP Duration 4m" and "D2: PP Duration 12m" rows in Figure 5 show that that varying the definition of postpartum does not change our results in a meaningful way. If anything, including mothers with children up to one year old leads to smaller effect estimates, but this difference is small.

E. Pre- vs. Post-Delivery—Throughout the analysis so far we define our analytical sample as women who are pregnant or who gave birth in the previous six months. We now show results where we estimate results for pregnant women and new mothers separately. We find that the effect of the grant persists both pre- and post-delivery, but the estimated impact of the Older Person's Grant is larger among new mothers than among pregnant women. Specifically, the "E1: Postpartum Only" row of Figure 5 shows a relatively large effect of grant receipt on the depression risk, whereas the "E2: Pregnant Only" row shows a slightly smaller and statistically insignificant effect, though the magnitude of each of these point estimates is qualitatively consistent with the estimate using our main perinatal sample.

F. Threshold Score for depression risk—In our main results we use a binary indicator of depression risk identifying if the respondent reported a CES-D score that is equal to ten or above. This definition follows previous research that aims to validate a critical threshold in the CES-D score to screen for depression and finds that a threshold of ten effectively satisfies a trade-off between sensitivity and specificity in detecting major depressive disorder (Andresen et al., 1994).[23] While we show that the CES-D score itself shows significant decline due to the grant in Figure A.6 in the Supplemental Appendix, other possible critical thresholds validated for use in South Africa are either 11 or 12 (Baron, Davies and Lund, 2017). We present results for these alternative threshold values defining depression risk in rows "F1: CES-D Threshold 11" and "F2: CES-D Threshold 12" in Figure 5 and we find qualitatively similar results showing that the Older Person's Grant reduces perinatal depression risk.

6 Conclusion

We estimate the effect of a large monthly cash transfer on perinatal depression risk. We document that, in our data, women who are either pregnant or have had a birth in the last six months show higher levels of depression risk compared to other women. When these women happen to be living with an older person who is age-eligible for the Older Person's Grant, however, we find evidence of a reduction in the risk of perinatal depression

[23]Sensitivity of screening using CES-D is based on the ability of the test to misdiagnose depression risk—i.e., getting a score below ten when the person has a major depressive disorder. A test with high sensitivity has high negative predictive value such that getting a score below the threshold is a good indication a person is not depressed. Specificity relates to the positive predictive value of a test—the more specific a threshold, the more likely it is that someone with a score above the threshold is actually suffering from depression.

associated with pregnancy and childbirth. We add to the growing literature on the intra-household spillover effects of South Africa's flagship social protection program: the Older Person's Grant. Moreover, these results demonstrate that social protection programs, that are already operating at scale, can play an important role in supporting maternal mental health both during pregnancy and in the first few months after the birth of a child.

To estimate these results, we leverage the age-eligibility rule of the Older Person's Grant which allows individuals over the age of 60 to qualify for the grant. Specifically, we compare measures of perinatal depression risk of women living in households where the oldest member of the household is close to the age-eligibility threshold. We show that our results are robust to different windows around the age-eligibility threshold, inclusion of a host of control variables, as well as to a litany of sensitivity and robustness checks that aim to alleviate concerns regarding endogenous household formation and fertility choices. While the idiosyncrasies of this specific program and its targeting of older people may limit its generalizability to other cash transfer programs, our results at least shed light on additional benefits of the Older Person's Grant on perinatal depression, affecting nearly a quarter of a million women in South Africa per year.

These results are important because understanding how to best address and reduce depression risk is critical given the frequency in which it is experienced (WHO, 2023) and the subsequent socio-economic consequences experiencing depression can generate (McGovern, Rokicki and Reichman, 2022; Rokicki et al., 2022). This is all especially true among women who are pregnant and have recently given birth given the possible inter-generational transmission of these socio-economic consequences (Parsons et al., 2012; Dadi, Miller and Mwanri, 2020; Eyal and Burns, 2019). Moreover, learning about how existing social protection programs with wide reach may play a role in supporting mental health is critical from a public policy perspective for at least two reasons. First, while existing research clearly demonstrates how carefully targeted interventions can help alleviate post-partum depression, depression is challenging to diagnose and timely interventions are difficult to implement at scale, especially in low- and middle-income countries. Thus, supply- and demand-side constraints on existing healthcare systems that limit access to targeted psychotherapy interventions motivate alternative ways that may represent effective means to reduce depression risk among vulnerable populations. Second, the typical policy approach to provide financial resources to support the care of children targets parents of children and requires the birth of a child as an eligibility criteria, often adding to a long list of administrative demands in the first few weeks after the birth of a child. For example, South Africa's Child Support Grant often does not reach households until several months after the birth of a child. Our results indicate that providing this support immediately after the birth of a child, and perhaps during pregnancy, can lead to meaningful benefits in limiting the increased risk of depression. These results, therefore, carry impli-

cations for social protection policies, such as South Africa's Child Support Grant or other large-scale social protection programs.

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Supplemental Appendix

Figures

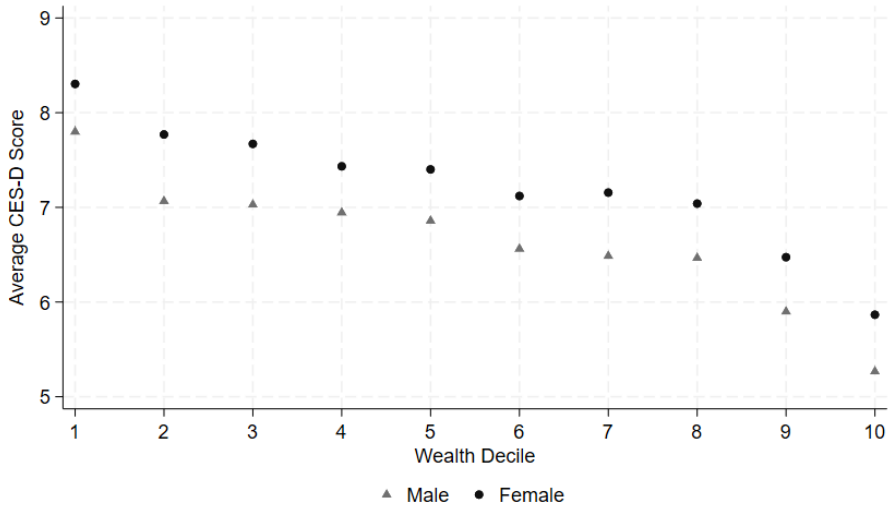


FIGURE A.1: Total CESD-10 Score averaged across wealth deciles for men and women

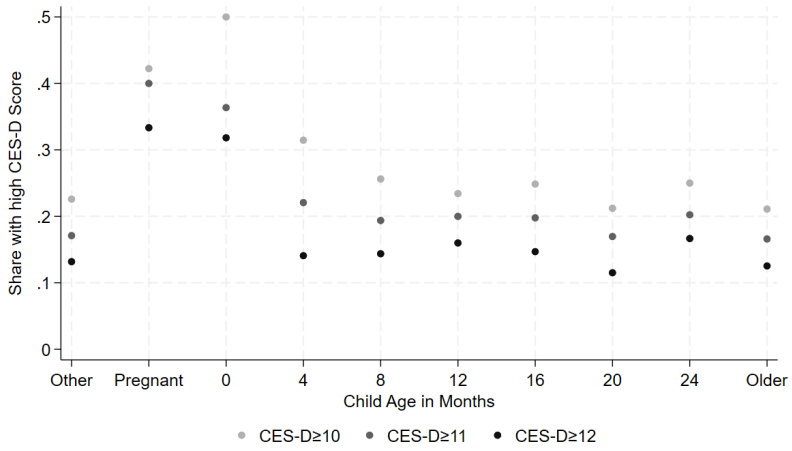


FIGURE A.2: Mothers' Depression Risk Relative to their Child's Birth—Depressive symptoms spike during pregnancy and decline slowly after the birth of their child. "Other" is women with no children and Older is women who are not currently pregnant and gave birth more than 24 months before the survey date. This figure uses a sample of households with an older person near 60 years old and complements the full sample results shown in Figure 2.

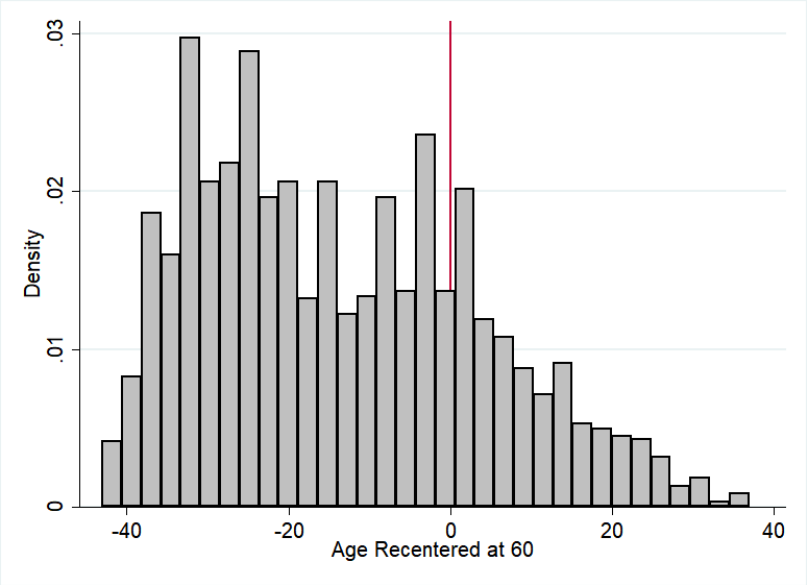
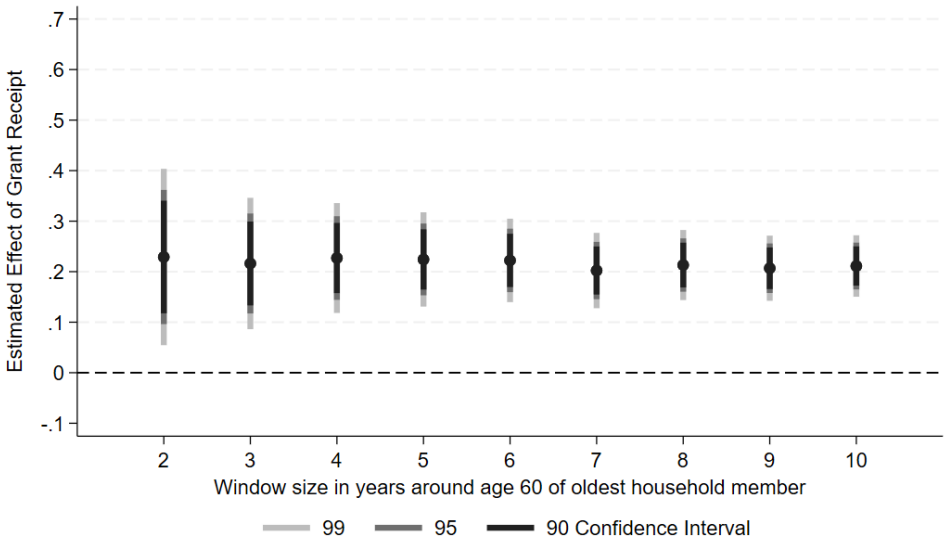
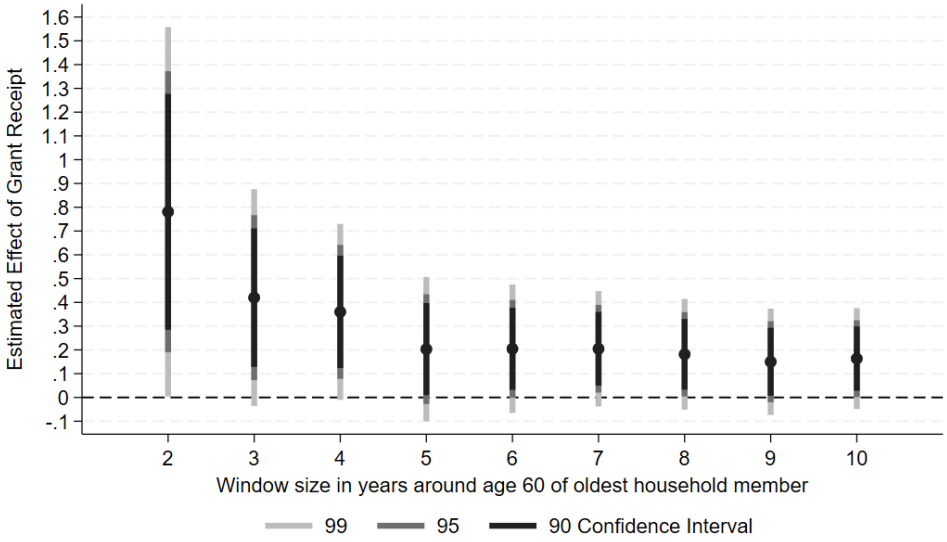


FIGURE A.3: There is no evidence of manipulation around the threshold.



(A) Full NIDS Sample



(B) Main Perinatal Sample

FIGURE A.4: The estimated effect of grant receipt on log of household income per capita by different window sizes around age 60

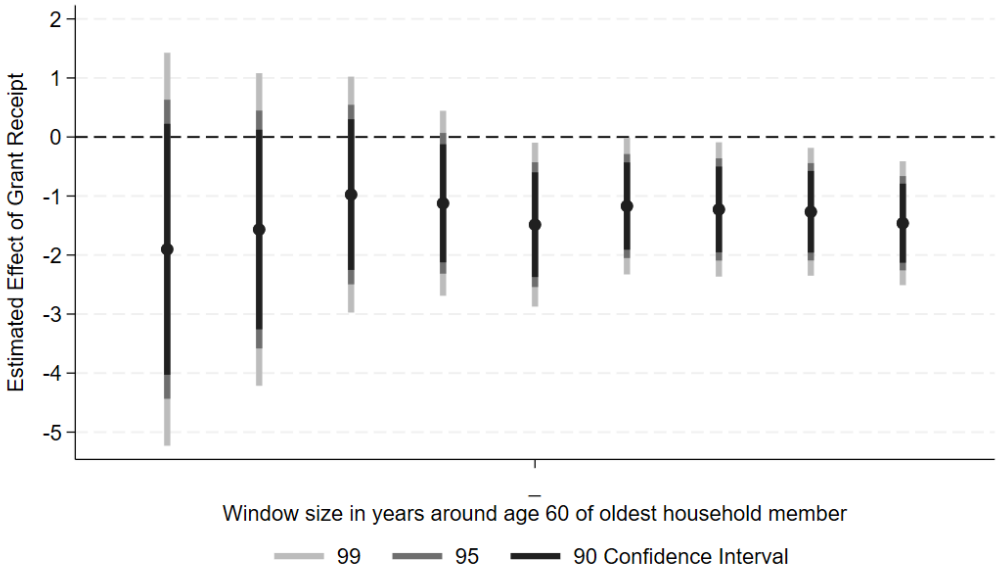


FIGURE A.5: Estimated effect of grant receipt by window size. We use our specification from column (5) of Table 2 and vary the window size around the age-eligibility age of 60. Despite varying sample sizes, we get point estimates that are consistently between 1 and 2 point reduction in CES-D score indicating a reduction depression symptoms.

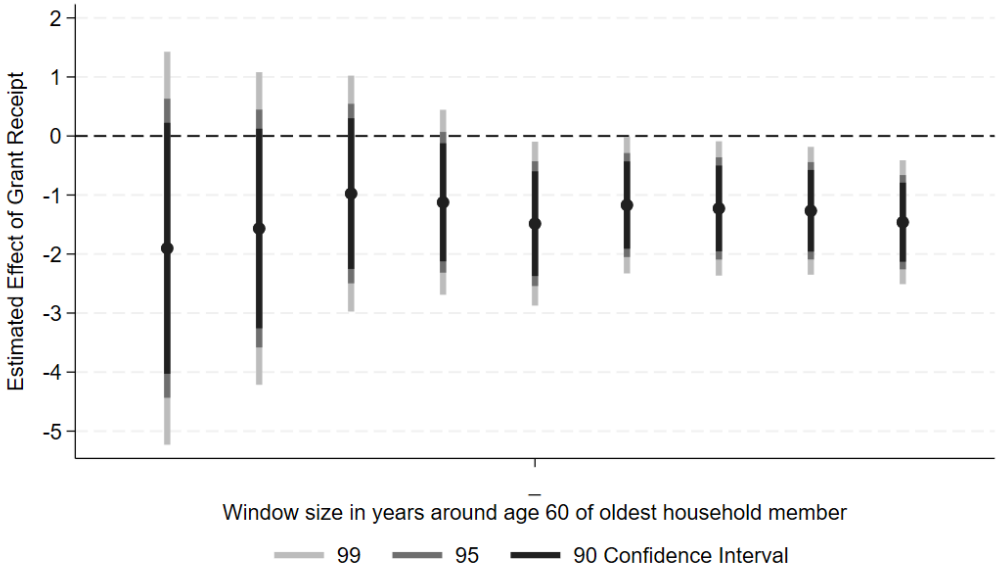


FIGURE A.6: Estimated effect of grant receipt on CES-D score by window size. We use our specification from column (5) of Table 2 and vary the window size around the age-eligibility age of 60. Despite varying sample sizes, we get point estimates that are consistently between -1 and -2 indicating a reduction in depression symptoms leading to a reduction in depression risk seen in Figure 4.

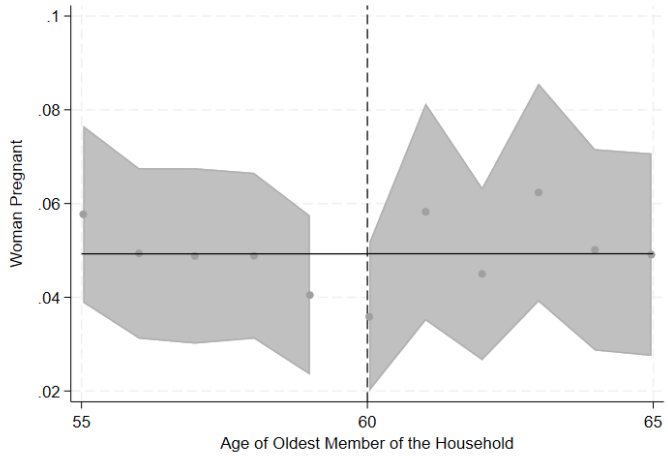
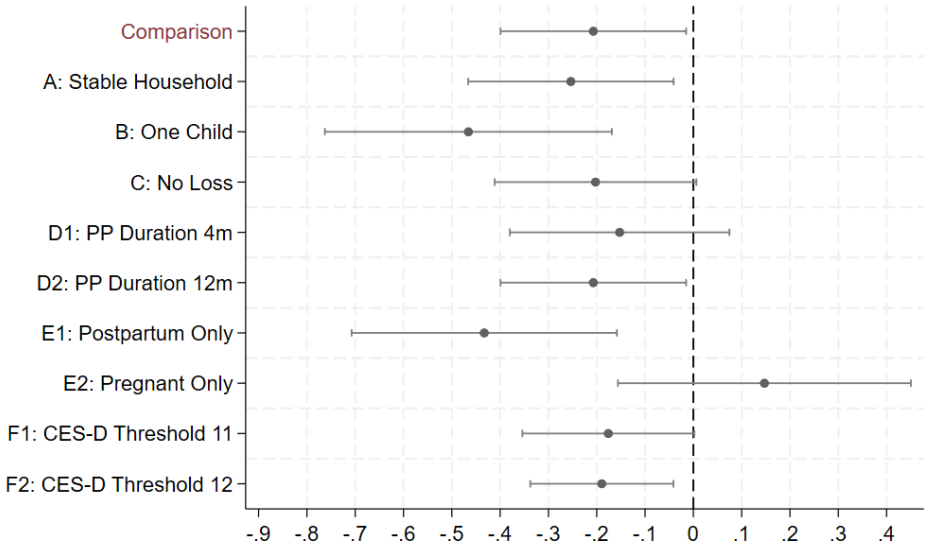
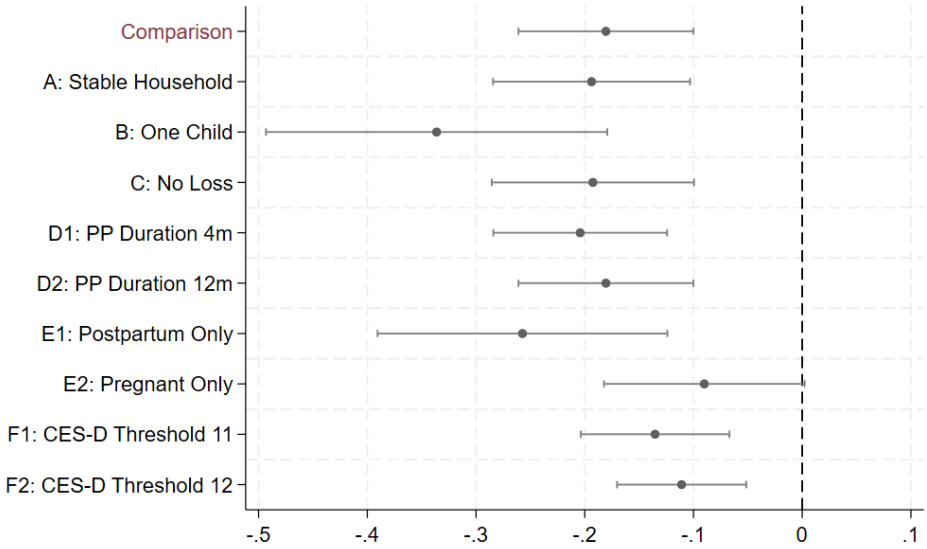


FIGURE A.8: No Evidence that Fertility increases when the Oldest member turns 60.



(A) Window size of 2.



(B) Window size of 10.

FIGURE A.7: We show robustness results with varied window sizes.

Tables

TABLE A.1: CESD-10 Questionnaire. The table shows the ten questions asked in the NIDS Survey to calculate the CESD-10 Score. For each emotion, individuals are asked how often they felt or experienced it in the past one week and a scoring has been assigned to the frequency such that a higher score corresponds to a more frequent experience of negative and difficult emotions. Two out of the ten emotions are positive for which the scoring is reversed.

In the past week	Rarely or none of the time	Some or little of the time	Occasionally	Most or all of the time
I was bothered by things that usually dont bother me	0	1	2	3
I felt depressed	0	1	2	3
I felt lonely	0	1	2	3
I was bothered by things that usually dont bother me	0	1	2	3
I felt that everything I did was an effort	0	1	2	3
I felt hopeful about the future	3	2	1	0
I felt fearful	0	1	2	3
My sleep was restless	0	1	2	3
I was happy	3	2	1	0
I could not get going	0	1	2	3

TABLE A.2: Balance Across Eligibility Status—Window Size Two

	(1) 58-59	(2) 60-61	(3) (1) vs. (2), p-value
Age	25.154	25.291	0.868
	(0.532)	(0.640)	
Pregnant	0.473	0.481	0.913
	(0.053)	(0.057)	
Black	0.868	0.823	0.416
	(0.036)	(0.043)	
Married	0.132	0.139	0.889
	(0.036)	(0.039)	
Death of any child	0.110	0.089	0.647
	(0.033)	(0.032)	
Employed	0.165	0.177	0.832
	(0.039)	(0.043)	
Education: Secondary	0.648	0.684	0.630
	(0.050)	(0.053)	
Household (HH) Size	7.912	7.772	0.778
	(0.337)	(0.365)	
HH Number of Children	2.945	3.165	0.474
	(0.195)	(0.239)	
HH receives Child Support Grant	0.692	0.658	0.638
	(0.049)	(0.054)	
HH rooms per person	0.697	0.742	0.436
	(0.038)	(0.042)	
HH Urban	0.571	0.506	0.399
	(0.052)	(0.057)	
HH death in last two years	0.165	0.165	0.996
	(0.039)	(0.042)	
HH age of oldest member	58.637	60.633	0.000
	(0.136)	(0.105)	
HH receives OPG	0.198	0.646	0.000
	(0.042)	(0.054)	
N	91	79	

Notes: The value displayed for t-tests are p-values. We compare all women in the regression sample to the left and right of the threshold in a 2-year window that is for the older person's age range of 58 to 61. Note that "Black African" is a the majority ethnic group in South Africa and includes sub-groups such as Zulu, Xhosa, Sotho, and Tswana. The last two rows are variables we expect to change across the threshold eligibility age of 60.

TABLE A.3: Balance Across Eligibility Status—Window Size Five

	(1) 55-59	(2) 60-64	(3) (1) vs. (2), p-value
Age	25.276	25.633	0.492
	(0.342)	(0.392)	
pregnant	0.507	0.473	0.491
	(0.034)	(0.035)	
Black	0.878	0.845	0.332
	(0.022)	(0.025)	
Married	0.167	0.174	0.859
	(0.025)	(0.026)	
Death of any child	0.086	0.097	0.703
	(0.019)	(0.021)	
Employed	0.172	0.208	0.346
	(0.025)	(0.028)	
Education: Secondary	0.683	0.691	0.866
	(0.031)	(0.032)	
Household (HH) Size	7.624	8.029	0.229
	(0.220)	(0.256)	
HH Number of Children	2.783	3.338	0.005
	(0.117)	(0.158)	
HH receives Child Support Grant	0.710	0.744	0.438
	(0.031)	(0.030)	
HH rooms per person	0.768	0.741	0.503
	(0.030)	(0.027)	
HH Urban	0.543	0.444	0.042
	(0.034)	(0.035)	
HH death in last two years	0.158	0.164	0.869
	(0.025)	(0.026)	
HH age of oldest member	57.158	62.159	0.000
	(0.118)	(0.113)	
HH receives OPG	0.113	0.773	0.000
	(0.021)	(0.029)	
N	221	207	

Notes: The value displayed for t-tests are p-values. We compare all women in the regression sample to the left and right of the threshold in a 5-year window that is for the older person's age range of 55 to 64. Note that "Black African" is a the majority ethnic group in South Africa and includes sub-groups such as Zulu, Xhosa, Sotho, and Tswana. The last two rows are variables we expect to change across the threshold eligibility age of 60.

TABLE A.4: Balance Across Eligibility Status (wider sample)—Window Size Five

	(1) 55-59	(2) 60-64	(3) (1) vs. (2), p-value
HH: Pregnancy	0.063	0.062	0.971
	(0.008)	(0.008)	
Black	0.832	0.830	0.921
	(0.012)	(0.013)	
Household (HH) Size	5.819	6.186	0.006
	(0.086)	(0.104)	
HH Number of Children	1.776	2.039	0.001
	(0.051)	(0.065)	
HH receives Child Support Grant	0.519	0.537	0.429
	(0.016)	(0.017)	
HH rooms per person	0.959	0.996	0.193
	(0.020)	(0.021)	
HH Urban	0.586	0.512	0.001
	(0.015)	(0.017)	
HH death in last two years	0.098	0.108	0.474
	(0.009)	(0.010)	
HH age of oldest member	57.099	62.042	0.000
	(0.049)	(0.055)	
HH receives OPG	0.090	0.743	0.000
	(0.009)	(0.015)	
N	1022	900	

Notes: The value displayed for t-tests are p-values. We compare households with at least one woman between 18 and 40 to the left and right of the threshold in a 5-year window that is for the older person's age range of 55 to 64. Note that "Black African" is a the majority ethnic group in South Africa and includes sub-groups such as Zulu, Xhosa, Sotho, and Tswana. The last two rows are variables we expect to change across the threshold eligibility age of 60.