



# **The parent trap: Cash transfers and the intergenerational transmission of depression in South Africa**

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Katherine Eyal and Justine Burns

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# **The parent trap: Cash transfers and the intergenerational transmission of depression in South Africa**

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## **Abstract**

Mental illness and substance abuse makes up the leading cause of disability among adolescents around the world, and yet adolescent mental health is an understudied area in developing countries. This is partly due to a lack of high quality nationally representative data on the prevalence of mental illness, in particular, in low-income countries. The impact of mental illness in adolescence is particularly problematic, given the formative nature of this period. This paper provides the first nationally representative estimates of the intergenerational transmission of depression in South Africa, and in Sub-Saharan Africa. Using a longitudinal household survey, we find that one-third of South African children will suffer from depression if either parent suffers from depression - and that parental mental health is the single largest determinant of child mental health. The nature of the intergenerational transmission of transmission, and its key determinants, have not been studied in-depth. While studies exist, which examine the impact of cash transfers on depression, research on the impact of cash transfers on the intergenerational transmission of depression is limited. We use exogenous variation in the roll-out pattern of an unconditional cash transfer in South Africa and find that cash transfer receipt can have a large impact on the intergenerational transmission of depression. Our estimates show that the South African child support grant reduces the intergenerational transmission of depression to teenage children by more than forty percent.

# 1 Introduction

Many social security programs have been introduced in developing countries in the past two decades (Adato, de la Briere, Mindek & Quisumbing 2000, Filmer & Schady 2011, Baird, McIntosh & Özler 2009, De Brauw & Hoddinott 2011). A large number of program evaluations have found positive impacts of cash transfers on household poverty, education levels, job search and child health and nutritional outcomes (Adato & Bassett 2009, Adato et al. 2000, Baird, Chirwa, De Hoop & Özler 2014, Attanasio & Lechene 2002). Cash transfers have been seen to be especially important for the welfare of women and girls (Baird, Chirwa, De Hoop & Özler 2014, Amarante, Ferrando & Vigorito 2011).

However, literature analysing the impact of cash transfers on older children, and their mothers, is limited compared to that analysing younger children. In particular, the impact of cash transfers on the mental health of adolescents and their parents is under-studied<sup>1</sup>. This is unfortunate, as mental illness constituted fourteen percent of the global burden of disease in 2007 (Prince, Patel, Saxena, Maj, Maselko, Phillips & Rahman 2007), is among the leading burden of disease for adolescents (Baird, De Hoop & Özler 2013), and is forecast to be the second highest cause of health disability by 2020 (Blas & Kurup 2010). South Africa is no exception to this particular health problem; estimates of teen depression in South Africa range between thirteen and fifteen percent (Myer, Stein, Jackson, Herman, Seedat & Williams 2009, Plüddemann, Morojele, Myers, Townsend, Lombard, Williams, Carney & Nel 2014).

A large literature exists describing the relationship in South Africa between receipt

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<sup>1</sup>In a considerable quantity of the cash transfer program evaluation literature, tangible outcomes are most often assessed, such as schooling outcomes, physical health and labor market participation. Many of these programs are implemented as randomized controlled trials, which are very often only evaluated in the short term. By economic necessity, these trials are often limited to smaller samples, and can suffer from high attrition. The conclusions of these program evaluations may be less generalizable to the general population. Evaluations of the cumulative impacts of long term cash transfer receipt are also lacking in this literature.

of its child support grant (CSG) and improved physical outcomes such as child nutrition, health, and development, and reduced child labor and household poverty (Budlender, Burns & Woolard 2008, Samson, Heinrich, Williams, Kaniki, Muzondo, Mac Quene & Van Niekerk 2008, Aguero, Carter & Woolard 2009, Hochfeld 2013, Boler 2007, Department of Social Development 2012, Leibbrandt, Woolard, Finn, Argent et al. 2010), but the potential link between adolescent mental health and grant receipt has not been explored.

## **1.1 The Burden Of Mental Illness**

Individuals living in poverty, and suffering from physical illness, often display high levels of mental illness as well. This fact has been largely ignored in public health research (Lund 2012, Prince et al. 2007, Blas & Kurup 2010, Plageron, Patel, Harpham, Kielmann & Mathee 2011), in particular in low and middle income countries (Chhagan, Mellins, Kauchali, Craib, Taylor, Kvalsvig & Davidson 2014). The mental health of adolescents in particular has been neglected as an area of study in developing countries, including South Africa (Plüddemann et al. 2014), despite the increasing incidence of mental illness and suicide among adolescents in many countries (Baird et al. 2013, Li, Phillips, Zhang, Xu & Yang 2008), and the high levels of mental illness among South African teens in particular. Mental health did not form one of the Millennium Development Goals for 2015, despite the large contribution of mental illness to the global burden of disease among adults and adolescents, and the complicated link which exists between mental illness and many of the millennium development goals, such as female empowerment, child mortality reductions, HIV/AIDS, and others (Chhagan et al. 2014, Prince et al. 2007, Tsai & Tomlinson 2012, Lund 2012, Marais, Sharp, Pappin, Rani, Skinner, Lenka, Cloete & Serekoane 2014).

A fairly limited literature exists in lower and middle income countries on maternal mental health, and its link with child development (Moultrie & Kleintjes 2006, Chhagan et al. 2014). Maternal mental illness can have numerous negative effects on physical child outcomes, such as poor nutrition, diarrheal disease, low vaccination rates, and limited breastfeeding<sup>2</sup> (Lund 2012, Prince et al. 2007, Tsai & Tomlinson 2012). In addition to child outcomes, mental illness negatively impacts on adults, resulting in reduced earnings and productivity (Hugo, Boshoff, Traut, Zungu-Dirwayi & Stein 2003), and high co-morbidity with physical illnesses<sup>3</sup>

It is in adolescence that important relationships are formed, decisions about further education are made, and first jobs are sought (Baird et al. 2013, Kilburn, Thirumurthy, Halpern, Pettifor & Handa 2015), and poor mental health during this time<sup>4</sup> negatively impacts these important decisions (Viner, Ozer, Denny, Marmot, Resnick, Fatusi & Currie 2012). Risky behavior among teens (especially boys) is more commonly observed in those suffering from depression (Li et al. 2008, Ensminger, Hanson, Riley & Juon 2003, Baird et al. 2013, Resnick, Catalano, Sawyer, Viner & Patton 2012, Plüddemann et al. 2014), as is poorer school attendance and educational achievement, worse physical health, and higher rates of HIV and early child bearing<sup>5</sup> (Bhana, Mellins, Petersen, Alicea, Myeza, Holst, Abrams, John, Chhagan, Nestadt et al. 2014, Hammen, Brennan & Le Brocque 2011).

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<sup>2</sup>These effects of maternal mental illness have been found in Pakistan, India, Vietnam, Barbados and other countries (Prince et al. 2007).

<sup>3</sup>These include cardiovascular disease, strokes, obesity, smoking, diabetes complications, hypertension, lowered immunity (Prince et al. 2007), substance abuse (Blas & Kurup 2010), lowered immunity and reduced brain function and brain matter (Sapolsky 2000). Research has shown depression very often predates these conditions (Prince et al. 2007).

<sup>4</sup>Behaviors begun in adolescence contribute to a large proportion of adult health levels (WHO 2009), and approximately half of all mood disorders begin at the age of fifteen (Kessler, Amminger, Aguilar-Gaxiola, Alonso, Lee & Ustun 2007).

<sup>5</sup>These negative outcomes have been observed among depressed youth in Malawi, America, the United Kingdom, Canada and New Zealand (Baird et al. 2013, Anderson, Case & Lam 2001, Beecham 2014, Anderson, Cesur & Tekin 2012, Currie & Stabile 2007).

Girls often have significantly higher rates of depression than boys (Ensminger et al. 2003, Plüddemann et al. 2014), as do women<sup>6</sup> compared to men (Cyranowski, Frank, Young & Shear 2000, Hammen et al. 2011).

## 1.2 The Cycle Continues

Maternal mental illness affects not only the physical health of their children, but also their mental health. The younger the child is when the mother's depression manifests, the more likely they are to suffer from depression themselves (Kessler et al. 2007, Hammen et al. 2011, Garber & Cole 2010, Ensminger et al. 2003). Mental health transmission is related to genetic *and* environmental factors<sup>7</sup>, and thus which factor plays a larger role in transmission is often examined in the literature, as well as the size of the intergenerational transmission effect.

The size of this effect differs across countries and age groups, but is never small. In Australia, rates of depression among the children of depressed mothers have been seen to be three to four times higher than the rates among children whose mothers are not depressed (Hammen et al. 2011, Hammen et al. 2012). In America the corresponding figure is 1.3 times higher (Akbulut & Kugler 2007), and in Denmark, five times higher (Strauss & Thomas 2007), and in a sample of Australian teens, twice as high (Hammen, Brennan & Shih 2004). In five major studies of the genetic transmission of depression, Sullivan, Neale & Kendler (2000) find that the risk of suffering from depression if a

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<sup>6</sup>This fact has been documented in many countries, and in South Africa (Ardington & Case 2009, Chhagan et al. 2014, Lund, Myer, Stein, Williams & Flisher 2013, Hamad, Fernald, Karlan & Zinman 2008). Rates of depression peak among women during the childbearing years in particular (Ozer, Fernald, Weber, Flynn & VanderWeele 2011).

<sup>7</sup>Individuals may have a strong genetic predisposition to depression inherited from their parents, but in the absence of environmental stressors, this may not manifest as worsened mental health. Conversely, teens may suffer from depression even without a genetic predisposition, if they are subject to the same negative environmental factors (such as financial stress, domestic violence or divorce) which have impacted negatively on their mother's mental health (Hammen, Hazel, Brennan & Najman 2012, Ensminger et al. 2003).

first degree relative suffered from depression was nearly three times the normal rate of depression.

### 1.3 Cash Transfers and Adolescent Depression

Lower socio-economic status has been frequently tied to worse mental health (Ozer et al. 2011). A vicious cycle<sup>8</sup> often exists between poverty and mental illness (Patel & Kleinman 2003, Blas & Kurup 2010, Lund 2012), suggesting a positive role for exogenous income shocks such as cash transfers.

The literature on the impact of cash transfers on teen mental health is often based on studies of small-scale programs (Kilburn et al. 2015), and has been mostly performed in disciplines other than psychology (Wolf, Aber & Morris 2013). Some studies have shown improvements in the mental health and well-being<sup>9</sup> of beneficiaries on receipt of cash transfers; in Latin American countries (Samuels & Stavropoulou 2016, Lund 2012), in Niger (Fenn, Noura, Sibson, Dolan & Shoham 2014), in South Africa (Case 2004, Hamad et al. 2008), in Kenya and in Malawi (Baird et al. 2013), in Sub-Saharan countries and the Middle East (Samuels & Stavropoulou 2016) and others, in particular among more vulnerable groups such as women, orphans and lower income children (Marais et al. 2014, Lund, De Silva, Plageron, Cooper, Chisholm, Das, Knapp & Patel 2011).

What is less well researched, if at all, is the impact that cash transfers have on the transmission of depression between parent and child. Fernald & Gunnar (2009) find lowered stress levels in teens who obtained a cash transfer in Mexico, with a particularly

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<sup>8</sup>Either a worsening of mental health causes a reduction in earnings, or people with lower socio-economic status have a higher probability of suffering from mental illness. The former is known of as social causation or drift, where individuals “drift” into lower income levels, and the latter as social selection (Lund et al. 2013, Miech, Caspi, Moffitt, Wright & Silva 1999).

<sup>9</sup>Measures used include aggression, stress (measured using cortisol levels), cognitive development, happiness and life satisfaction, self-confidence and pride.

strong effect for those living with a depressed mother, but apart from this paper it is difficult to find research which specifically mentions the role that cash transfers can play to mitigate the strong link between parent and child mental health.

This paper seeks to add to this limited body of existing literature. Using exogenous variation in both age eligibility and potential exposure to the South African child support grant, we estimate the cumulative and current effects of grant receipt on the mental health of older adolescents. Our results show that parental mental health is by far the largest determinant of teen mental health in South Africa, and the effect size itself is substantial. Our estimates show that the CSG acts as a substantial mitigator of the intergenerational transmission effect, reducing it by forty-five or sixty-seven percent for maternal and paternal depression, respectively.

This paper is organized as follows. Section (2) discusses the life of a typical South African child, including those children receiving the child support grant, and reports the CSG program details, Section (3) describes the data used for our analysis and Section (4) details the methodology used to identify the effects of interest. Results are presented in Section (5), and Section (6) concludes.

## **2 The Child Support Grant**

### **2.1 Child Welfare in South Africa**

South Africa's first democratically elected government in 1994 inherited a country rife with social problems, the burden of which were disproportionately borne by African households. A large proportion of adults were unemployed, and poverty and inequality levels were high (Case & Deaton 1998, Klasen & Woolard 2009, Blas & Kurup 2010),

and a high prevalence of serious health conditions such as tuberculosis and HIV was seen in the population (Hall & Woolard 2012). A large proportion of South Africa's children grow up in extreme circumstances, with exceptionally unfavorable living conditions and limited access to adequate nutrition, health care or education (Ardington & Case 2009, Budlender & Lund 2011, Hall & Woolard 2012). Rates of orphanhood are high (Case & Ardington 2006), and fathers are absent in a large proportion of households (Djebbari & Mayrand 2011). Over fifty percent of youth aged eighteen to twenty-four are neither working nor enrolled in school or tertiary education (Altman, Mokomane & Wright 2014).

One of the welfare improvement programs put in place by the government was a social security system, intended as a direct poverty alleviation tool to help those most in need (Department of Social Development 2011). There has been extensive growth in the reach of this public assistance program, with spending on social assistance in South Africa in 2010 constituting 3.5 percent of gross domestic product (Woolard & Leibbrandt 2010). Of this system, the child support grant (CSG), a grant available since 1998 to all age and means test eligible children, is the program with the largest number of beneficiaries (Woolard, Buthelezi & Bertsher 2012).

Recipient households are likely to be larger, have much lower income (Case, Hosegood & Lund 2005) but higher levels of grant income (including pensions, disability and foster grants) (Patel 2012, Department of Social Development 2012), have members who are less educated, have fewer assets and employed members, and are more likely to be situated in rural areas (Budlender et al. 2008, Agüero et al. 2009, Hunter & Adato 2007). Recipients are overwhelmingly African and female (Delany 2008). Empirically, women have been seen to spend more on children's health, nutrition and education, compared to the greater spending on personal consumption observed among men, both interna-

tionally (Quisumbing & de La Brière 2000, Alderman, Chiappori, Haddad, Hoddinott & Kanbur 1995, Thomas 1990) and in South Africa (Duflo 2003, Rogan 2013).

## 2.2 Program Details

The grant amount in and of itself is modest (the grant amount was 280 rand per month in 2012, approximately twenty-six US dollars), and it is also not large in comparison to the old age pension (R1,200 in 2012), and the disability and foster grants. Nonetheless, given the low average per capita incomes in South Africa, it may still form a significant portion<sup>10</sup> of a household's monthly income (Woolard & Leibbrandt 2010).

Between program inception in 1998 and the year 2012, the age threshold at which receipt ceases was increased a number of times, at irregular intervals<sup>11</sup>. The initial age cut-off of seven in 1998 was extended until the threshold finally reached the age of eighteen in January 2012, where it has remained ever since. Grant receipt has risen, and by 2008, reported receipt was approximately sixty percent of all age-eligible children under the age of fifteen (McEwen, Kannemeyer & Woolard 2009).

Patterns of receipt by age can be seen in Figure 1 for each wave of the National Income Dynamics Survey (discussed in further detail in Section 3). Receipt after birth is usually low<sup>12</sup>, but climbs after the first year. Receipt predictably declines the closer one approaches to the age limit, and there is a sharp cut-off on either side of the age limit in each year. Some non-zero rates of receipt for children above the age threshold are seen in both Waves 1 and 2, which may be partially explained by administrative or age recollection errors.

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<sup>10</sup>In 2010, a child support grant amounted to forty percent of median monthly per capita income (Woolard & Leibbrandt 2010).

<sup>11</sup>Table 8 in Appendix Item A.1 contains a summary of grant extension and amount details from 1998 to the current period.

<sup>12</sup>Slightly over forty percent of children under a year of age receive the CSG.

Figure 1

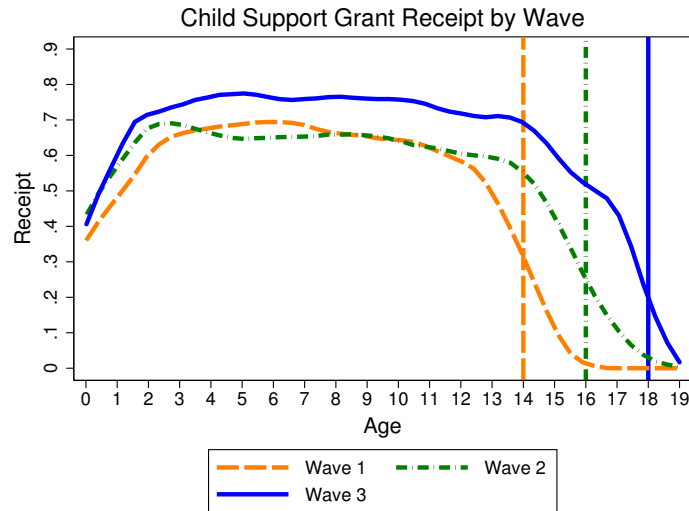


Figure 1 shows average child support grant receipt by age category, and wave. The vertical lines show the CSG age threshold beyond which the child is ineligible for the child support grant.

Whether continued receipt in a transfer program has conditions attached to it or not has been seen to matter for outcomes (Baird, Ferreira, Özler & Woolcock 2014). Receipt is subject to a means test based on caregiver income<sup>13</sup> (Budlender et al. 2005). Although initially the case, by 2016, the official conditions by which a child was eligible for the child support grant did not include proof of school enrolment or attendance (SASSA 2016). Given the available information, apart from the age and income requirements, the child support grant is effectively considered an unconditional grant by researchers (Samson et al. 2008, Baird, Ferreira, Özler & Woolcock 2014).

<sup>13</sup>The amount was doubled for married caregivers, and excluded other government grants (Budlender, Rosa, Hall et al. 2005).

### 3 Data

Household surveys which collect data on both depression and socio-economic factors are rare (Ardington & Case 2010, Tomlinson, Grimsrud, Stein, Williams & Myer 2009). Data on the prevalence of mental illness in South Africa is lacking, particularly nationally representative data<sup>14</sup>. The data used in this paper is the National Income Dynamics Survey (NIDS), a nationally representative biennial survey first undertaken in 2008 (Brown, Daniels, De Villiers, Leibbrandt & Woolard 2013). The NIDS is the first panel survey of its kind in South Africa, and was undertaken to measure welfare over time, with a focus on income, assets and expenditure (Brown et al. 2013). It contains a rich set of demographic variables, detailed data on grant receipt, and an emotional health module which allows the measurement of mental health.

Wave 3 of the survey (comprising more than 38,000 households), undertaken in 2012, is the main year of analysis in this paper, due to the specific timing of the changes in CSG receipt which can be observed in this year, and the high variation in potential duration of receipt in beneficiaries in 2012.

#### 3.1 Measuring Mental Health

Household surveys are often collected by field workers who are not familiar with any tools used to diagnose psychiatric disorders. Simple psychometric scales are often used, due to the ease with which they can be administered and interpreted (Blas & Kurup 2010). The NIDS collects data on the Center for Epidemiological Studies Short Depression Scale

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<sup>14</sup>The last nationally representative survey of psychiatric disorders is the South African Stress and Health Study, which was conducted between 2001 and 2002 (Herman, Stein, Seedat, Heeringa, Moomal & Williams 2009).

(CES-D 10), a short self-reported scale<sup>15</sup> which serves as a screening instrument<sup>16</sup> to indicate the presence and severity of depression in a survey respondent (Radloff 1977).

A problem within this field of study is a lack of commonality in the measures used to measure emotional health (Samuels & Stavropoulou 2016). Screening instruments created in developed countries may fail to correctly indicate the presence of depression in developing countries, if the cultural or socio-economic differences between the two countries are large (Samuels & Stavropoulou 2016, Strauss & Thomas 2007). The CES-D 10 is widely used both in other countries and in South Africa, has been verified for use as an initial screening tool, and has been found to be internally consistent (Johnes & Johnes 2004, Hamad et al. 2008, Kilburn et al. 2015, Myer, Smit, Roux, Parker, Stein & Seedat 2008, Pretorius 1991). It is also consistent when compared to shorter<sup>17</sup> and longer versions of the same questionnaire (Myer et al. 2008). It has also been verified for use in populations speaking three South African languages other than English (Baron, Davies & Lund 2017). In addition, sensitivity testing using other threshold values to determine depression, as opposed to the standard cut-off of ten, yields similar results (Kilburn et al. 2015). The CES-D 10 measures well in diagnosis when compared to other diagnostic tools and screening instruments commonly used (Radloff 1977, Das, Do, Friedman, McKenzie & Scott 2007). In the NIDS data itself, the CES-D 10 behaves in a way consistent with expectations for a measure of mental health<sup>18</sup>.

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<sup>15</sup>This score is calculated between zero and thirty, with higher values representing higher levels of mental distress. A cut-off score of ten or above indicates mild to significant depression. See Appendix Item A.2 for a specific discussion of the calculation of the CES-D 10.

<sup>16</sup>Screening instruments are used to detect a potential disease in the general population (Radloff 1977), and should be distinguished from diagnostic tools, which are used by trained medical professionals to establish the presence of a disease in a symptomatic patient.

<sup>17</sup>In the NIDS, the CES-D 10 displays similar patterns to the CES-D 8, a shorter version of the questionnaire which excludes the two positively phrased questions to avoid the possibility of participants answering in the reverse. The two measures have a correlation above eighty percent.

<sup>18</sup>A positive correlation is observed between the CES-D 10 and other measures of negative events, such as a death in the family. Negative correlations exist between the CES-D 10 and measures of happiness, optimism, good health and satisfaction (these can be seen in Table 9 in Appendix Item A.3.). The correlations calculated between the individual questions that make up the scale are negative except with

An advantage to the CES-D 10 score is that it succeeds in asking questions about mental health without explicitly mentioning the names of any psychiatric illnesses, which is important in the South African context, where high levels of stigma surrounding mental illness exist in many communities (Sorsdahl & Stein 2010, Hugo et al. 2003). The NIDS also contains other questions about the presence of other psychiatric illnesses such as anxiety, bipolar, and schizo-affective disorder. Despite the high levels of depression observed in the NIDS, the average number of respondents of these questions is very low<sup>19</sup>, in contrast to the CES-D 10<sup>20</sup>. This pattern is also seen in other surveys<sup>21</sup>. Those who answer the CES-D 10 do not differ markedly in characteristics compared to those who do not<sup>22</sup>.

The NIDS contains other measures of well-being such as life satisfaction, happiness, self-perceived health, and optimism. Some of these variables are analysed in part, but the main variable used in the following analysis is the CES-D 10 score. This both facilitates easy comparison with other literature, and incorporates all available data.

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the two positively phrased questions about hope and happiness. A measure of Chronbach's alpha, a measure of internal consistency for a psychometric scale (Santos 1999), for the CES-D 10 between Waves 1 to 3 is between sixty-seven and seventy-seven percent (seventy is often taken as a the cut-off for a reliable scale).

<sup>19</sup>In Wave 3, 78 adults answered in the affirmative that they had a psychological or psychiatric disorder, out of more than 25,000 possible respondents.

<sup>20</sup>In African and Coloured fifteen to nineteen-year-olds in Wave 3, an eighty-six percent response rate is seen, and close to hundred percent response for mothers.

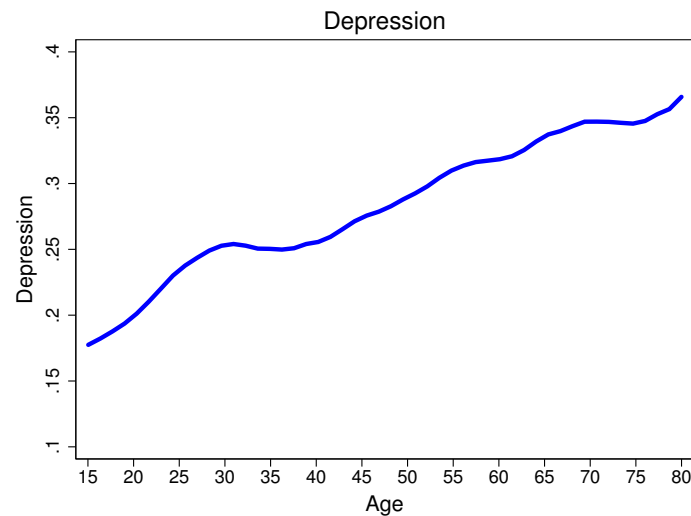
<sup>21</sup>For example, the 2012 General Household Survey contains a question about the respondent's mental health (StatsSA 2002). Less than ten percent of the sample answer the question, and of those who do, only 127 report suffering from depression or a mental illness (out of a sample of more than ninety thousand people).

<sup>22</sup>Those who did answer the questions are slightly more likely to be African, to report CSG receipt, and less likely to be enrolled. This last observation makes sense as these teens are more likely to be at home when the interviewer is present. A small difference is seen in the rate of response by gender for teens, indicating controlling for gender is recommended in any estimates including the CES-D 10 variable. No significant differences are seen by other variables such as rural or urban location, household income, maternal depression, age or means test eligibility status.

### 3.2 Patterns in Mental Health

Mental health differs along a number of different characteristics in South Africa. Depression is more prevalent in rural areas, and among individuals with lower levels of education. Whites have significantly better mental health than Coloureds, who in turn have better mental health than Africans<sup>23</sup>. Depression<sup>24</sup> also rises with age - see Figure 2.

Figure 2



*Figure 2 shows levels of depression graphed by age in Wave 3.*

No significant differences in depression by gender or CSG beneficiary status of the child are observed in the data<sup>25</sup>. However, some significant gender differences in teen depression can be seen in Figure 3 when examining teen depression as a function of parental depression. In both figures, a strongly positive relationship is seen between parent and teen mental health.

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<sup>23</sup>See Appendix Item A.4 for graphical illustration of these differences.

<sup>24</sup>See Appendix Item A.5 for the graph of the CES-D 10 score over age, which displays similar results.

<sup>25</sup>See Figure 8 in Appendix Item A.6.

Figure 3

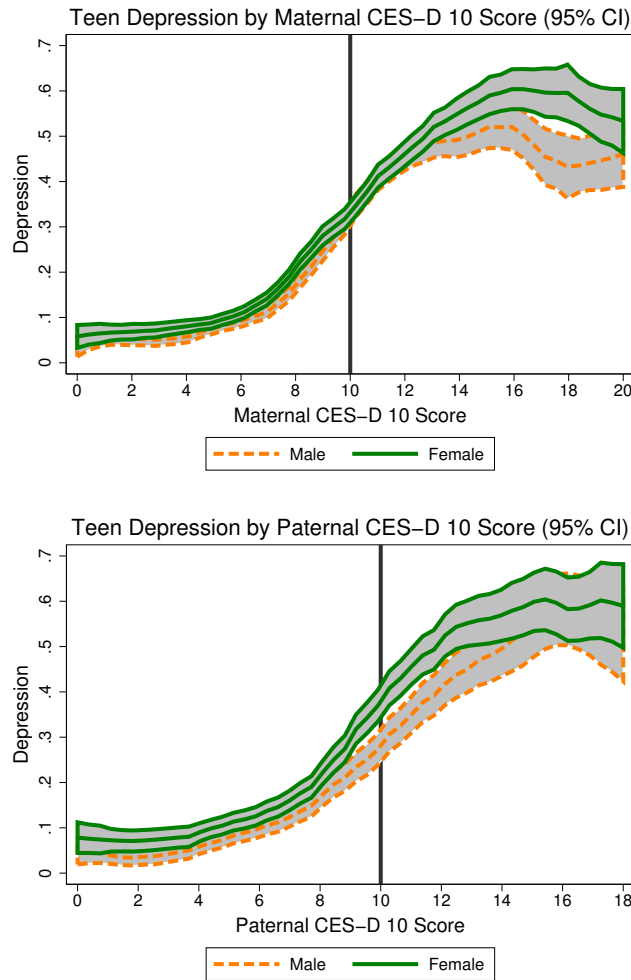


Figure 3 shows rates of teen depression, graphed as a function of parental CES-D 10 score, by gender. The vertical line at 10 shows the cut-off after which parents are classified as depressed. The maternal CES-D 10 score is capped at twenty, due to the very small sample size of mothers reporting CES-D 10 scores higher than twenty. For similar reasons, the paternal CES-D 10 score is capped at eighteen.

When maternal CES-D 10 score is lower, the rates of depression of boys and girls do not differ, but as the mental health of mothers worsens (as seen in higher CES-D 10 scores), teen girls start to have significantly higher rates of depression than boys - although these differences only become significant at very high values of the maternal CES-D 10 score. Similarly gendered patterns are seen in the relationship between teen depression and paternal CES-D 10 score, although the significant differences become apparent at much more moderate values of the paternal CES-D 10 score. These patterns suggest the

intergenerational transmission effect may differ by both the gender of the parent, and by the gender of the child. Section (4) now moves on to a more detailed analysis of the characteristics of these children, as well as the identification and modelling strategies used to estimate the intergenerational transmission effect.

## 4 Methodology

### 4.1 Investigating Adolescent Characteristics

Table 1 presents descriptive statistics for certain mental health and welfare outcomes for teenagers in Wave 3, differentiated by CSG beneficiary status. There are very few significant differences, except for the teen depression variable. Nineteen percent of the entire sample can be classified as depressed. However, beneficiaries have significantly lower rates<sup>26</sup> of depression than non-beneficiaries, and correspondingly, live in households with fewer depressed teenagers, and depressed adults. However, parental depression does not differ by CSG beneficiary status.

The differences between teens who suffer from depression and those who do not are investigated in Table 2, and a number of key differences are found. Depressed teens are significantly less likely to be enrolled in school<sup>27</sup>, and are less likely to be CSG beneficiaries<sup>28</sup> (echoing the results in Table 1). All of the mental health outcomes, both individual and of the family, are significantly different (at the one percent level). Depressed teens are much more likely to have mothers, fathers or siblings who are depressed, and possibly have been for a number of years. They are correspondingly more likely to live in

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<sup>26</sup>Sixteen versus twenty-one percent, significant at the five percent level.

<sup>27</sup>Seventy-five percent of depressed teens are enrolled, versus eighty-three percent of non-depressed teens, significant at the five percent level.

<sup>28</sup>Thirty-six percent versus twenty-nine percent, significant at the five percent level.

households with a larger number of depressed individuals. These differences are large; for example, seventy-five percent of depressed teens have depressed mothers, compared to only twenty percent of teens who are not depressed.

Table 1

Individual Descriptive Statistics of Teenagers Aged 15 to 19 by CSG Beneficiary Status				
	All	CSG Beneficiary		Non Beneficiary
<i>Individual Characteristics</i>				
CES D-10*	5.96	5.67	**	6.11
Depressed (CES-D 10 >= 10)	0.19	0.16	**	0.21
Became Depressed in Wave 3	0.18	0.19		0.18
Level of Life Satisfaction (1-10, 10 is very satisfied)	4.62	4.64		4.61
In Poor Health (Self-Perceived)	0.03	0.02		0.03
Happier than Ten Years Ago	0.52	0.54		0.51
Optimistic (2 Years)	0.67	0.67		0.67
Optimistic (5 Years)	0.85	0.86		0.85
Smokes or Drinks	0.08	0.05	**	0.09
Mother is Depressed (CES-D 10 > 10)	0.30	0.29		0.31
Maternal CES D-10	7.62	7.82		7.50
Mother Became Depressed in Wave 3	0.24	0.29	*	0.21
Number of Waves the Mother is Depressed	1.06	1.06		1.06
Father is Depressed (CES-D 10 > 10)	0.28	0.23		0.31
Paternal CES D-10	7.06	6.56		7.37
Father Became Depressed in Wave 3	0.25	0.19		0.29
Number of Waves the Father is Depressed	0.83	0.84		0.82
Either Parent is Depressed	0.35	0.35		0.35
A Sibling is Depressed	0.12	0.11		0.12
<i>Household Characteristics</i>				
Number of Depressed Individuals in the Household	0.83	0.79		0.85
Number of Depressed Teens in the Household	0.24	0.20	**	0.26
Household has a Depressed Individual	0.38	0.39		0.38
Household has a Depressed Individual (Excluding Self)	0.38	0.39		0.38
Number of Observations	3,119	982		2,137

This table reports individual descriptive statistics for a sample of means test eligible Coloured and African teens between the ages of fifteen and nineteen in Wave 3 of the National Income Dynamics Survey Data. \*The CES-D 10 is a scale used to measure depression. It ranges from zero to thirty, where zero is a complete lack of depressive symptoms, and thirty is the maximum level of depressive symptoms Radloff (1977). Estimates presented are weighted using the Wave 3 sample weights. Significant differences are starred. \* implies p value < 0.10, \*\* implies p value < 0.05, and \*\*\* implies p value < 0.01.

Table 2

Individual Descriptive Statistics by Depression Status in Wave 3 (15-19 Year Olds)				
Variable	All	Depressed		Not Depressed
Age	17.0	17.1	*	16.9
Female	0.50	0.57		0.51
CSG Beneficiary	0.31	0.29	**	0.36
Mother's Education	7.08	6.93		7.16
Mother is Resident in the HH	0.75	0.72		0.74
Father's Education	6.34	6.04		6.45
Father is Resident in the HH	0.44	0.42		0.42
Smokes or Drinks	0.08	0.12		0.07
CES D-10*	5.96	12.6	***	4.41
Level of Life Satisfaction (1-10, 10 is very satisfied)	4.62	3.53	***	4.87
In Poor Health (Self-Perceived)	0.03	0.01		0.02
Became Depressed in Wave 3	0.18	0.81	***	0.00
Mother is Depressed (CES-D 10 > 10)	0.30	0.75	***	0.20
Number of Waves the Mother is Depressed	1.06	1.60	***	0.96
Father is Depressed (CES-D 10 > 10)	0.28	0.72	***	0.20
Number of Waves the Father is Depressed	0.83	1.24	***	0.79
Either Parent is Depressed	0.35	0.66	***	0.25
A Sibling is Depressed	0.12	0.32	***	0.08
Enrolled	0.82	0.75	**	0.83
Years of Completed Education	8.77	8.79		8.82
Household Size	5.86	5.77		5.82
Rural	0.52	0.53		0.52
Household Income	4,359	3,452		4,358
Household Grant Income	1,425	1,352		1,398
Number of Children in HH	2.73	2.69		2.74
Number of Pensioners in HH	0.43	0.41		0.42
Number of Depressed Individuals in the Household	0.83	2.75	***	0.40
Number of Depressed Teens in the Household	0.24	1.22	***	0.02
Household has a Depressed Individual (Excluding Self)	0.38	0.80	***	0.28
Number of CSG Recipients in HH	1.93	1.89		2.01
Number of Observations	3,119	499		2,232

Descriptive Statistics of teens who suffer from depression or do not suffer from depression, for a sample of means test eligible Coloured and African teens between the ages of fifteen and nineteen in Wave 3 of the National Income Dynamics Survey Data. \*The CES-D 10 is a scale used to measure depression. It ranges from zero to thirty, where zero is a complete lack of depressive symptoms, and thirty is the maximum level of depressive symptoms (Radloff 1977). Estimates presented are weighted using the Wave 3 sample weights. Significant differences are starred. \* implies p value < 0.10, \*\* implies p value < 0.05, and \*\*\* implies p value < 0.01.

The results from Table 1 imply that while CSG receipt does not appear to impact on the mental health of mothers, it may have a positive effect on the mental health of teenagers. Table 2 shows that teens who suffer from depression are worse off than those that do not, in a number of different measures.

## 4.2 Identification

No large scale randomised controlled trials have been conducted in South Africa to evaluate the impacts of the child support grant, making the estimation of causal effects a challenging task. The lack of panel data has also complicated estimation (Lund et al. 2013, Miech et al. 1999). Researchers have attempted to deal with the endogeneity of grant receipt in various ways<sup>29</sup>. The non-systematic pattern of roll-out in the CSG, with its unanticipated extensions in both the age-limit and the means test threshold, provides opportunities for a quasi-experimental method of evaluation.

Teens aged fifteen and above in 2012 experienced the random increase in the age threshold to eighteen. It is possible to compare the outcomes of individuals immediately on either side of the age threshold, who are very similar in characteristics, except for the variation in their grant receipt. In addition, in this sample the potential duration of receipt (based on the relationship between year of birth and the years when the age threshold changed) is highly variable, ranging between three and fourteen years (see Figure 4). Both the variation in receipt, and potential duration of receipt is mostly exogenous, determined entirely by birth year. Some portion of grant receipt (but not

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<sup>29</sup>Many controls are usually included in estimations, such as age, gender, race, years of education, household income, maternal characteristics and many others, in a bid to reduce omitted variable bias. Other studies use continuous treatment estimation strategies, matching methods, constructed control groups, difference-in-difference (DID) estimates, regression discontinuity methods or panel data methods, to identify the effect of receipt (Aguero et al. 2009, Coetzee 2013, Department of Social Development 2012, Samson et al. 2008, Case et al. 2005, Williams 2007, Djebbari & Mayrand 2011, Ranchhod 2006).

Figure 4

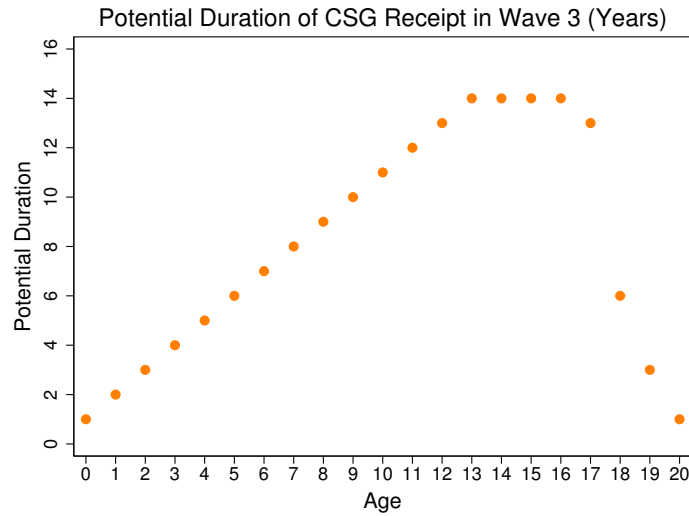


Figure 4 shows potential exposure to the CSG graphed by age in Wave 3.

potential exposure to the grant) will still be related to individual characteristics, and these are controlled for in all analysis. The NIDS collects information about the length of time that the individual has actually received the CSG for, which could possibly be used as a measure of grant receipt. However, the data collected is also of poor quality, and suffers from the same endogeneity concerns as current receipt.

In the following analysis, estimates are performed mostly on the means test eligible sample, as those who have incomes sufficiently above the threshold are likely to be different in characteristics to those below. A large proportion of children are income eligible: approximately eighty-three percent of age-eligible children in Waves 1 to 3 passed the means test. Rates of receipt, and the absolute number of recipients in the means test eligible sample are much higher than in the sample of those classified as income ineligible. In addition, only Coloured and African beneficiaries are analysed, as they are a more homogeneous sample likely to contain a high proportion of recipients. As mentioned previously, the analysis makes use primarily of Wave 3, collected in 2012, as it is in this year that the variation in both current CSG receipt, and potential duration of receipt,

can be best exploited.

### 4.3 Balancing Tests

Successful identification of the CSG effect relies on the assumption of minimal significant differences of characteristics between similar age CSG recipients and non-recipients, and between those who are aged just above and below the age eligibility threshold (for example, seventeen and eighteen-year-olds). Significance tests of differences in mean characteristics are performed in a number of age-defined samples<sup>30</sup>, and the results can be seen in Table 3.

For fifteen and sixteen-year-olds, beneficiaries do not differ in a host of key characteristics<sup>31</sup> compared to non-beneficiaries. One notably large, but insignificant difference is observed in household income. This lack of significance arises due to a high variance in household income<sup>32</sup> among non-beneficiaries which is expected given the relatively small size of this sample. According with previous observed patterns, beneficiaries are significantly less likely to be depressed (this is true for all age cohorts) and have lower CES-D 10 scores, and often have significantly higher levels of life satisfaction than non-beneficiaries.

More significant differences in individual characteristics exist in the seventeen to eighteen-year-old sample, many of which are obviously related to the difference in age or recipient status<sup>33</sup>. One notable difference is the large difference in paternal depression -

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<sup>30</sup>The base sample is African and Coloured means test eligible fifteen-eighteen year olds.

<sup>31</sup>These include gender, race, maternal characteristics (maternal age, education, labour market status, residence in the household, depression level), paternal characteristics (paternal residence in the household and depression level), household characteristics (household income, size, number of children, pensioner present in household, and whether the household is regarded as being on the bottom income step by any household member).

<sup>32</sup>This can be seen in Figure 9 in Appendix Item A.7.

<sup>33</sup>Eighteen-year-olds live in households with fewer children (children are more likely to leave the household the older they are), and have older mothers with correspondingly higher maternal education, and higher levels of education (and a lower probability of being enrolled). Beneficiaries are also significantly more likely to have either parent resident in the household, which given the high levels of co-residence of caregiver recipients with beneficiaries, this difference is to be expected.

Table 3

Balancing Checks: Comparison of Means in the Means Test Eligible Sample in Wave 3												
Receive CSG?	Age 15		Age 16		Age 17		Ages 15-17		Ages 17-18			
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No		
Age	15.0	15.0	16.0	16.0	17.0	17.0	15.9	16.2	17.0	17.0	18.0	***
Female	0.50	0.52	0.50	0.53	0.46	0.44	0.49	0.49	0.46	0.47	0.53	
Coloured	0.04	0.09	0.04	0.08	0.04	0.08	0.04	0.08	0.04	0.05	0.06	**
African	0.96	0.91	0.96	0.92	0.96	0.92	0.96	0.92	0.96	0.93	0.94	**
Mother's Education	7.36	7.38	6.72	7.42	6.56	7.76	6.91	7.57	6.83	6.83	6.82	**
Mother's Age	42.2	43.6	44.6	45.8	43.9	45.1	43.5	45.0	44.0	44.0	46.6	***
Mother Economically Active	0.62	0.60	0.59	0.62	0.65	0.58	0.61	0.60	0.61	0.61	0.59	
Mother Resident in HH	0.79	0.74	0.83	0.74	0.79	0.66	0.81	0.70	0.78	0.78	0.67	*
Father Resident in HH	0.35	0.31	0.39	0.32	0.50	0.39	0.40	0.35	0.54	0.54	0.33	***
Years of Education	7.47	7.26	8.09	8.12	8.80	8.73	8.06	8.16	8.86	8.86	9.52	***
Enrolled	0.98	0.87	0.96	0.89	0.92	0.86	0.96	0.87	0.93	0.93	0.75	***
Depressed	0.13	0.23	0.18	0.19	0.16	0.21	0.16	0.21	0.17	0.17	0.19	*
CES-D 10	5.03	6.44	5.95	6.02	5.91	5.94	5.61	6.09	5.99	5.99	6.00	*
Mother is Depressed	0.31	0.29	0.21	0.23	0.35	0.38	0.29	0.31	0.34	0.34	0.32	
Father is Depressed	0.22	0.31	0.27	0.36	0.19	0.33	0.23	0.33	0.14	0.14	0.39	**
In Poor Health	0.00	0.03	0.02	0.03	0.06	0.05	0.02	0.04	0.05	0.05	0.03	
Life Satisfaction (1-10)	4.75	4.97	4.58	4.01	4.60	4.66	4.65	4.54	4.59	4.59	4.55	*
Rural	0.61	0.54	0.67	0.49	0.53	0.57	0.59	0.54	0.51	0.51	0.56	*
Household Income	3,081	10,311	3,526	3,733	3,295	4,620	3,273	5,913	3,649	3,649	3,474	*
Household Grant Income	1,497	1,834	1,554	1,664	1,588	1,464	1,490	1,546	1,540	1,540	1,409	*
Total Spending on Education	1,782	2,695	2,083	3,220	2,150	3,594	1,991	3,242	2,275	2,275	3,089	***
Household Size	6.11	6.68	6.63	6.63	5.96	6.39	6.09	6.27	5.93	5.93	6.19	
Number of Children in HH	3.39	3.37	3.53	3.29	3.20	3.37	3.24	3.15	3.12	3.12	2.37	***
Pension Household	0.28	0.34	0.26	0.28	0.23	0.29	0.25	0.29	0.22	0.22	0.24	
Poorest Household	0.32	0.32	0.30	0.24	0.23	0.28	0.28	0.27	0.20	0.20	0.20	
Optimistic 2 Years From Now	0.67	0.61	0.65	0.57	0.72	0.69	0.68	0.63	0.70	0.70	0.72	
Optimistic 5 Years From Now	0.86	0.82	0.81	0.87	0.93	0.87	0.86	0.86	0.90	0.90	0.89	*
Number of Observations	348	228	337	251	252	349	937	828	278	278	623	

This table presents a test of mean differences between recipients and non-recipients in 5 samples. The sample used is that of African and Coloured teens aged fifteen to nineteen in Wave 3 of the National Income Dynamics Survey who are means test eligible for the child support grant. Weighted estimates are used. In Wave 3, individuals aged eighteen and above are age ineligible for the child support grant. Significant differences are starred. \* implies p value < 0.10, \*\* implies p value < 0.05, and \*\*\* implies p value < 0.01.

seventeen-year-old beneficiaries are less likely to have a father who is depressed. However, the sample of fathers reporting depression data is very small. No highly significant differences are recorded in variables measuring attitudes towards the household's current financial situation or its future prospects<sup>34</sup>. Household grant income is significantly different across all age samples, yet the differences are not large, do not display a consistent pattern<sup>35</sup>, and the differences are only significant at the ten percent level. Total educational spending is significantly higher<sup>36</sup> for non-beneficiaries for all age groups except for fifteen-year-olds. Household income begins to differ in the older samples, although only at the ten percent level.

The lack of significant differences in the younger teen samples provides support to the hypothesis that grant receipt is more likely to be exogenous (relating only to differences in birth year), and unrelated to most personal characteristics. Family preferences regarding investment in children which might be correlated with CSG receipt may be considered less of a concern in older teens who age through the system. If such preferences are present, we might expect to see higher levels of maternal education among beneficiaries. However, the data do not show this to be the case. Where it is significant, maternal education tends to be higher in non-beneficiaries.

All regression analysis in the following analysis includes an appropriate sub-set of the relevant covariates in Table 3 as control variables, in particular those displaying significant differences by beneficiary status. Including these controls both improves the precision of the estimates, and controls for any sample selection caused by observing

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<sup>34</sup>These variables include the poorest household variable, which measures current beliefs regarding the household's financial position relative to other households, and levels of optimism regarding the household's prospects two or five years from now. Individuals do start to differ in their levels of optimism regarding the household's situation in five years from now, although absolute levels of optimism are high (a minimum of eighty-six percent in these samples), and these differences are very small, and only significant at the ten percent level.

<sup>35</sup>A similar lack of consistency is seen in the rural location variable by beneficiary status

<sup>36</sup>Significance ranges from one to ten percent, depending on the sample.

individuals further away from the age threshold (Imbens & Lemieux 2008).

## 4.4 Modelling the Transmission of Depression

Modelling depression presents challenges, as the condition manifests itself in a wide array of symptoms (both cognitive and biological), which are not all present in every patient (Rehm 1977). Using animal experiments, or surveys measuring specific health indicators<sup>37</sup>, biological models have focused on neurological and hormonal factors such as the HPA axis<sup>38</sup> (Gotlib, LeMoult, Colich, Foland-Ross, Hallmayer, Joormann, Lin & Wolkowitz 2015), cytokine/macrophage theories<sup>39</sup>, monoamine theories<sup>40</sup>, structural abnormalities<sup>41</sup>, damage to brain tissue (Roy & Campbell 2013), and genetic vulnerability. Cognitive models of depression are also numerous, and may include the study of individual's actions, feelings of guilt or failure (Rehm 1977, Abramson, Seligman & Teasdale 1978), pessimism and poor self-esteem (Beck 2008), hypochondria (Rehm 1977), and a lack of resilience during life challenges (Lewinsohn et al (1974;1969) in Rehm (1977)), and very many other behavioural characteristics. Some of the individual environmental or genetic determinants of depression may also be related to cumulative factors, beginning as early as childhood (Roy & Campbell 2013). This is in part due to

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<sup>37</sup>Such as asthma or hay-fever (Thompson 2014), or levels of stress hormones.

<sup>38</sup>The hypothalamic–pituitary–adrenal axis (HPA or HTPA axis) is a complex set of direct influences and feedback interactions among hormones produced by three endocrine glands: two located in the brain (the hypothalamus and the pituitary gland) and one above the kidneys - the adrenal gland (Pariante & Lightman 2008).

<sup>39</sup>Macrophages are white blood cells which play an important role in reducing inflammation, through the release of cytokines. These are small protein particles which are strongly related to the healthy functioning of the immune system, and have been linked to depression in multiple studies (Roy & Campbell 2013, Dowlati, Herrmann, Swardfager, Liu, Sham, Reim & Lanctôt 2010).

<sup>40</sup>Monoamines such as serotonin, noradrenaline, norepinephrine and dopamine are neurotransmitters (chemical messengers in the brain) which may either be present in lowered amounts in the presence of depression, or an oversensitivity in the receptors which release these chemicals may be present, resulting in lowered monoamine levels (Roy & Campbell 2013).

<sup>41</sup>Two areas of the brain which have been seen to be different (through cell damage, atrophy, lesions or other differences) in individuals suffering from depression are the hippocampus, and the pre-frontal cortex (Sapolsky 2000, Roy & Campbell 2013). Nutritional deficiencies in vitamins or iron can also impact on neuronal integrity (Roy & Campbell 2013).

the persistent nature of the disease (Currie & Stabile 2007, Keller, Lavori, Rice, Coryell, Hirschfeld et al. 1986), and its propensity to increase with age (Ardington & Case 2010).

A limited number of studies of the intergenerational transmission of depression exist (Akbulut & Kugler 2007, Strauss & Thomas 2007) in the international literature. In South Africa in particular, research into any parental-child health links is fairly scarce (Burns & Keswell 2012). Depression in children has been modeled with a launch and grow<sup>42</sup> framework, where maternal depression launches processes related to stress, an emotionally unhealthy family environment and low self worth, all of which predict adolescent depression (Garber & Cole 2010). The model described below is similar to that of others in the literature (Thompson 2014, Akbulut & Kugler 2007).

$$MH_i = f(X_i, HH_h, C_c, P_p, PD_p) \quad (1)$$

The key dependent variable,  $MH_i$ , refers to the mental health of child  $i$ . The  $X_i$  are individual characteristics such as age, gender, health, education level, race, marital status, nationality, orphan status, perceived social status, self esteem and loneliness (Hamad et al. 2008, Ardington & Case 2010) and others. For parents, number and age of children is also an important determinant of mental health (although no consensus exists regarding the direction of these effects). For women, the recent birth of a child, and the resultant life and hormonal changes are also factors in depression. The  $C_c$  refer to community factors, such as size, access to services or transport, levels of safety or social cohesion (Tomita & Burns 2013), among others. The  $HH_h$  refer to household characteristics such as household income, location, size, composition (i.e. pensioners, children, working or unemployed adults), whether the household has suffered any recent income shocks, or

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<sup>42</sup>The grow portion of the model reflects the fact that adolescents' initial levels of depression significantly predicted the growth in their symptoms over time.

deaths, and the overall health of all the household members (including mental health). The  $P_p$  refer to parental characteristics include the health of the parent, their age, labour market status and education, and any other variables which could impact on the child's mental health.  $PD_p$  separates out the mental health variables associated with the parent - this is a measure of parental depression. The strength of the relationship between  $PD_p$  and  $MH_i$  reflects the strength of the mental health transmission from parent to child.  $PD_p$  may refer to the current or previous mental health status of the parent, to take into account the chronic nature of depression, and the often static situational determinants of parental depression.

Very many studies do not try to disentangle the relationship<sup>43</sup> between the genetic and environmental determinants of transmission (Van Ijzendoorn 1992). With available twin data, it is possible to separate the genetic and environmental factors (Bowles & Gintis 2002). However, very often this data is not available and it is not clear exactly how generalisable these results are (Erikson & Goldthorpe 2002). Household surveys which collect data on emotional health tend to collect information more related to socio-economic and sociological factors rather than biological (Blas & Kurup 2010). Due to the nature of the data available, no biological<sup>44</sup> or neurological determinants of depression can be taken into account. As many relevant characteristics as are available in the data are included in the estimates which follow.

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<sup>43</sup>An example of a gene/environment interaction would be financial stress in an individual who already has a genetic predisposition to depression, resulting in a depressive episode.

<sup>44</sup>Apart from parental mental health.

## 5 Results

### 5.1 The Intergenerational Transmission of Depression

Table 4 presents preliminary ordinary least squares estimates of the determinants of teen depression, and the size of the intergenerational transmission coefficient, both excluding and including relevant control variables. These results show that if a mother suffers from depression, it raises her child's probability of being depressed by thirty-two percentage points. Given that on average seventeen percent of teens in this sample are depressed<sup>45</sup>, this represents an almost tripling of the risk of depression for teens. Similar size transmission coefficients are seen in the paternal depression sample, despite the much smaller sample size<sup>46</sup>. The inclusion of controls changes the size and significance of the intergenerational transmission effect very little, in either the maternal or paternal depression estimates.

Only a few of the independent variables have statistical or economic significance. Having a mother who is economically active lowers the probability of depression by five percentage points, a relatively large effect. Coloured teens have significantly better mental health<sup>47</sup> than African teens. Living in a household with a pensioner is associated with a seven percentage point decrease in teen depression in the maternal depression sample<sup>48</sup>.

None of the characteristics in the paternal depression sample have any impact on teen depression, apart from whether the father is depressed. These results echo those<sup>49</sup> in

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<sup>45</sup>See bottom of Table 4 for the reported mean levels of teen depression, and parental residence in the regression sample.

<sup>46</sup>Only forty-five percent of fathers are present in maternal depression sample, resulting in a much smaller sample size in Columns (4) through (6), as parental depression data can only be collected of resident household members.

<sup>47</sup>Coloured teens have depression levels that are eleven percentage points lower than African teens, holding all other factors constant.

<sup>48</sup>No pensioner effect by gender exists. Other estimates not reported here show that living in a household with a female pensioner is not a significant determinant of teen depression, but rather living with any pensioner, no matter their gender.

<sup>49</sup>The authors find only maternal education significantly impacts own depression, while many other

Table 4

## Intergenerational Transmission of Mental Health: Determinants of Child Depression

	Child is Depressed					
	Mother			Father		
	(1)	(2)	(3)	(4)	(5)	(6)
Parent is Depressed	0.34***	0.32***	0.32***	0.33***	0.30***	0.28***
Other Parent Resident			-0.00			0.00
Parent's Education		0.01*	0.01***		0.00	0.00
Parent is Economically Active		-0.05**	-0.05**		-0.01	-0.01
Age in Years		0.01	0.02		0.01	0.01
Female		0.03*	0.04*		0.02	0.02
Years of Attained Education		-0.00	-0.01		-0.00	0.00
Coloured		-0.11**	-0.08		-0.05	-0.05
Log of Household Income		0.03*	0.01		0.01	-0.01
Pensioner Household		-0.07**	-0.06**		-0.02	-0.03
Household Size		0.00	0.01		0.00	0.00
Rural		0.01	-0.00		0.05	0.03
Dependent Variable Mean		0.17			0.17	
Other Parent Resident Mean		0.45			0.89	
Number of Observations	1325	1320	936	459	457	423
F stat	112.1	9.091	7.124	35.50	3.488	2.969
Adjusted R-squared	0.167	0.203	0.222	0.169	0.209	0.190

Ordinary least squares estimates are calculated to measure the impact of parental depression on child depression. A child is depressed if they have a CES-D 10 score of 10 or higher. The CES-D 10 score is a measure of depression, scaled between zero and thirty, where a higher score indicates higher levels of depression. The sample consists of African and Coloured teens between the ages of fifteen and nineteen who are means test eligible for the child support grant in Wave 3 of the National Income Dynamics Survey. A full set of province dummies is included in specifications (2) and (4). Robust standard errors are reported, corrected for clustering. \* implies p value < 0.10, \*\* implies p value < 0.05, and \*\*\* implies p value < 0.01.

work by Powdthavee & Vignoles (2008). The sample of teens whose fathers are resident (and thus whose depression data is available) is clearly different in characteristics to the sample of teens with a resident mother, although average teen depression levels are the same in both samples. Despite these differences, controlling for whether the other parent is resident has very little impact on the size of the transmission effect, nor is this control significant. Missing data for the father resident indicator lowers the sample size from Column (2) to (3).

The descriptive statistics in Section 4.1 suggest that CSG receipt may impact on teen depression. Table 5 replicates the estimates in Table 4, including a control for CSG receipt (in Columns (1) and (6)), and an interaction term between CSG receipt and parental depression.

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parental characteristics are insignificant.

Table 5

Other Parent	Intergenerational Transmission of Mental Health: Determinants of Child Depression									
	Maternal Depression Transmission					Paternal Depression Transmission				
	All	(2)	(3)	(4)	(5)	All	(6)	(7)	(8)	(9)
Parent is Depressed	0.32***	0.42***	0.45***	0.25	0.41***	0.27***	0.39***	0.36***	0.11	0.10
CSG Receipt	-0.05	0.01	0.00	-0.31**	0.05	-0.12**	-0.04	-0.04	-0.48***	0.07
CSG Receipt*Parent is Depressed		-0.19***	-0.27***	-0.12	-0.38**		-0.26***	-0.22**	0.01	-0.33
Other Parent Resident	0.00	0.00			0.11	0.01	0.01			0.32*
Parent's Education	0.01***	0.01***	0.01	0.00	0.02	0.00	0.00	0.01	0.02	0.00
Parent is Economically Active	-0.05**	-0.05*	-0.07*	-0.18	0.03	-0.01	0.01	0.00	-0.06	0.17
Age in Years	0.00	0.01	0.01	-0.05	-0.02	-0.01	-0.01	-0.01	-0.08	-0.02
Female	0.04*	0.04**	0.03	0.10	0.15*	0.02	0.03	0.02	0.08	0.22
Years of Attained Education	-0.01	-0.01	0.00	-0.02	0.02	0.00	0.00	0.00	0.00	0.00
Coloured	-0.09*	-0.08*	-0.09	0.19	0.01	-0.05	-0.06	-0.07	-0.30	0.55
Log of Household Income	0.01	0.02	0.02	-0.1	-0.03	-0.01	-0.01	-0.03	-0.09	-0.07
Pensioner Household	-0.06*	-0.06**	-0.09**	-0.31**	0.05	-0.03	-0.01	-0.03	-0.20	0.03
Household Size	0.01	0.01	0.01	0.02	-0.01	0.00	0.00	0.01	0.04	0.00
Rural	0.00	0.00	-0.02	-0.04	0.19*	0.04	0.04	0.05	-0.06	-0.05
Dependent Variable Mean	0.16	0.16	0.16	0.37	0.49	0.16	0.16	0.16	0.44	0.53
Other Parent Resident Mean	0.45	0.45	1.00	1.00	0.52	0.89	0.89	1.00	1.00	0.92
Number of Observations	936	936	422	94	146	423	423	376	89	79
F stat	6.9	7.0	4.0	-	-	2.9	3.0	2.9	-	-
Adjusted R-squared	0.23	0.24	0.27	0.42	0.37	0.21	0.23	0.22	0.32	0.49

Ordinary least squares estimates are estimated to measure the impact of parental depression on child depression, and the interaction between child support grant receipt and parental depression. The sample consists of African and Coloured teens between the ages of fifteen and nineteen who are means test eligible for the child support grant in Wave 3 of the National Income Dynamics Survey. A full set of province dummies is included in all specifications. \* implies p value < 0.10, \*\* implies p value < 0.05, and \*\*\* implies p value < 0.01.

Receipt by itself does not impact on teen depression in either sample in a consistent manner. However, a very strong and highly significant interaction effect is found between CSG receipt and parental depression. CSG receipt reduces maternal intergenerational transmission by nineteen percentage points - see Column (2) - and this effect is even larger in households where fathers are resident - see Column (3) - at twenty-seven percentage points. Even larger coefficients are observed in the paternal depression sample, although this mitigating effect is slightly lower in households where mothers are also present - see Column (8). In the unrestricted samples in Column (2) and (7), we see that CSG receipt lowers intergenerational depression transmission by forty-five percent for maternal depression, and sixty-seven percent for paternal depression<sup>50</sup>.

In Columns (4) and (9), the sample is restricted to households where the other parent is also depressed. This restriction reduces sample size<sup>51</sup> considerably. The levels of teen depression in these samples are very high<sup>52</sup>, and the significance and pattern of the main coefficients of interest are very different. The intergenerational transmission coefficient is insignificant, which may be due to both the very high correlation between paternal and maternal depression, and the lower precision in estimation due to the much smaller sample size. However, the effect of CSG receipt is very large, and negative, implying that in samples where at a minimum one parent is depressed, CSG receipt is very important for teen mental health. This agrees with the significance of the interaction terms observed in Columns (3) and (8).

One last sample is investigated in Columns (5) and (10), that of teens who report

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<sup>50</sup>In Column (2), CSG receipt lowers maternal depression transmission by nineteen percentage points, and the presence of maternal depression raises teen depression by forty-two percentage points - dividing these two figures yields the figure of forty-five percent. Similar calculations in Column (7) yield the figure of sixty-seven percent.

<sup>51</sup>Ninety-four and eighty-nine individuals respectively.

<sup>52</sup>Thirty-seven and forty-four percent in the mother and father depression samples respectively - see the bottom of Table 5.

having a sibling who is depressed. Teen depression is very high if a sibling is depressed - approximately fifty percent. Maternal intergenerational transmission is very large and significant, at forty-one percent, implying that a teen who has a depressed mother and depressed sibling will, with almost certainty, be depressed. The interaction term is negative, large, and significant in the maternal depression sample. This implies that the mitigating effect of CSG receipt on intergenerational transmission of maternal depression is present even in families where siblings are also depressed. The interaction term is also large and negative in the paternal depression estimates in Column (10). However, it is not significant, which may be due to issues of high correlation between sibling and paternal depression, and to the very small sample size (seventy-nine observations).

It is clear that familial connections, and possibly even simply connections through co-residence in a household matter for the transmission of depression. In Appendix Item A.8, the relationship between grant receipt and depression is expanded to include measures of depression for other household members, in a number of different samples. A few differences emerge. Depression is strongly transmitted between household members (who are not necessarily related), but the mitigating effect of CSG is not as strong in this case. Rates of intergenerational transmission are particularly high in female headed households, and among female and African teens.

The preceding estimates are expanded to further exploit the exogeneity in CSG receipt by birth year. Ordinary least squares and instrumental variables estimates (where age eligibility instruments for CSG receipt), and estimates using the potential duration of receipt are presented in Table 6. Columns (1) and (4) replicate the estimates in Columns (2) and (7) of Table 5 for ease of comparison.

Table 6

Intergenerational Transmission of Mental Health: Alternative Specifications						
	Mother			Father		
	OLS	IV	Exposure	OLS	IV	Exposure
	(1)	(2)	(3)	(4)	(5)	(6)
Parent is Depressed	0.42 ***	0.36 ***	0.41 ***	0.39 ***	0.31 ***	0.45 ***
CSG Variable	0.01	-0.15	-0.14 **	-0.04	-0.25 *	-0.15 *
CSG Variable*Parent is Depressed	-0.19 ***	-0.09	-0.18 ***	-0.26 ***	-0.11	-0.02 *
Other Parent Resident	0.00	0.00	0.00	0.01	0.03	0.00
Parent's Education	0.01 ***	0.01 **	0.01 ***	0.00	0.00	0.00
Parent is Economically Active	-0.05 *	-0.04 *	-0.05 *	0.01	0.00	-0.01
Age in Years	0.01	-0.03	-0.04 *	-0.01	-0.05	-0.05
Female	0.04 **	0.04 *	0.04 *	0.03	0.03	0.02
Years of Attained Education	-0.01	0.00	-0.01	0.00	0.01	0.00
Coloured	-0.08 *	-0.11 **	-0.09 *	-0.06	-0.06	-0.05
Log of Household Income	0.02	0.01	0.02	-0.01	-0.01	-0.01
Pensioner Household	-0.06 **	-0.05 *	-0.06 **	-0.01	-0.02	-0.03
Household Size	0.01	0.01	0.01	0.00	0.00	0.00
Rural	0.00	0.00	0.01	0.04	0.05	0.03
Dependent Variable Mean	0.16	0.16	0.16	0.16	0.16	0.16
Number of Observations	936	936	936	423	423	423
F stat	7.0	7.3	7.4	3.0	2.9	3.0
Adjusted R-squared	0.22	0.20	0.22	0.19	0.15	0.16

Ordinary least squares estimates are estimated to measure the impact of parental depression on child depression, and the interaction between child support grant receipt and parental depression. In Columns (1) and (4), actual receipt is used as the CSG variable of interest. In Columns (2) and (5), instrumental variables estimates are presenting, using age eligibility as an instrument for actual receipt. In Columns (3) and (6), the impact of potential duration of CSG receipt is shown, with the coefficient reported multiplied by ten years. The sample consists of African and Coloured teens between the ages of fifteen and nineteen who are means test eligible for the child support grant in Wave 3 of the National Income Dynamics Survey. A full set of province dummies is included in all specifications. Robust standard errors are reported, corrected for clustering. \* implies p value < 0.10, \*\* implies p value < 0.05, and \*\*\* implies p value < 0.01.

In all specifications, the intergenerational transmission of depression is similarly large and significant. The mitigating factor of the CSG is similar in size and significance for mother's depression, in the ordinary least squares and potential duration estimations. Additional years of exposure<sup>53</sup> to the grant both reduce teen depression directly - see Column (3), and reduce the impact of maternal depression. An extra ten years of exposure to the grant reduces the probability of depression by fourteen percent, and by a further eighteen percent if the teen's mother is depressed, which are large effects in comparison to the maternal transmission coefficient of forty-one percent.

The coefficients on the interaction term in the instrumental variables estimates in Columns (2) and (5) are also negative, although they are not significant. This effect measures the impact of CSG receipt on the transmission of depression, for those who respond to the age eligibility criterion by obtaining the grant. In comparison, many current grant recipients could have been receiving the grant for many years (some for as many as thirteen). The CSG effect and the interaction term measured in the OLS estimates may be identifying the impact of the duration of receipt. This time effect is not captured in the instrumental variables results, which would result in insignificant coefficients.

## 5.2 The Effect of Time

The mental health of both parents and children is a function of not only current factors, but also the cumulative effect of previous events. A question is which matters more for the mental health of teenagers - the current or past mental health of their parents?

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<sup>53</sup>The coefficient on potential duration is reported multiplied by ten, for ease of interpretation. A comparison of ten years allows a realistic measurement of the approximate average impact of cumulative years of grant exposure that could be expected to be observed in this sample, given that the potential duration of receipt varies from three to fourteen years for fifteen to nineteen-year-olds in Wave 3.

In Figure 5, average depression in Wave 3 is plotted as a function of maternal CES-D 10 in each separate wave, for a full sample of individuals from age fifteen to sixty. Maternal CES-D 10 score and child depression are positively related in Wave 3. However, no relationship is found between child mental health in Wave 3 and maternal mental health in Wave 1 or 2 (as evidenced by the flatness of these two curves). Similar findings can be seen for the paternal CES-D 10 values (see Figure 10 in Appendix Item A.9).

Figure 5

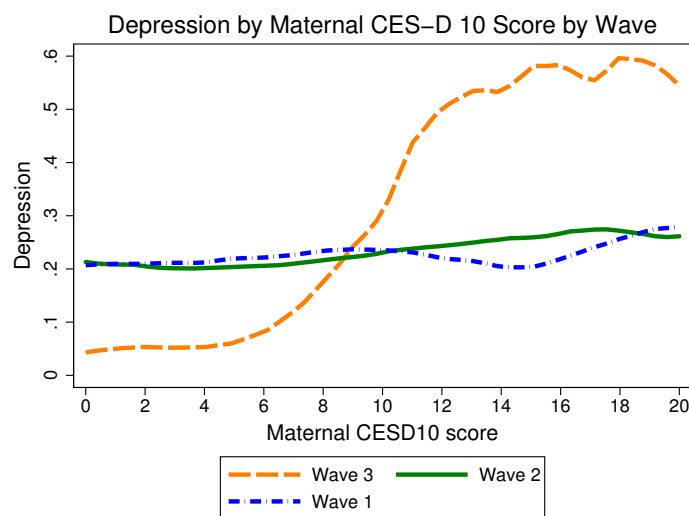


Figure 5 plots levels of depression by maternal CES-D 10, for individuals aged 15 to 60.

Table 7 contains the average levels of depression of African and Coloured teenagers, and their mothers or fathers, in a number of transmission matrices. Each cross tabulation is performed in reference to the mental health of the person in question in Wave 1. For example, it can be seen that in a sample of 1,927 teenagers in Wave 2, of those who report being depressed in Wave 1, twenty percent of them also report being depressed in Wave 2, and the rates of depression in Wave 2 for teens do not differ significantly by whether or not they were depressed in Wave 1 (as shown by the p-value of 0.48).

Teen depression does not appear to be persistent over time. Table 7 shows that

teenagers in Wave 2 and Wave 3 have similar depression levels<sup>54</sup> no matter their mental health in Wave 1.

Table 7

Transmission Matrices: Teen and Parental Depression Persistence over Time							
		Teenager Depression Status by Wave					
		Wave 1		Wave 2		Wave 3	
		No	Yes	No	Yes	No	Yes
Teen is depressed in Wave 1	No	1.00	0.00	0.81	0.19	0.78	0.22
	Yes	0.00	1.00	0.80	0.20	0.80	0.20
n, p-value		2,600		1,927	0.48	1,795	0.51
Mother is depressed in Wave 1	No	0.86	0.14	0.83	0.17	0.80	0.20
	Yes	0.67	0.33	0.79	0.21	0.81	0.19
n, p-value		1,446	0.00	1,974	0.04	2,430	0.83
Father is depressed in Wave 1	No	0.87	0.13	0.87	0.13	0.80	0.20
	Yes	0.66	0.34	0.81	0.19	0.80	0.20
n, p-value		584	0.00	762	0.05	957	0.91
		Maternal Depression Status by Wave					
		Wave 1		Wave 2		Wave 3	
		No	Yes	No	Yes	No	Yes
Self (mother) is depressed in Wave 1	No	1.00	0.00	0.75	0.25	0.74	0.26
	Yes	0.00	1.00	0.71	0.29	0.69	0.31
n, p-value		7,684		5,849	0.00	5,479	0.00
		Maternal Depression Status by Wave					
		Wave 1		Wave 2		Wave 3	
		No	Yes	No	Yes	No	Yes
Child is depressed in Wave 1	No	0.59	0.41	0.71	0.29	0.71	0.29
	Yes	0.33	0.67	0.78	0.22	0.70	0.30
n, p-value		1,446	0.00	1,246	0.03	1,099	0.75
		Paternal Depression Status by Wave					
		Wave 1		Wave 2		Wave 3	
		No	Yes	No	Yes	No	Yes
Child is depressed in Wave 1	No	0.69	0.31	0.80	0.20	0.74	0.26
	Yes	0.40	0.60	0.80	0.20	0.76	0.24
n, p-value		584	0.00	519	0.99	419	0.68

This table contains the average levels of depression in the African and Coloured population for teenagers aged fifteen to nineteen, or the mothers who are aged fifteen to nineteen in Wave 1 of the NIDS, by own depression status in Waves 2 and 3, and by mother and father depression status. The sample size for each cross tabulation, and the p value when checking for significant differences between the two variables are reported. For example, when checking to see if mean teen depression in Wave 2 differs by Wave 1 teen depression status, a p-value of 0.48 is found, implying there are no significant differences.

Mothers and fathers are seen to impact largely on the mental health of teenagers in the current wave. In Wave 1, thirty-three percent of teens who have depressed mothers

<sup>54</sup>Both teens in Waves 2 and 3 have depression rates of approximately twenty percent.

are themselves depressed, compared to only fourteen percent of teens whose mothers are not depressed, and this difference is significant at the one percent level. Similar patterns are seen for teens who have depressed fathers<sup>55</sup> in Wave 1. These effects of significantly higher depression among teens who have depressed parents in Wave 1 persist to Wave 2. However, by Wave 3 the rates of depression in teens are the same no matter the mental health status of the parent in Wave 1.

The bottom three panels of Table 7 show the mean depression levels among mothers and fathers, dependent on the mental health of their children in Wave 1, and the persistence of mothers' own depression from Wave 1. At least a fifth of all mothers and fathers are depressed in each wave, no matter the mental health status of their children in Wave 1. If mothers are depressed in Wave 1, they continue to be significantly more depressed in Waves 2 and 3, although mothers suffer from high rates of depression, no matter their initial state of mental health in Wave 1.

Mothers and fathers who have depressed children in Wave 1 have very high contemporaneous rates of depression (more than sixty percent for both parents), but by Waves 2 and 3 these differences fade in size and significance. In this bi-variate analysis, the mental health of teenagers does not appear to impact on paternal depression in the future, and for mothers, the impact of a depressed child on maternal depression persists until Wave 2 but by Wave 3 is not present. While not a definitive test, these figures provide no solid evidence that the causality of the intergenerational transmission effect runs from children to parents, as is sometimes hypothesised. It may seem more likely that the direction of the causality runs from parent to child. In support of this assumption, Garber & Cole (2010) find that adolescent symptoms of depression do not predict mothers' mental health

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<sup>55</sup>Of those who whose fathers were depressed in Wave 1, thirty-four percent are themselves depressed, compared to thirteen percent of those whose fathers were well in Wave 1, and this difference is significant (the p value is 0).

symptoms. Children inherit their parent’s genetic predisposition to mental illness, and it is often assumed that the impact of a depressed parent on a child is likely to be far larger than the impact of a depressed child on the parent.

The previous analysis has shown that CSG receipt can interrupt intergenerational transmission in the present, and the above indicates the causality of depression transmission in all probability runs from parent to child. That the CSG manages to disrupt depression transmission is more likely to be due to a positive change in the environment shared by parents and children, rather than a change related to shared genetic factors. Solving this simultaneity problem is complex, and requires more than the simple uni-variate analysis used here, but is beyond the scope of this paper.

### **5.3 Confounding Factors and Robustness Checks**

Estimates are also performed<sup>56</sup> using both the parental and child CES-D 10 scores as the independent and dependent variables of interest (rather than depression), and quantitatively similar results are found. Satisfaction with life, as well as the ten component parts of the CES-D 10 score are also used as dependent variables and similar results are found.

The specifications in Table 5 are replicated, using logistic regressions reporting marginal effects. The results are similar to those seen in the main estimates in Table 5 in significance, and for the most part in size.

To test the hypothesis that it is current parental depression which matters the most for teen depression, one can use the parental depression values from previous waves in place of the current measures. Other estimates of Table 5, are performed using the maternal and paternal depression values not from Wave 3, but rather Wave 2. In these estimates,

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<sup>56</sup>Not reported here.

both the coefficients on paternal depression in Wave 2, and the interaction term between CSG receipt in Wave 3 and paternal depression in Wave 2 are insignificant. It appears the current link is the most important between the mental health of parents and teens, rather than a link to parental mental health in previous waves. Another test employing a CSG variable which measures whether the individual gained receipt between Waves 2 and 3, rather than measuring current CSG receipt, yields an insignificant coefficient on this variable and the interaction term.

A potentially confounding factor exists if maternal depression decreases with teen age (possibly due to the increasing independence of older teens and thus lower care burdens for mothers). If so, given a negative correlation between CSG receipt and age (older teens are less likely to be recipients), the positive coefficient on the CSG-maternal depression interaction term may arise as a result of the multiplication of these two negative effects, and not due to any positive benefit derived from CSG receipt of teens with depressed mothers. The data however does not support this theory - levels of maternal depression appear constant over the teen age distribution. The inclusion of an interaction term<sup>57</sup> between maternal depression and teen age is insignificant in the estimates in Table 5.

Another concern for the general validity of these results may be if sample selection exists, caused by differential attrition rates by depression status. The estimations used control for the variables used to create the sample weights, which should ameliorate some sample selection (Angrist & Pischke 2008). If sample selection exists, it is more likely to be related to mortality/morbidity, and the inability to locate the individual, rather than refusal to participate in the survey. While the probability of dying between waves is significantly higher for people with depression, the rates of attrition (excluding death) between all waves are not significantly different between individuals who are depressed

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<sup>57</sup>Estimates not reported here for brevity.

and those who are not, both for all adults, and for teens in particular, and for male teens<sup>58</sup>. This result accords with previous research (de Graaf, Bijl, Smit, Ravelli & Vollebergh 2000). Not only individual depression, but also parental depression, has no impact on one's own possibility of attrition.

Other sample selection concerns include the fact that the sample used in this paper consists only of resident household members, and those who are not present may differ in characteristics (Burns & Keswell 2012). Unfortunately there is no solution to this in the NIDS. It is difficult to say what the net effect of including these individuals in the sample would be. The mental health of these individuals could be expected to correlate positively with that of resident household members, if they are related by blood. This implies a bias may be present in the intergenerational transmission coefficient. However, given that not every household has absent household members, this bias will be present only in some households. Without knowing the size or significance of the relationship of absent members' mental health to resident members, it is difficult to know quite how large the bias may be. In addition, we know that those who have left the household may well have done so in search of work (Case & Deaton 1998), and as such are less likely to suffer from depression than those remaining in the household. Were those members to be present in the household, average depression levels in the household could be lower, and the size of the intergenerational transmission effect could also be lower. However, the size of the effect is considerable, and very stable to the inclusion of various controls, thus it may be less likely to differ greatly from a sample which includes all household members.

Missing data for either maternal or paternal depression also impacts on the size,

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<sup>58</sup>The death rate of people who suffer from depression between Wave 1 and 2 is 6.5 percent, compared to 4.3 percent of people who are well (thirty-four percent of adults are depressed in Wave 1). The death rate of people suffering from depression between Wave 2 and 3 is 4.5 percent, compared to 3.1 percent of people without depression (thirty-four percent of adults are depressed in Wave 2).

and possibly the composition of the sample available for estimation. We control for the presence of individuals with missing depression data. However, this correction neither affects sample size substantially, nor the coefficients of interest.

The episodic nature of depression can complicate the estimation of the temporal nature of intergenerational transmission when using household survey data. An individual may suffer from chronic depression; however, if they are in-between episodes at the time of the interview, they would be recorded as not depressed in that wave, which is an incorrect reflection of their true state of mental health. This is a constraint, but it is to be hoped that on average in a large enough sample meaningful conclusions about the determinants of depression can still be drawn.

The insignificance and instability of household income in the depression estimates in Table 5 is unexpected. A similarly insignificant result is found when we use other measures of a household's socio-economic status. Teen depression is graphed by household income quartile (see Figure 11 in Appendix Item A.10). No clear pattern of a strict unidirectional relationship between depression and household income can be found in the teen sample. It may be the *change* in individual income from grant receipt which is important, as opposed to the absolute levels of household income. A literature exists which shows that relative consumption matters (Luttmer 2005), and obtaining a grant may increase utility for adolescents as their position improves in relation<sup>59</sup> to that of their peers (Baird et al. 2013). Teens may have direct control over the spending of their own grants, compared to household funds. Changes in household income may have less of an impact if these changes do not result in any increase in the teen's own resources.

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<sup>59</sup>The timing of the NIDS sampling process (every two years) does not allow for an accurate enough estimate of the changes in life satisfaction or depression levels of teens over time, and relative to their peers.

## 5.4 Mechanisms

That grant receipt lowers the intergenerational transmission of depression is an interesting result. The grant may act through either the improved mental health of parents, or an increase in the ability of teens to withstand the negative effects of poor parental mental health. It is widely acknowledged that cash transfers have the potential to not only impact on the outcomes of the intended beneficiary, and may also have an impact on the welfare of the recipient caregivers, even if this has not been the intention of the program designers (Samuels & Stavropoulou 2016). A literature exists showing the positive impacts cash transfers can have on the mothers of beneficiaries, especially in countries where the size of the transfer forms a meaningful share of household income. If this link exists, it could be a key auxiliary channel through which grants can improve child outcomes, both directly and through the improved mental health of mothers, which has been seen in the literature to play an important role in improved child outcomes such as nutritional status and educational achievement (Ensminger et al. 2003).

Improvements in family mental health can result from the elimination of food insecurity (Plagerson et al. 2011), reduced financial stress among mothers (Baird et al. 2013), the ability to afford schooling costs and health care (Wolf et al. 2013), or increased female bargaining power which can result in higher spending on items which both improve child welfare and add to women's sense of agency (Plagerson et al. 2011, Hochfeld 2013, Strauss, Mwabu & Beegle 2000). These are all factors which may improve maternal mental health, and thus lower the risk of transmission of depression to teens.

Cash transfers in South Africa have been seen to increase the resilience of household members to withstand health related shocks (Goudge, Russell, Gilson, Gumede, Tollman & Mills 2009), and resilience among children in general is cited as an impor-

tant characteristic in the ability to withstand parental illness without adverse effects (Boler 2007, Rehm 1977, Serbin & Karp 2004). Levels of resilience to health shocks are also lower in poor households (Adato & Bassett 2012, Lund, Breen, Flisher, Kakuma, Corrigan, Joska, Swartz & Patel 2010, Serbin & Karp 2004), which are more likely to contain grant recipients. Social determinants (of which the CSG could be argued to be an important one) have also been cited as important predictors of teen vulnerability to negative health outcomes, including mental health outcomes (Viner et al. 2012).

It may be the case that teen recipients have an overall more positive or optimistic attitude to life, making them less vulnerable to negative health events in the family. However, the data do not appear to support this theory. The NIDS includes questions on the intention to continue in school until matriculation, how the individual perceives the income level of the household, life satisfaction on a scale of one to five, and whether the respondent is happier than ten years ago. No significant differences are seen in these variables by beneficiary status, and the variation in the first two measures is not high. CSG beneficiaries *are* significantly less likely to perceive themselves to be in a state of poor health, however the variation in this variable is very low<sup>60</sup>. These results accord with the lack of significance on the CSG variable in the estimates, implying the effect does not act directly through the receipt of child support grant.

## 6 Conclusion

This paper has investigated the size of the intergenerational transmission of depression among South African adolescents. The risk that a child suffers from depression if their parent does is large, at approximately three times the average risk in the population.

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<sup>60</sup>Less than three percent of teen respondents answer in the positive to this question.

In particular, the size of the intergeneration transmission of depression is higher among vulnerable groups such as adolescent girls, African teens, and those in female headed households. Paternal depression has an even larger negative effect on youth mental health than maternal depression.

We investigate the key determinants of teen depression, and find that receipt of the child support grant plays an important role in reducing the negative effect a parent with mental illness can have on a teenager's mental health. This effect is double or triple the size of any other significant determinants<sup>61</sup> of teen depression. CSG receipt reduces parental depression transmission by forty-five or sixty-seven percent, for maternal or paternal depression respectively, which is a sizeable effect. These effects are robust to a number of different specifications and samples.

Another finding is that intergenerational transmission is lower in households receiving other government grants such as the pension. In addition, preliminary analysis provides support that the link between parental and child depression is very likely to be in the direction of parent to child, and not in the reverse.

While the data used in the paper does not allow for a detailed analysis of the potential mechanisms through which the CSG effect operates, some preliminary investigation indicates that it is not the direct effect of CSG receipt on teen mental health which is important at reducing depression transmission. A literature suggests that CSG receipt may be increasing the resilience of teens to the presence of mental illness among parents. In the absence of sufficient treatment for mental illness among the youth, the child support grant plays an important role in improving mental health outcomes in South African teenagers.

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<sup>61</sup>Such as maternal education, and living in a household with a pensioner.

# Appendix

## A.1 CSG Age and Benefit Amount Changes

Table 8 contains a summary of grant extension and amount details from 1998 to the current period. By 2000 the grant was being distributed to the primary caregivers of income eligible children below the age of seven.

Table 8

The South African Child Support Grant Roll-Out Dates and Amounts of Receipt and Eligibility				
Year	Month	Amount	Age Limit	Single Caregiver Means Test
1998	October	R 100	7	R 1,100
1999	July	R 100	7	R 1,100
2000	July	R 100	7	R 1,100
2001	July	R 110	7	R 1,100
2002	April	R 130	7	R 1,100
2002	October	R 140	7	R 1,100
2003	April	R 160	9	R 1,100
2004	April	R 170	11	R 1,100
2005	April	R 180	14	R 1,100
2006	April	R 190	14	R 1,100
2007	April	R 200	14	R 1,100
2008	April	R 210	14	R 1,100
2008	October	R 230	14	R 2,300
2009	January	R 240	15	R 2,400
2010	April	R 250	16	R 2,500
2011	April	R 260	17	R 2,600
2012	January	R 280	18	R 2,800
2013	April	R 290	18	R 2,900
2014	April	R 310	18	R 3,100
2014	October	R 320	18	R 3,200
2015	April	R 330	18	R 3,300

This table contains the details of the dates and amounts of the child support grant roll-out over the years since 1998. The age limit referred to is the upper age limit, for e.g. in 2011, children aged 16 and under could receive the grant. In 2008, the means test was changed to 10 times the grant amount, i.e. in 2009 when the monthly grant amount was R240, the means test was R2,400. For married couples, the means test amount is exactly double the single means test level at R4,800 per month. Between 1998 and the beginning of 2008, the means test amount was set at R1,100 in urban areas, and R800 in rural areas. At the end of 2008 an identical threshold was put into place for both rural and urban areas. Source: National Treasury Reports.

## A.2 CES-D 10 Score Calculation

Ten questions are asked of study participants. The questions rate on a scale of one to four the frequency in the past week that the person has experienced the symptom, ranging from (1) none of the time (less than one day), (2) some or a little of the time (one to two days), (3) occasionally or a moderate amount of the time (three to four days), to (4) all of the time (five to seven days). Self reported symptoms include:

1. I was bothered by things that usually don't bother me
2. I had trouble keeping my mind on what I was doing
3. I felt depressed
4. I felt that everything I did was an effort
5. I felt hopeful about the future
6. I felt fearful
7. My sleep was restless
8. I was happy
9. I felt lonely
10. I could not "get going"

The two positively phrased question, numbers (5) and (8), are inverted, and a score is calculated which sums the answers for each of the ten questions, after re-scaling the answers to range from zero to three, instead of one to four. A score is obtained which ranges between zero and thirty, where zero reflects no depressive symptoms, and thirty

represents the maximum possible number of symptoms, signifying very high levels of depression. Following the standard procedure, a score of ten or more indicates the presence of mild to significant depression<sup>62</sup>. Figure 7 shows the distribution of CES-D 10 over age for each of the waves.

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<sup>62</sup>This follows the standard process through which the CES-D 10 score is calculated (Radloff 1977, Tomita, Labys & Burns 2015)

### A.3 CES-D 10 Validation

Table 9

CES-D 10 Validation: Correlations			
	Wave 1	Wave 2	Wave 3
Death of a Family Member	0.06	0.05	0.04
Happier than Ten Years Ago	-0.18	-0.21	-0.23
Life Satisfaction	-0.20	-0.19	-0.27
Poor Health	0.23	0.18	0.17
Optimistic about the Future 2 Years from Now	0.04	-0.05	-0.05
Optimistic about the Future 5 Years from Now	0.02	-0.05	-0.12
Household Experienced a Negative Income Shock	0.00	0.03	-0.03
Mother is Depressed	0.32	0.44	0.44
Father is Depressed	0.33	0.42	0.44
<i>CES-D 10 Component Variables</i>			
Respondent was unusually bothered	0.51	0.43	0.41
Respondent had trouble keeping their mind on what they were doing	0.55	0.45	0.48
Respondent felt depressed	0.58	0.49	0.50
Respondent felt that everything was an effort	0.40	0.31	0.30
Respondent's sleep was restless	0.52	0.46	0.43
Respondent felt hopeful about the future	-0.15	-0.19	-0.32
Respondent felt fearful	0.50	0.48	0.43
Respondent was happy	-0.33	-0.35	-0.43
Respondent could not get going	0.53	0.47	0.42
Respondent felt lonely	0.49	0.45	0.42
Chronbach's Alpha: CES-D 10	0.77	0.73	0.67
Chronbach's Alpha: CES-D 8	0.84	0.80	0.78

This table reports correlations between each of the measures of mental health, and a number of outcomes either representing an individual's mental health and general welfare, or likely to impact on their mental health and welfare. Data from the National Income Dynamics Survey.

## A.4 Mental Health in South Africa

Figure 6

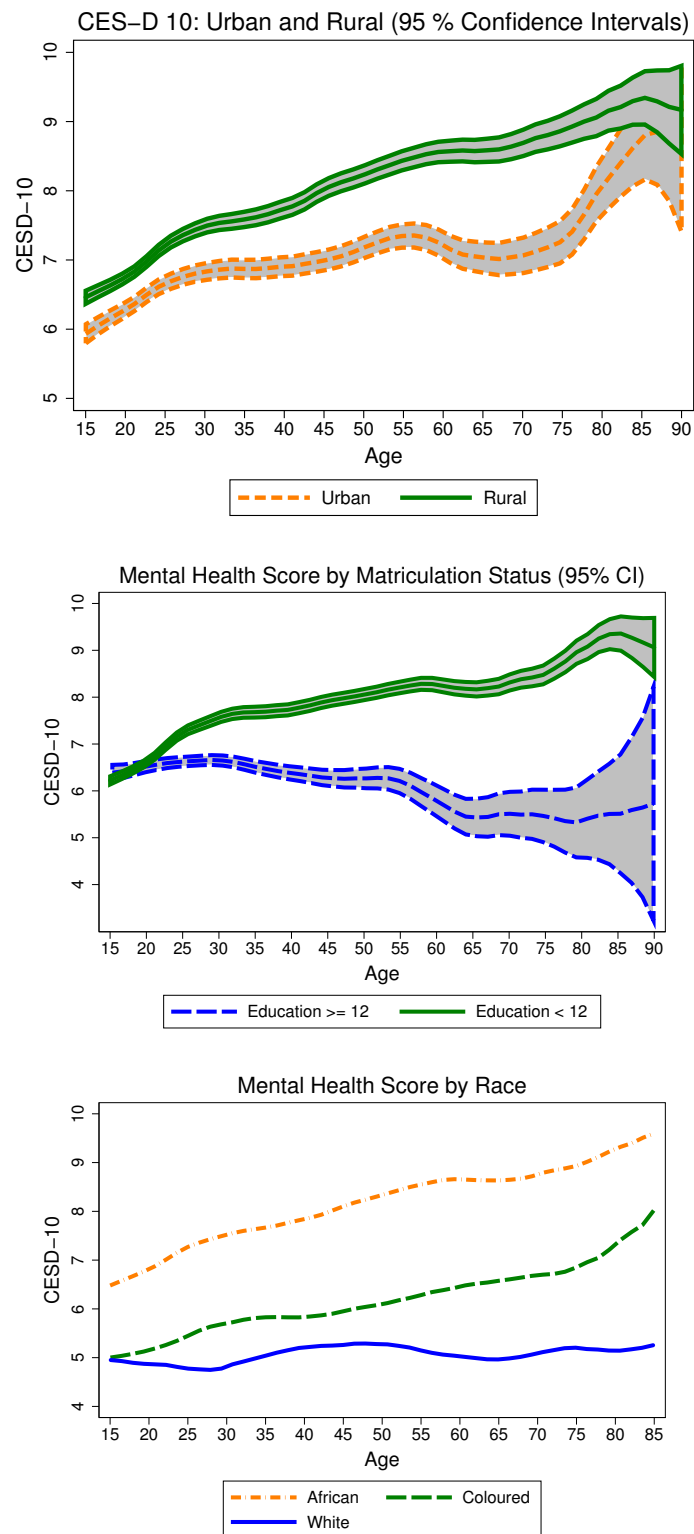


Figure 6 shows the CES-D 10 score differentiated by location, matriculation status, and race, in all 3 waves of the NIDS, with ninety-five percent confidence intervals.

## A.5 CES-D 10 over Age

Figure 7 shows the distribution of CES-D 10 over age for each of the waves.

Figure 7

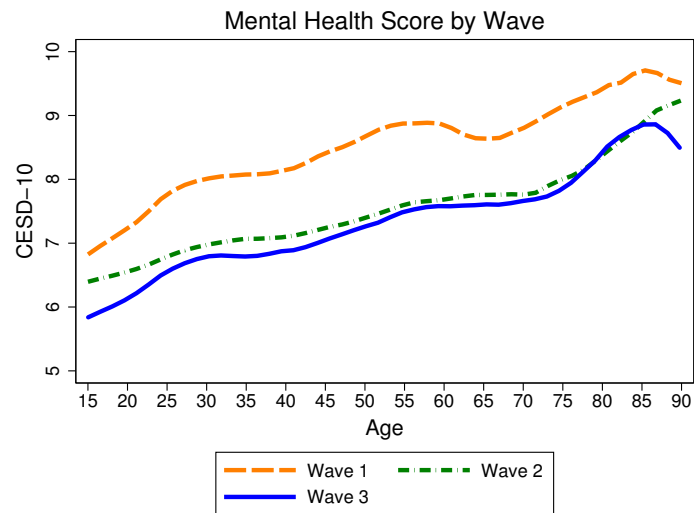


Figure 7 shows CES-D 10 (a measure of mental health status, ranging from 0 and 30), graphed by age and wave. The higher the score, the more likely an individual is to be depressed. Data: National Income Dynamics Survey.

## A.6 Teen Depression by Race, CSG Status and Gender

Figure 8

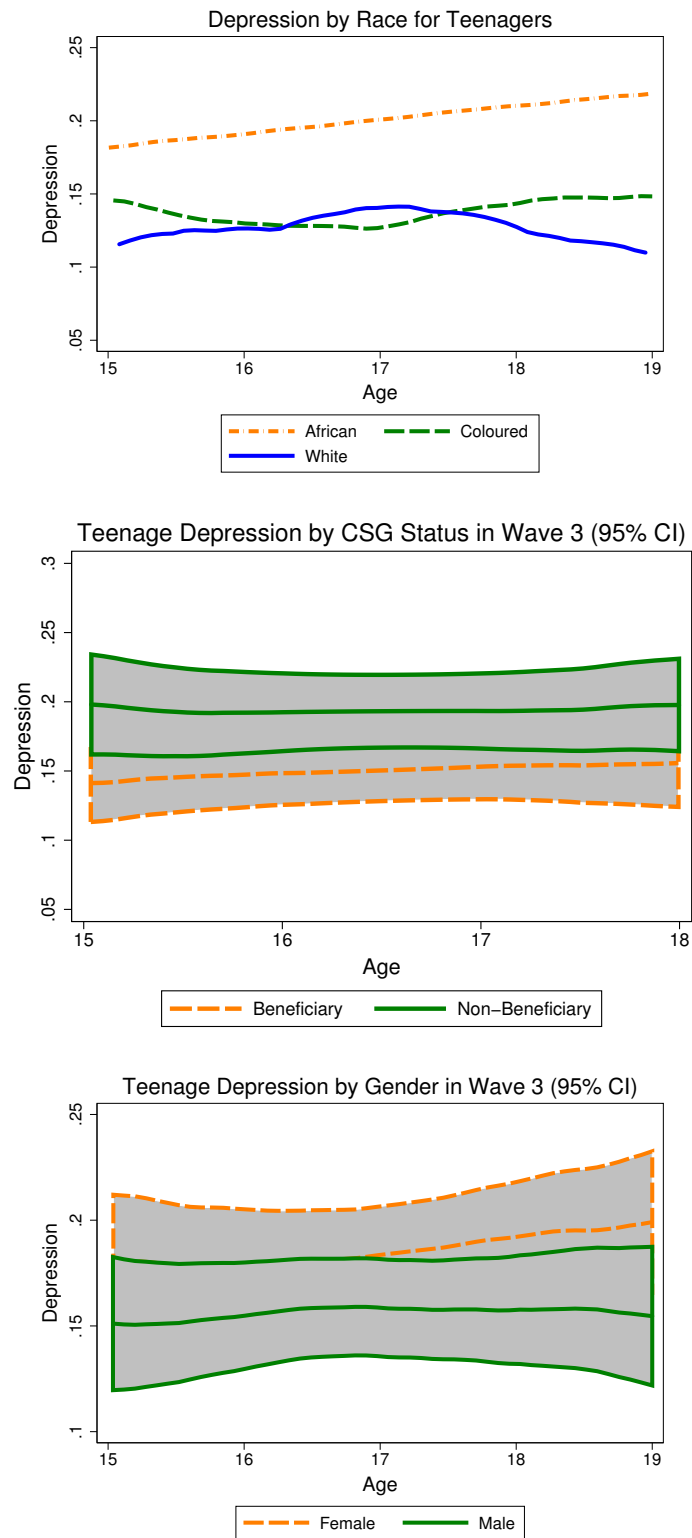


Figure 8 shows teen depression, graphed by age for different population groups, CSG status, and gender.

## A.7 Average Household Income by Beneficiary Status

Figure 9

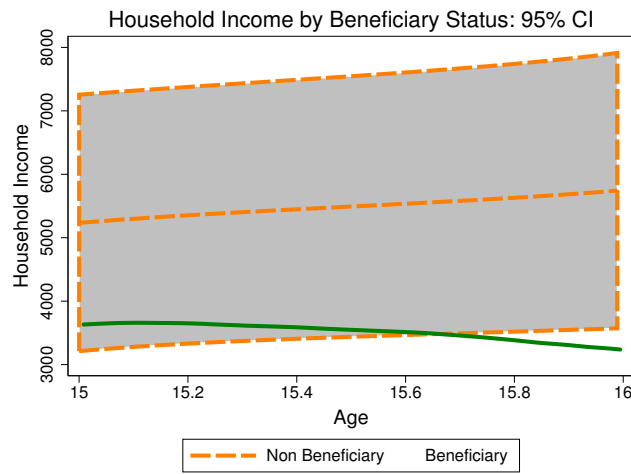


Figure 9 shows average household income by beneficiary status for fifteen-year-olds in Wave 3, with a ninety-five percent confidence interval displayed for non-beneficiaries. Data: National Income Dynamics Survey.

## A.8 Intergenerational Transmission and Familial Effects

We expect that the mental health of family members is very closely related. In Table 10, the relationship between grant receipt and depression is expanded to include measures of depression for other household members, in a number of different samples<sup>63</sup>. The overall size of the transmission effects is again large<sup>64</sup>, and highly significant, for all the familial connections, and in all the sub-samples. Rates of intergenerational transmission are particularly high for female teens, and for those living in female headed households.

The interaction term has a positive and significant<sup>65</sup> coefficient in all samples except when the relative is a sibling<sup>66</sup>. Having a depressed sibling negatively impacts on one's own mental health, and to a large degree<sup>67</sup>. For the most part, CSG receipt lowers the transmission of depression by approximately a third, which is a large impact relative to the transmission size, and in comparison to all other determinants of teen depression. The CSG has the largest impact in households where the father is depressed<sup>68</sup>.

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<sup>63</sup>The first two sets of elements in the means test eligible sample column correspond to the Column (2) and (7) estimates in Table 5.

<sup>64</sup>The smallest size transmission coefficient is thirty-two percent, and the largest is fifty-one percent.

<sup>65</sup>All effects except one are significant at either the five or one percent level.

<sup>66</sup>This accords with the results in Table 5 where a teenager with both a depressed parent and depressed sibling was with almost certainty likely to be depressed.

<sup>67</sup>Sibling depression transmission effects range between thirty-six and fifty-one percent.

<sup>68</sup>In these households CSG receipt reduces intergenerational transmission by a factor of two or more.

Table 10

Determinants of Teen Depression by Type of Depressed Relation					
	All	Means Test Eligible	Female	African	Female HH Head
CSG Beneficiary	0.01	0.01	0.03	0.02	0.03
Mother is Depressed	0.43 ***	0.42 ***	0.49 ***	0.44 ***	0.47 ***
Depressed Mother*CSG Beneficiary	-0.18 ***	-0.19 ***	-0.20 ***	-0.18 ***	-0.21 ***
CSG Beneficiary	-0.04	-0.04	-0.04	-0.05	-0.07
Father is Depressed	0.40 ***	0.39 ***	0.49 ***	0.41 ***	0.53 ***
Depressed Father*CSG Beneficiary	-0.25 ***	-0.26 ***	-0.23 **	-0.25 ***	-0.41 ***
CSG Beneficiary	0.01	0.02	0.02	0.01	0.02
Any Parent is Depressed	0.38 ***	0.38 ***	0.45 ***	0.39 ***	0.43 ***
Depressed Parent*CSG Beneficiary	-0.16 ***	-0.19 ***	-0.18 ***	-0.16 ***	-0.19 ***
CSG Beneficiary	-0.03	-0.04	-0.02	-0.04	-0.02
Sibling is Depressed	0.41 ***	0.36 ***	0.51 ***	0.37 ***	0.42 ***
Depressed Sibling*CSG Beneficiary	-0.08	-0.06	-0.03	-0.03	-0.15 *
CSG Beneficiary	0.00	0.01	0.00	0.00	0.01
HH Member is Depressed	0.32 ***	0.33 ***	0.37 ***	0.33 ***	0.37 ***
Depressed HH Member*CSG Beneficiary	-0.12 ***	-0.15 ***	-0.12 *	-0.12 ***	-0.13 ***

This table presents estimates which measure the strength of the impact of a depressed relative on a depression status, in a number of sub-samples. Each specification differs by the inclusion of a term indicating which person is depressed, and the accompanying interaction term with CSG receipt. Standard errors are clustered at the PSU level and corrected for heteroskedasticity. All specifications include a full set of individual and household characteristics, and province dummies. African and Coloured teenagers between the ages of fifteen and nineteen constitute the sample using data from Wave 3 of the National Income Dynamics Survey. \* implies p value < 0.10, \*\* implies p value < 0.05, and \*\*\* implies p value < 0.01

## A.9 The Effect of Time: Fathers

Figure 10

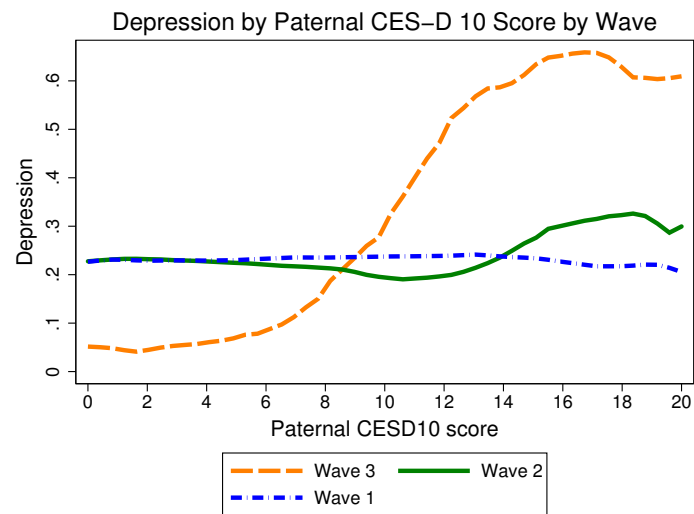


Figure 10 plots levels of depression by paternal CES-D 10, for a full sample of individuals from age 15 to 60 in each wave. Own depression in the current wave (Wave 3) is positively related to paternal CES-D 10 values in Wave 3, yet appears unrelated to paternal CES-D 10 in Waves 2 and 1. Data: National Income Dynamics Survey.

## A.10 Household Income

Figure 11

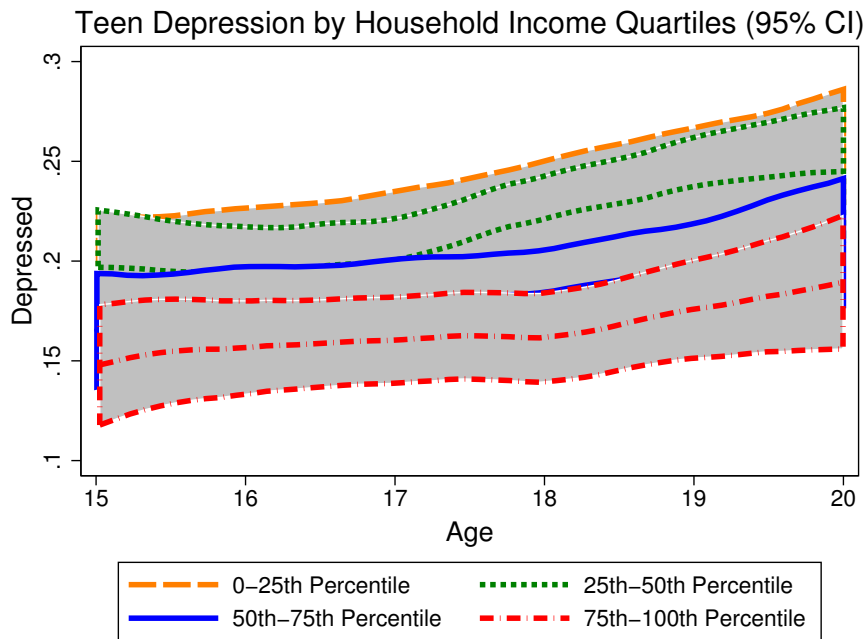


Figure 11 graphs household income by income quartiles for teens between fifteen and twenty. Data: National Income Dynamics Survey.

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The Southern Africa Labour and Development Research Unit (SALDRU) conducts research directed at improving the well-being of South Africa's poor. It was established in 1975. Over the next two decades the unit's research played a central role in documenting the human costs of apartheid. Key projects from this period included the Farm Labour Conference (1976), the Economics of Health Care Conference (1978), and the Second Carnegie Enquiry into Poverty and Development in South Africa (1983-86). At the urging of the African National Congress, from 1992-1994 SALDRU and the World Bank coordinated the Project for Statistics on Living Standards and Development (PSLSD). This project provide baseline data for the implementation of post-apartheid socio-economic policies through South Africa's first non-racial national sample survey.

In the post-apartheid period, SALDRU has continued to gather data and conduct research directed at informing and assessing anti-poverty policy. In line with its historical contribution, SALDRU's researchers continue to conduct research detailing changing patterns of well-being in South Africa and assessing the impact of government policy on the poor. Current research work falls into the following research themes: post-apartheid poverty; employment and migration dynamics; family support structures in an era of rapid social change; public works and public infrastructure programmes, financial strategies of the poor; common property resources and the poor. Key survey projects include the Langeberg Integrated Family Survey (1999), the Khayelitsha/Mitchell's Plain Survey (2000), the ongoing Cape Area Panel Study (2001-) and the Financial Diaries Project.

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