Up or Down? Intergenerational Mental Health Transmission and Cash Transfers in South Africa

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Abstract

We investigate the intergenerational transmission of depression in South Africa from parents to teens, and the positive role income shocks (in the form of cash transfers) can play to reduce this transmission effect. South Africa is characterised by high levels of mental illness, concurrent with poor access to the appropriate care. The consequences of untreated psychiatric disorders are profound, especially in the formative period of adolescence. A dearth of research and data exists in South Africa in this area. We use the National Income Dynamics Survey, the only recent nationally representative survey which collects data both on mental illness and socio-economic factors. Cash transfers are found to be particularly important as a protective factor against teens developing mental illness, and specifically for those teens with parents who themselves suffer from mental illnesses. Pensions are also found to be a positive factor for teen mental health. Using a number of methods, we find that the impact of parental depression on child depression is high - one third of children (adult or teen) who have parents who suffer from depression will themselves suffer from depression. We investigate the temporal nature of this relationship and find that it is mainly current parental depression and current CSG receipt which are important - gaining the grant between waves, and having a parent who suffers from depression in previous waves does not significantly impact on one's current mental health status.

1 Introduction

One third of South Africans will suffer from a mental disorder in their lifetime (Lund 2012), and this burden of disease has been rising since 1990 (Jack, Wagner, Petersen, Thom, Newton, Stein, Kahn, Tollman & Hofman 2014). Rates of mental illness are higher in South Africa than many other countries (Lester & Akande 1997, Ardington & Case 2010). However mental health care has been fragmented and inequitable distributed geographically (Moultrie & Kleintjes 2006), and has not been integrated well into primary health care services. Care practitioners are usually over-stretched[1] and facilities are underfunded (Skeen, Tomlinson, Macedo, Croome & Sherr 2014, Jack et al. 2014), despite new policies such as the Mental Health Policy Framework, and the Strategic Plan for 2013 - 2020, by the National Health Council (following the Mental Health Act of 2002) (Moultrie & Kleintjes 2006). Even after the 2011 public commitments by the Ministry of Health, health budgets are not reflective of the ministry's stated intentions (Jack et al. 2014). Stigma and incorrect information about the diagnosis and treatment of mental health are widespread, and often traditional methods are used before western medicine (Jack et al. 2014).

Internationally, mental health, and the relationship of mental health with poverty has been largely ignored. Mental health does not form one of the Millennium Development Goals (Lund 2012), despite the large contribution of mental illness to the global burden of disease (14% in

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[1]South Africa has staff rates of 1.2 psychiatrists, and 7.5 psychiatric nurses to 100 000 people (Jack et al. 2014).

2007 (Prince, Patel, Saxena, Maj, Maselko, Phillips & Rahman 2007)), and the complicated link which exists between mental illness and many of the MDGs, such as female empowerment, child mortality reductions, HIV/AIDS, and others. Depression in particular has been found to be the second highest cause of loss of years of life to disability after HIV (Moultrie & Kleintjes 2006). Inequality is positively associated with mental illness in many countries, and thus the measured Gini coefficient of 0.66 in South Africa gives us cause for concern. Chhagan, Mellins, Kauchali, Craib, Taylor, Kvalsvig & Davidson (2014) state the need for increased mental illness treatment, particularly for caregivers, and in particular treatment which takes into account the many links between mental health and other conditions/environmental factors. On cost considerations alone, early mental health treatment is critical, as it can reduce overall health care costs by as much as a third (Prince et al. 2007).

This paper investigates the inter-generational transmission of mental health in South Africa, and the role cash transfers can play at mitigating this effect. The probability that a child will suffer from depression if a parent does is large and significant. Teens who receive the child support grant are slightly less likely to suffer from depression, but in particular, those recipients who have parents who are depressed are significantly less likely to be impacted negatively by their parents. These effects are stronger in certain samples, and similar results for the impact of both maternal and paternal depression.

This paper is organised as follows: Section 2 contains the theoretical framework, Section 3 presents a literature review, a description of the child support grant roll-out is contained in Section 4, Section 5 describes the data and descriptive statistics, including the patterns we see in mental illness. Parametric and non-parametric estimates, are included in Section 6. Section 7 contains discussion and further analysis of these results. Issues relating to identification, and robustness checks are discussed in Section 8, and Section 9 concludes.

2 Theoretical Framework

Many models exist regarding depression, and some of these have a long history, derived from the Freudian and Jungian schools of thought, and other older theories. Some models are derived from animal experiments, which may or may not translate well to application to humans. A good model should allow the testing of hypotheses relating to the causes of depression, and indicate some means of treatment (Rehm 1977). The creation of models which explain depression is difficult, as the condition manifests itself in a wide array of symptoms (both cognitive and physical), of which each patient may display a different subset or slightly overlapping subsets (Rehm 1977). Depression models incorporate either biological or psychological factors, or both (Roy & Campbell 2013). The number of both types of models is large. Some biological models include those linking neurological and hormonal factors (HPA), cytokine/macrophage theories (relating to the immune system), monoamine theories (lowered amounts of serotonin, noradrenaline, norepinephrine and dopamine), structural abnormalities or damage in the brain (Roy & Campbell 2013), and genetic vulnerability (Beck 2008). There are potential advantages to seeking to formulate a bio-psychological model which combines both biological and psychological factors (Beck 2008). These models may also be linked. It is important to note the potential bi-directionality of causality between depression and factors which predict depression (Roy & Campbell 2013). For example, lowered income may result in depression, which may impact on an individual's ability to work, which in turn again lowers income. A vicious cycle often exists between poverty and mental illness (Patel & Kleinman 2003).

Following the work of Kanfor, Rehm (1977) make use of an heuristic model of depression, modelling the relationship as a set of related difficulties in self control. The authors note that depression may manifest in different ways which can be related to an individual's actions, guilt, somatic concerns, and failure. Other symptoms include those of helplessness, pessimism and poor self-esteem (Rehm 1977). Lewinsohn et al (1974;1969) in Rehm (1977) describe depression as a combinatory function of external changes in the environment, and differences among individuals of social skills and the ability to positively reinforce behaviours which mitigate depression. A learned helplessness model is proposed by Abramson, Seligman & Teasdale (1978), where an individual continues to feel powerless and lacking control in a situation, even after the situation resolves. Beck (2008) describe a cognitive model of depression, where individuals have a negative view of

the world, the self, and the future, and these views arise from incorrect beliefs.

The data available for this paper (a household survey), does not lend itself to any biological modelling of depression, except the consideration of the genetic link between parent and child. We posit a psychological model of depression, where mental health depends on a number of factors:

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

Where the X_i are individual characteristics such as age, gender, health, attained education, race, marital status, nationality, orphan status, perceived social status, self esteem and loneliness (Hamad, Fernald, Karlan & Zinman 2008) and many more. 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 location, size, composition, social cohesion (Tomita & Burns 2013) or safety, 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 deaths, and the overall health of all the household members (including mental health). The P_p refer to characteristics of the individual's parents, which are more important the younger the individual is. They 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 transmission from parental mental health to child mental health. A lack of safety both in the neighbourhood and at home, low income, poor health and other negative factors can be stressors which potentially lead to the presence of depressive symptoms.

Another important factor of the above model is that some of the individual characteristics X_i may be related to cumulative factors. One's attitude or resilience reflects not only one's current state, but also cumulative effects, beginning from as early as childhood. It is widely acknowledged that childhood has a strong impact on adult characteristics, such as sensitivity to stress, and resilience. Even stress during a pregnancy has been shown to impact on the levels of certain stress levels in the child (Roy & Campbell 2013).

A model such as the one above is primarily concerned with what we might call "nurture" factors, as opposed to "nature". The above does not take into account any biological or neurological determinants of depression. We know that despite the absence of any negative life stressors, individuals may still suffer from mental illness, and this may be strongly related to genetic factors. Many of these approaches seek to firstly establish the most important determinants of depression, and secondly to treat those determinants. It is important to remember that much of the literature reminds us that depression may cease in the short term, but may continue to be a problem if the environmental or biological factors are not dealt with.

3 Literature Review

The theoretical section mentions some of the multiple determinants of mental health. Some relate to socio-economics status, such as education, employment status, household income, immigrant status and others. Location or environment is also important. A lack of social connection, an unsafe environment, poor transport or service delivery (especially health services), and the presence of family or other social support or social capital (Tomita & Burns 2013) can all affect mental state. Mental health can be impacted by negative events such as deaths in the family, violence, divorce, loss of employment etc. Other exogenous factors such as age, gender, sexual orientation, language, parental mental health and education and income levels. Personal characteristics are important too - inner resilience to negative events, any predilection for risky behaviours, physical health and HIV status, religious beliefs, and personal outlook on life and health are important predictors of good or bad emotional states.

The consequences of poor mental health are profound. Those suffering from mental illness are less likely to be able to take care of themselves and others, implying knock on effects on physical health. They are also less able to advocate for themselves to obtain better health care.

In addition, illnesses such as depression have biological effects on the body's functions, such as stress, inflammatory processes and immunity (Prince et al. 2007), and both reduced brain function and brain matter (Sapolsky 2000). As co-morbidity tends to be high in those who have mental illness, treating the illness is integral in improving general physical health. The link between mental and physical health has largely been ignored in public health (Prince et al. 2007). The disorders which may simultaneously be present are not trivial, but include cardiovascular disease, strokes, obesity, smoking, diabetes complications, hypertension and others (Prince et al. 2007), and research has shown depression very often pre-dates these conditions[2].

Children of women who suffer from untreated mental disorders are more likely to suffer from mental health issues themselves, and thus a secondary cost to children is incurred if mothers are not treated. Adherence to HIV and other important medications is lower for the mentally ill. For mothers, poor mental health has been associated with poor infant nutrition, stunting, diarrhoeal disease, low vaccination rates, and limited breastfeeding[3] (Lund 2012, Prince et al. 2007), thus treatment may have a large impact on infant development. Left untreated, poverty and mental health interact in a vicious cycle that continues throughout a person's life (Lund 2012). Individuals suffer from loss of productivity, and may lose employment if illness goes untreated (Hugo, Boshoff, Traut, Zungu-Dirwayi & Stein 2003). They also lose income to the costs of health treatment. Stigma also worsens the impact of psychiatric disorders, and results in exclusion of individuals from society (Skeen et al. 2014). Treating mental health results improves economic outcomes in developing countries (Lund 2012). Mental health treatment costs are higher the longer the illness is left untreated, and include the costs of treatment for co-morbid conditions.

Women in particular bear the costs of gender specific factors, such as the mental and physical costs of child care and child bearing, the prevalence of HIV and other illnesses such as obesity (60% of all women in NIDS Wave 1 in 2008 are either overweight or obese (Ardington & Case 2009)), and the impact of domestic or societal violence, or general powerlessness due to gender disadvantage (Moultrie & Kleintjes 2006). South Africa's unique past has implied that women suffered due to many of these factors (Chhagan et al. 2014, Jack et al. 2014). Women (especially African, Coloured and rural women) have the highest rates of poverty, unemployment, HIV, and violence (Moultrie & Kleintjes 2006), in particular sexual violence. Women also deserve a special focus as they suffer from depression at rates nearly twice that of men, as documented in many countries, and in South Africa (Ardington & Case 2009, Chhagan et al. 2014), and in general higher prevalence than men for most other psychiatric disorders. African women have the highest rates of depression compared to other races (Ardington & Case 2009).

Care giving has been found to be a strong predictor of high stress and poor mental health (Moultrie & Kleintjes 2006, Chhagan et al. 2014), and most caregivers tend to be women. One third of caregivers in a Kwazulu Natal study were found to suffer from psychiatric conditions (Chhagan et al. 2014), and a similar figure of 28% was found for carers of HIV positive people in Malawi and South Africa (Skeen et al. 2014). Caregivers were also found to be unlikely to seek help for psychiatric illnesses[4]. Postnatal depression (PND) is also higher in South African women than the international average[5] (Chhagan et al. 2014).

Unhealthy adolescents become unhealthy adults, so early intervention is important, and to not do so may squander the gains from investments made to promote early childhood health. Given the existing presence of stunting (24% of children under 5 in 2008), in particular among African and Coloured children, in poor and rural households, maintaining health in adolescents seems imperative (Ardington & Case 2009). Behaviours started in adolescence contribute to a minimum of 70% of premature adult deaths (Resnick, Catalano, Sawyer, Viner & Patton 2012). Age distributions show that half of the world's population is below the age of 25. The health of

[2]Some research even suggests that individuals with mental disorders have a higher risk of contracting HIV (Prince et al. 2007).

[3]These effects of mental illness have been found in Pakistan, India, Vietnam, Barbados and others (Prince et al. 2007)

[4]Only 31 percent of those classified as depressed in Wave 3 of the NIDS (2012) had sought treatment in the previous month.

[5]34% of post-partum women in Khayelitsha suffered from PND), as is antenatal depression. Moultrie & Kleintjes (2006) note that gender violence is closely linked to both HIV prevalence and pregnancy, and women in South Africa have much higher rates of HIV than men, particularly adolescents. Depression incidence in HIV positive women has been found to be much higher than the national average.

this group is worthy of examination on the grounds of its magnitude alone.

As children become adolescents, threats to their health begin to include typical injuries found in adolescence, and risky behaviours which jeopardise health (Resnick et al. 2012). Untreated mental health issues in adolescent girls have been seen to increase risky decision making, and be associated with future health problems (both physical and mental), and decreased educational attainment (Baird, De Hoop & Özler 2013). Adolescence is a formative period where relationships are formed, decisions about further education are made and first jobs are sought (Baird et al. 2013), and poor mental health during this time negatively impacts these important decisions.

Mental health in adolescents has been neglected as an area of study in developing countries (Plüddemann, Morojele, Myers, Townsend, Lombard, Williams, Carney & Nel 2014), and South Africa is no exception. Studies in India have shown that suicide is the leading cause of death in boys aged 10-19, accounting for a quarter of all deaths, and shockingly, up to three quarters of all deaths of young women. A large study of high school students in the Western Cape in South Africa found that 15% of students were categorised as high risk for mental illness, and female learners were almost double as likely to be high risk (Plüddemann et al. 2014). High risk was associated with increased absence from school for female students. Again, this research highlights the need for improved mental health treatment in South Africa, and screening for all populations and ages.

Teens infected with HIV are also far more likely to suffer from mental illness (Bhana, Mellins, Petersen, Alicea, Myeza, Holst, Abrams, John, Chhagan, Nestadt et al. 2014). Adolescent girls have been found to have HIV rates which are three times that of boys (Datta, Burns, Maughan-Brown, Darling & Eyal 2015), which again implies a higher burden of mental illness among girls. High HIV prevalence has resulted in many orphaned and vulnerable children (Marais, Sharp, Pappin, Rani, Skinner, Lenka, Cloete & Serekoane 2014), and very little attention has been paid to their mental health.

A dearth of research exists on these topics. Chhagan et al. (2014) note the lack of research in lower and middle income countries on the link between maternal mental health and child development. Very little research has been conducted on women's mental health in South Africa (Moultrie & Kleintjes 2006), and no other nationally representative studies exist after the 2002 South African Stress and Health Study (Tomlinson, Grimsrud, Stein, Williams & Myer 2009), which measure the prevalence of psychiatric disorders in either gender. Few studies exist of the specific economic costs associated with mental and other neurological disorders in South Africa (Jack et al. 2014), and which types of health care packages would be most cost and welfare effective. Marais et al. (2014) note that mental health is often not considered as one of the issues of concern by government when considering the outcomes of social problems such as HIV/AIDS, and in turn is often not recognised as an area of concern by community based organisations.

Cash transfers are one of the many different interventions which attempt to tackle the problem of poor mental health. Cash transfers may alleviate financial constraints which contribute to poor mental health. Hamad et al. (2008) find that increased income in the last month (in particular, non-employment income such as grants and remittances) is associated with lower depressive symptoms. Baird, Chirwa, De Hoop & Özler (2014) find the cash transfers reduced the probability that adolescents suffered from psychological distress. However these effects were seen only during the period of cash receipt, and diminished when adolescents ceased to receive income from the program. Cash transfers may serve to raise female bargaining power in the household, and thus levels of control and agency, improving female well-being. If the grant is used to fund the costs of job search, it may have a ripple effect on mental health if employment is also found. Simultaneity exists between poverty levels and the state of mental health - improving the one tends to improve the other (Lund 2012).

Studies in Mexico of the *Opportunidades* program have shown the positive impact of cash transfers on maternal depression (Lund 2012) and teen stress levels (Lund, De Silva, Plagerson, Cooper, Chisholm, Das, Knapp & Patel 2011). Other studies have shown that cash transfers, particularly to women who head households, hold promise for the mental health of orphans and vulnerable children (Marais et al. 2014, Lund et al. 2011). Lund (2012) state the need for more research into the mental health consequences of cash transfer programmes for recipients. It is not necessarily the case that cash transfers should specifically be used to improve mental health, but it is worth investigating whether improved mental health is one of the outcomes of cash transfer

programs. As a blunt tool to improve mental health, cash transfers may be a cost effective mechanism, which can improve the well being of those who may live in areas without access to any psychiatric treatment.

4 Program Details: The South African Child Support Grant

A universal child support grant was introduced in South Africa in 1998, for all income eligible children under the age of seven. The goals of the program included a reduction in poverty and inequality (both racial and gender), and a means of support for children in their early years (Lund 2008). Initial roll-out was slow, at an estimated ten percent in 2000, but increased significantly thereafter. The grant amount itself is modest (around twenty six US dollars in 2012, approximately a quarter of the old age pension amount), but it has a large distribution - more than 11 million grants were distributed in 2014, and the rate of growth of receipt has been fairly constant at 7.5 percent a year (Eyal, Woolard & Burns 2015).

The age threshold and means test amount were increased in certain years, and in 2012 the age limit was 18, and the means test amount for caregiver recipients was ten times the grant amount. Appendix Item A.1 contains a summary of extension and amount details from 1998 to current in Table 8.

The grant had a fairly bumpy start, and was initially plagued with infrastructural problems (Hunter 2004, Hunter & Adato 2007, Budlender et al. 2005, Aguero et al. 2009, Goudge et al. 2009, Delany 2008), confusion about the application procedure, a lengthy application process, and difficulty obtaining the grant for caregivers other than the mother (Delany 2008). Other issues included the exclusion of potential applicants due to the continued use of a very low means test threshold value, which was only adjusted in 2008 (Budlender et al. 2005).

At first the grant was only granted to younger children with a Road to Health clinic card (signifying regular vaccination and clinic visits on the part of the caregiver for the child), and for older children, only to those who had proof of school enrolment. These conditions were not consistently applied, and at some point ceased to be official requirements. In January 2010, receipt was again formally conditioned on proof of school enrolment for new applicants (Department of Social Development & UNICEF 2012). Failure to provide this proof (in the form of a school report or other similar documentation) does not result in an automatic loss of the grant, but is intended to begin a process of investigation by a social worker. Anecdotally, this condition is not often checked for existing recipients, rather only first time applicants not yet of school going age (Department of Social Development & UNICEF 2012).

No gender differences exist in rates of receipt. Mothers do not immediately apply for the graph - only forty percent of infants under one were recipients in 2012 in NIDS Wave 1. Orphans, and in particular children who have lost their mothers have lower rates of receipt (Leibbrandt et al. 2010, Woolard et al. 2009, Case & Ardington 2006). Large numbers of age eligible children are income eligible too - 83 percent in NIDS waves 1 to 3. Patterns of receipt by age can be seen in Figure 1 (replicated from Eyal et al. (2015)). The extension in the age cut-off to age 18 occurred by 2012, and this can be seen in the higher rates of receipt for older children in Wave 3[6].

[6]Similar patterns of receipt are seen for a restricted sample of means test eligible African and Coloured children, and obviously higher receipt is seen in this group.

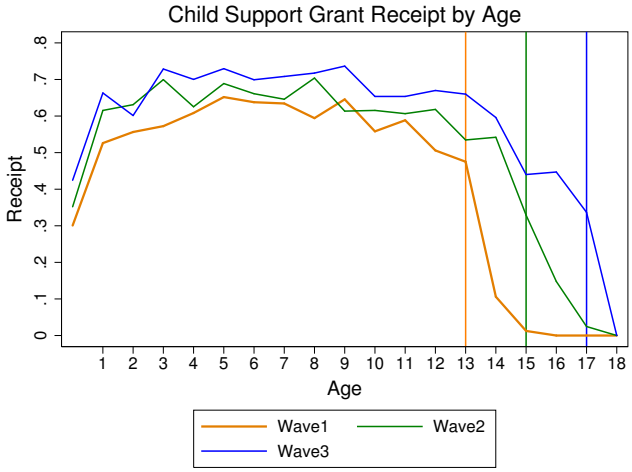

Figure 1 shows average child support grant receipt by age category, in each wave of the NIDS, for children from birth to eighteen years of age. For example, we can see that nine year old children in Wave 3 have average rates of receipt of seventy percent. The vertical lines show the age cut-off relevant to each wave. In Wave 2, the maximum age of receipt is fifteen, and we can see that receipt drops after this age (although not completely to zero due to inclusion and data errors). Averages are calculated using the sample weights for each wave. It is possible to see the increase in receipt in the older ages from Wave 1 to Wave 3. This figure originates from Eyal et al. (2015).

Figure 1

Some inclusion errors are seen in 2008 and 2010, where non zero rates of receipt are seen for fourteen and seventeen year olds. The collection of data in two phases for Wave 2 may partially explain this pattern, and errors in either data collection or age recollection.

5 Data and Descriptive Statistics

5.1 Data

This paper makes use of the National Income Dynamics Survey (SALDRU 2013), the first nationally representative panel survey in South Africa. The survey measures welfare over time, with a focus on income, assets and expenditure, and a rich set of demographic variables (Brown et al. 2013). Waves 1, 2 and 3 were collected in 2008, 2010 and 2012. 10,241 households were surveyed in Wave 3 (2012), a sample of more than 38,000 individuals. NIDS collects a large amount of data on child support grants, both recipients and beneficiaries. Changes in the grant age cut-off occurred over Waves 1 to 3, making it easier to study the grant impact in these years.

The NIDS also collects data on emotional health, in particular ten key variables which can be used to calculate a CES-D 10[7] score, a screening instrument to detect the presence of depression (but not a diagnostic tool). NIDS also contains other questions which indicate the presence of other psychiatric illnesses such as anxiety, bipolar, schizo affective disorder, and others, but the average number of respondents is very low. NIDS is unique in that no other nationally representative data sets exist in South Africa which allow us to study the relationship between mental health and socio-economic status (Ardington & Case 2009). For the study of inter-generational mental health transmission, the repeated sampling of individuals is extremely valuable, and lends itself to estimation using fixed effects.

The calculated CES-D 10 score is between 0 and 30, 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 detailed discussion of how the score is calculated and a preliminary discussion of the patterns of mental illness over the age distribution by wave, rural urban status

[7]Center for Epidemiologic Studies Short Depression Scale

and matriculation status. Data concerns sometimes indicate the use of the CES-D 8 score, which excludes items 5 and 8, as survey participants often mis-understand these questions and answer in the reverse.

Other health measurement variables are self reported measures of over-all health, and assisted daily living scores can be computed from the data in Waves 2 and 3. Other variables are collected regarding general satisfaction with life, whether survey participants are happier, the same, or less happy than ten years ago, and whether participants feel they are doing better or worse than others in terms of household income.

NIDS also has very many variables required to represent the many and varied determinants of mental health. These include: age, race, sex, household income, education, maternal education, maternal and paternal presence in the household, geographical location variables, service delivery quality and type (water, electricity, refuse removal etc.), health services available, social support and networks, violence, language, migration, mental health of parents (if present in the household), religious beliefs, employment status, housing quality, parental employment status if present, safety in the community, civic engagement, social capital and connectedness (such as membership in churches or other community organisations), transport, deaths in the family, risky behaviours, physical health (Brown et al. 2013).

5.2 Descriptive Statistics

5.2.1 Characteristics by Beneficiary Status

Following (Eyal et al. 2015), Table 1 presents descriptive statistics for all children aged eighteen or under in Wave 3, differentiated by CSG beneficiary status. Average age in the sample is 9.1, attained education is 3.47 years, 82 percent of mothers are resident in the household, and average maternal education is 9.75 years. 59 percent of this sample are CSG beneficiaries[8] (with an average number of beneficiaries per household of 1.38). Average duration of receipt (collected for those under fifteen) is 5.43 years. Mean household size is 4.88, and mean household grant income is 1,216 rand.

The data seen in Table 1 accord with previous differences seen in the literature between beneficiaries and non-beneficiaries. Beneficiaries live in larger households, are younger, thus have lower attained education (and lower levels of maternal education), live in poorer households (as seen in household expenditure, income and means test eligibility). They are also more likely to be African, to live with other beneficiaries and in pensioner households, and to live in rural areas. The fathers of CSG recipients are significantly less likely to be resident (30 percent vs 55 percent), and mothers are slightly less likely to be resident (81 vs 83 percent). Similar results are also found for Waves 1 and 2 (not presented here), and a significant increase over the waves is seen in the numbers of recipients, and average grant income. Most differences are at the one percent level. Household grant income is not significantly different for beneficiaries and non-beneficiaries.

5.2.2 Patterns in Mental Health

In Table 1, the differences in mental health score (CES-D 10) and depression status, across beneficiaries and non-beneficiaries are not significant. However CSG beneficiaries have significantly higher average CES-D 10 levels, and rates of both maternal and paternal depression. CSG beneficiaries also have significantly lower levels of life satisfaction than non-beneficiaries.

Appendix Item A.2 presents an analysis of the prevalence of depression by various factors. Depression levels have dropped from Wave 1 to Wave 3 (seen in Figure 11 of Appendix Item A.2). Levels of depression increase with age, as seen in Figure 12. In Figure 14 in Appendix Item A.2, CES-D 10 is graphed by matriculation status (defined as having obtained 12 or more years of education). Matriculation rates decrease with age, and non-matriculants are significantly more

[8]NIDS collects data on grant receipt from the caregivers of children aged fourteen and younger. Teens aged fifteen and above are asked directly about their grant receipt, as they are included in the Adult module of the questionnaire. Data comparability and quality do not seem to be compromised by this slight difference - as seen in Figure 1, the receipt recorded for older teens agrees with the patterns seen for teens below the age of fifteen in Waves 1 and 2.

Table 1

Individual Descriptive Statistics by CSG Beneficiary Status in Wave 3				
Variable	All	CSG Beneficiary		Non Beneficiary
Characteristics				
Age	9.05	8.04	***	10.5
Female	0.50	0.50		0.50
Years of Completed Education	3.47	2.63	***	4.66
Rural	0.39	0.48	***	0.28
Age and Income Eligible for the CSG	0.70	0.89	***	0.42
Mother's Education	9.75	9.17	***	10.6
Mother is Resident in the HH	0.82	0.81	*	0.83
Father is Resident in the HH	0.40	0.30	***	0.55
Health Variables				
CES D-10*	5.71	5.69		5.72
Depressed	0.17	0.16		0.18
Maternal CES D-10	6.85	7.22	***	6.29
Paternal CES D-10	6.27	6.87	***	5.77
Mother is Depressed (CES-D 10 > 10)	0.25	0.27	**	0.21
Father is Depressed (CES-D 10 > 10)	0.22	0.24		0.21
In Poor Health (Self-Perceived)	0.02	0.03		0.02
Happier than Ten Years Ago	0.58	0.55		0.59
Level of Life Satisfaction (1-10, 10 is very satisfied)	4.97	4.66	**	5.13
Population Group				
African	0.84	0.92	***	0.72
Coloured	0.09	0.06	***	0.12
Indian/Asian	0.02	0.01	***	0.04
White	0.06	0.01	***	0.12
Child Support Grant Variables				
CSG Beneficiary	0.59	1.00	***	0.00
Duration of CSG Receipt	5.43	5.43		
Number of CSG Recipients in Household	1.38	2.17	***	0.35
Household Characteristics				
Household Size	4.88	5.16	***	4.52
Number of Children in the Household	2.22	2.48	***	1.89
Number of Pensioners in the Household	0.34	0.37	**	0.30
Household Income Characteristics				
Household Income	8,135	4,234	***	13,229
Household Grant Income	1,216	1,192		1,301
Household Expenditure	5,608	2,639	***	9,480
Poorest Household (Self-Perceived)	0.16	0.20	***	0.10
# Observations	15,490	9,249		6,241

Notes: Descriptive Statistics of Child Support Grant Beneficiaries and Non-Beneficiaries in Wave 3 of the National Income Dynamics Survey Data. *The CES-D 10 is a scale used to measure depression. It ranges from 0 to 30, where 0 is no depression, and 30 is the highest level of depression. Estimates presented are weighted using the wave 3 sample weights. The sample consists of children aged 0 to 18. Significant differences are starred. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

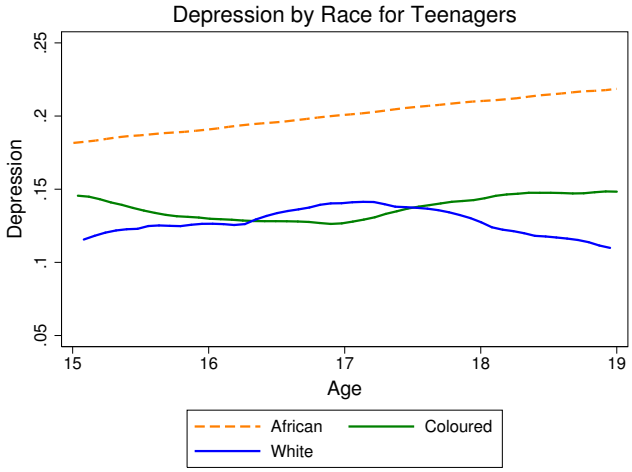

Figure 2 shows depression, graphed by age and population group, for teenagers. Depression is calculated a score of ten or above for the CES-D 10 measure. The CES-D 10 measures mental health status, ranges from 0 and 30, and the higher the score, the more depressed an individual is. Africans are significantly more unhappy than other race groups, and unhappiness increases with age for Africans and Coloureds.

Figure 2: Teenage Depression by Race

depressed than matriculants. Those living in urban areas have lower levels of depression than those in rural areas (see Figure 13).

Moving onto an analysis of teens in particular, in Figure 2 we see that the mental health of Africans is worse than that of Coloureds and Whites. Figure 3 shows that overwhelmingly girls have higher levels of depression than boys.

The mental health of teens is strongly correlated with that of parents, as seen in Figure 4 and Figure 5. When maternal CES-D 10 score is lower, the rates of depression of boys and girls does not differ, though we see both have increasing levels of depression as maternal CES-D 10 score increases. Similarly, teen depression increases with paternal CES-D 10 score.

In Table 2 we investigate mean depression and CES-D 10 scores, by category and gender, for teenagers aged 15 to 19. We find that overwhelmingly girls have higher levels of depression and higher CES-D 10 scores than boys. Depression appears to peak at age 17 for girls, and age 19 for boys. Similar patterns are seen for CES-D 10 scores as for depression levels in many places, although in certain instances differences are seen. For White teenagers mean CES-D 10 scores are higher for girls, while depression levels are higher for boys. Africans have the highest rates of depression, followed by Whites and then Coloureds. Sample sizes for Indian and Asian are too small to allow meaningful analysis. The rates of depression for teens with parents who have above average CES-D 10 scores is much higher than the average. For example average rates of depression in girls is 20 percent, while 33 percent of those with mothers with above average CES-D 10 scores are depressed. Teens who have depressed fathers have levels of depression that are double the average levels for all teens. Those who report being happier than ten years ago, or who have above average levels of life satisfaction, have lower rates of depression. A perception of poor health is associated with higher depression in female teens. Mothers and fathers residing in the household have small but positive protective effects on teen mental health.

5.2.3 Validation of the CES-D 10 Score

Depression is manifested in physical and mental symptoms. The Diagnostic and Statistical Manual-V contains the most up to date definitions and descriptions of all mental disorders, and is one of the most common references for diagnosis. However, empirical work is often performed by researchers who do not specialise in medicine or psychiatry in particular. Simple psychometric scales are often used, due to the ease with which they can be administered and interpreted. The

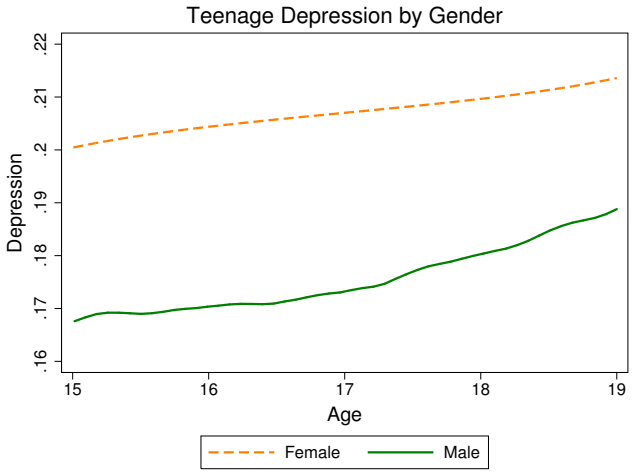

Figure 3 shows depression, graphed by gender, for teenagers. Depression is calculated a score of ten or above for the CES-D 10 measure. The CES-D 10 measures mental health status, ranges from 0 and 30, and the higher the score, the more depressed an individual is. Female teens are significantly unhappier than male teens at all ages. The sample consists of 8,608 teens of all races.

Figure 3: Rates of Teen Depression by Gender

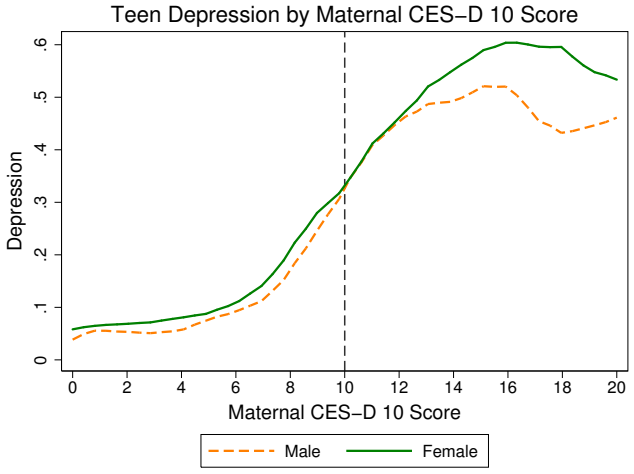

Figure 4 shows rates of teen depression, measured as a score of ten or above for CES-D 10. CES-D 10 is a measure of mental health status, ranging from 0 and 30. The higher the score, the more depressed an individual is. Child depression is graphed as a function of maternal CES-D 10 score, by gender. The vertical line at 10 shows the cut-off after which mothers are considered to be depressed. The sample size is 13,840 teens using a stacked dataset over all 3 waves.

Figure 4: Teen Depression as a function of Maternal Mental Health

Table 2

Mean Depression and CES-D 10 Scores in Wave 3 by Category and Gender						
	Depressed			CESD-10		
	All	Female	Male	All	Female	Male
All	0.18	0.20	0.16	5.8	6.0	5.6
Above Average Maternal CES-D 10	0.30	0.33	0.26	7.2	7.4	7.0
Above Average Paternal CES-D 10	0.33	0.33	0.32	7.4	7.6	7.2
Mother is Depressed	0.38	0.42	0.33	8.0	8.3	7.7
Father is Depressed	0.47	0.54	0.38	8.9	9.2	8.5
Mother has Matric	0.16	0.18	0.13	5.5	5.7	5.2
Mother is Resident in the Household	0.17	0.21	0.14	5.6	5.9	5.3
Father is Resident in the Household	0.16	0.17	0.14	5.3	5.4	5.2
Means Test Eligible	0.19	0.21	0.17	6.0	6.2	5.8
Child Support Grant Beneficiary	0.16	0.21	0.11	5.7	6.2	5.2
Happier than Ten Years Ago	0.14	0.15	0.12	5.2	5.4	5.1
Above Average Level of Satisfaction	0.10	0.11	0.09	5.0	5.2	4.8
Depressed	1.00	1.00	1.00	12.5	12.6	12.5
Poor Health (Self-Perceived)	0.20	0.25	0.16	6.2	7.2	5.4
Poorest Household (Self-Perceived)	0.21	0.24	0.17	6.2	6.6	5.8
Rural	0.18	0.20	0.17	5.9	5.9	5.8
Age Categories						
15	0.15	0.17	0.12	5.4	5.9	4.8
16	0.17	0.18	0.16	5.8	5.7	5.8
17	0.20	0.24	0.17	5.9	6.2	5.6
18	0.17	0.21	0.12	5.8	5.8	5.7
19	0.21	0.19	0.23	6.2	6.1	6.2
African	0.18	0.21	0.16	6.0	6.2	5.8
Coloured	0.14	0.11	0.17	4.5	4.2	4.8
Indian/Asian	-	-	-	5.3	4.0	5.9
White	0.17	0.16	0.19	4.2	4.5	3.9
Number of Observations.	4,051	2,032	2,019	4,051	2,032	2,019

Notes: Mean Depression Prevalence and CES-D 10 Scores, presented by Category and Gender. The CES-D 10 score is a measure of depression, scaled between 0 and 30, where a higher score indicates higher levels of depression. Depression is defined as a CES-D 10 score of ten or above. National Income Dynamics Survey Data. Estimates presented are weighted using the sample weights from each wave. The sample consists of teenagers aged 15 to 19.

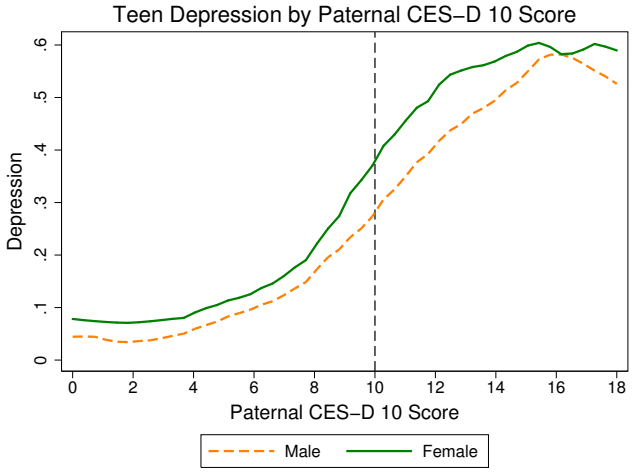

Figure 5 shows rates of teen depression, measured as a score of ten or above for the CES-D 10 score. CES-D 10 is a measure of mental health status, ranging from 0 and 30. The higher the score, the more depressed an individual is. Teen depression is graphed as a function of paternal CES-D 10 score, by gender. The vertical line at 10 shows the cut-off after which fathers are considered to be depressed. The sample size is 5,369 teens using a stacked dataset over all 3 waves. This sample is smaller than that of Figure 4 due to the high numbers of fathers who are not resident in the household.

Figure 5: Teen Depression as a Function of Paternal Mental Health

CES-D 10 is a short self-reported scale which is designed to diagnose and classify the severity of depression (Radloff 1977). It has been found to be be consistent both internally, and in repeated testing, in other countries and in South Africa (Hamad et al. 2008). In addition, it measures well in diagnosis when compared to other diagnostic scales commonly used, such as the Rockliff Depression Rating scale, the Hamilton, the Edinburgh and others (Radloff 1977, Das, Do, Friedman, McKenzie & Scott 2007). It is also consistent when compared to two other measures - the CES-D 8[9], and the CES-D 20 (a longer version of the same questionnaire). The CES-D 20 has been found to be valid in international studies and in South Africa (Myer, Smit, Roux, Parker, Stein & Seedat 2008). In Figure 12 in Appendix Item A.2, both the CES-D 8 and CES-D 10 are graphed together, and a very similar pattern is seen for both.

The CES-D 10 is a scale originally conceptualised in North America, and thus may not be as effective when used in other cultures. Its effectiveness has been tested in Hong Kong (Cheung & Bagley 1998), and it has been found to be valid in that country. In South Africa, the CES-D 10 is widely used (Johnes & Johnes 2004, Hamad et al. 2008, Pretorius 1991, Myer et al. 2008), and it has certainly been verified for use as an initial screening tool, although clinicians recommend making use of other tools in addition.

A psychometric scale such as the CES-D 10 may be less valid if the translation of the questions to other languages loses something of the essence of the original question. In addition, metaphors or symbols[10] may be more appropriate in certain cultures to describe depression, and these do not form a part of the basic scale (Ellis 2003). Depression itself in Africa is a tricky concept, and all around the world, as it can tend to manifest differently in different cultures and ethnic groups. High levels of stigma persist (Hugo et al. 2003), and in certain African languages, the literal translation for a psychiatrist is a mad person's doctor. If stigma is higher in certain groups, and lower in others, one may find the questions for the CES-D 10 scale are answered with greater ease in the low stigma community, meaning the prevalence of depression measured in that community is likely to be close to the true measure. In high stigma communities it is less likely that depression

[9]This scale removes two positively phrased questions from the CES-D 10, in order to remove any potential confusion in answers.

[10]For example, in Zulu descriptions such as I cannot feel my body, or my heart is tired, or the blood is finished, may be used to describe depressive symptoms (Ellis 2003).

will be detected or treated. Mental distress is likely to be treated with traditional methods first, and it may be associated with troubles with one's ancestors, witch-craft, or the need to cast demons out (Ellis 2003). In addition, certain African languages are very good at naming tangible objects, but have great difficulty in naming intangible concepts, and will often use lengthy, and non-specific descriptions to do so (Ellis 2003).

In the data itself, we see a strong positive correlation of the CES-D 10 with other measures of negative events, such as a death in the family. A negative correlation exists between the variable and measures of happiness and satisfaction. A measure of Chronbach's alpha[11] across all 3 waves of NIDS is 72 percent (70 is often taken as a the cut-off for a reliable scale). The correlations between the individual questions that make up the scale are negative, except with the two positive questions about hope and happiness.

A question exists as to whether the CES-D 10 score is appropriate, given the possible data problems due to the two positively phrased questions. The data does show a somewhat different distribution for these two questions, but regression analysis shows the 2 variables have a significant correlation of eighty percent. Figure 12 in Appendix Item A.2 shows a graphic representation of the CES-D 10 and CES-D 8. Analysis by race group for both these measures reveals similar correlations and patterns over the age distribution.

We elect to continue to use the CES-D 10 score as our measure of depression, as this facilitates easy comparison with other papers, and also incorporates all available data.

Following Eyal et al. (2015), we use a sample of African and Coloured learners between fifteen and nineteen. This group has the highest rate of CSG receipt. When the analysis is also performed for Africans alone, similar results are found. In addition, we present results from Wave 3 only. Teens below the age of fifteen have no CES-D 10 data in all waves; in Wave 1 are not eligible for receipt, and in Wave 2 do not show sufficient variation in receipt due to the recent expansion of the age limit.

6 Methodology and Estimation

6.1 Parametric Estimation

Three specifications, estimated with CES-D 10, depression, and level of life satisfaction as dependent variables[12] are estimated. The first specification is multiple linear regression (columns (1), (4) and (7) of Appendix Tables A.3 and A.4), with the main determinants of interest reported child support grant receipt for children, and the parental depression variable. These tables estimate the impact of paternal and maternal depression separately. Model (1) is as follows:

$$Y_{ih} = \beta_0 + \beta CSG_{ih} + \alpha X_{ih} + \lambda PDep_p + \gamma HH_h + \epsilon G_{ih} + u_{ih} \tag{1}$$

Y_{ih} reflects the outcome variable for individual i, in household h. CSG_{ih} reflects receipt, X_{ih} includes age, gender, years of completed education, mother's education, a binary variable for Coloured, maternal presence in the household and other individual characteristics. $PDep_p$ reflects whether the mother or father is depressed. HH_h is a vector of household characteristics including the log of household income[13] and household size. G_{ih} includes geographical controls, including binary variables for the provinces, and an indicator of living in a rural area, and u_{ih} is an error term.

In Model (2) we present the results of a regression discontinuity model, where CSG receipt CSG_{ih} is instrumented for using an age eligibility dummy $Elig_i$. This coefficient measures the average treatment effect for those who respond to the age eligibility condition. These results are shown in columns (2), (5) and (8) in Appendix Tables A.3 and A.4. For a discussion on the strength and validity of this instrument, see Eyal et al. (2015).

[11] A measure of internal consistency for a psychometric scale.

[12] Estimates are also performed with a variable reflecting whether the individual is happier than ten years ago, and the results are similar.

[13] Results do not differ when the inverse hyperbolic sine transformation of household income is used.

In Model (3), the CSG variable used is potential duration of CSG receipt. The coefficient reported shows the impact of an extra ten years of exposure. These estimates are seen in columns (3), (6), and (9) in Appendix Tables A.3 and A.4.

Appendix Table A.4 contains far fewer observations, as fewer fathers are resident in the household, and thus more teens have missing data for paternal depression. Higher parental depression is associated with a higher probability that a teenager is depressed, higher CES-D 10 levels, and lower life satisfaction scores. In Appendix Table A.3 the child support grant is consistently associated with lower levels of depression in all three specifications. In the maternal depression specification, a recipient has a probability of depression which is eleven percentage points lower than non-recipients, or 29 percentage points according to the instrumental variables results, which implies the instrumental variable estimation eliminates some form of negative omitted variable bias. An extra ten years of potential exposure is associated with depression 24 percentage points lower. Similar, but smaller effects are seen in Appendix Table A.4 for models (1) and (3), although the instrumental variables estimates, though the same sign, are not significant.

Other significant determinants include whether an individual is Coloured (Coloured individuals have lower levels of depression) and gender (women suffer from depression more than men). As the effects are similar, we choose to focus on depression as our dependent variable of choice for our further analysis. In addition, we focus on different versions of the first OLS estimation, as these are clearly a lower bound for the impact of CSG receipt.

New estimates are shown in Table 3 below. Column (1) shows the uncontrolled effect of parental depression on own depression. The effect size is approximately 33 percentage points. Adding in extra controls in the remaining 3 models of Table 3 changes this coefficient slightly, yielding an estimated range of 29 to 40 percentage points for this coefficient. In the third and fourth specifications used, we add in actual receipt as a determinant, and then an additional interaction term between receipt and whether the parent is depressed. CSG receipt by itself is found to lower rates of depression in teens. However this impact becomes insignificant when we introduce the interaction term. It appears to be that the impact of the CSG is felt mostly for those children who have depressed parents. For those that do, CSG receipt lowers their probability of being depressed by between twelve (for teens with depressed mothers) and twenty four (paternal depression) percentage points. These estimates are significant at the five and one percent levels respectively. In these estimates, another significant determinant of teen mental health is race, where again Coloured teens are seen to have lower levels of depression, especially in households where mothers are present.

Females are seen to have higher rates of depression, and living in a pensioner household is associated with lower levels of depression, in particular for households with resident depressed mothers[14]. Unexpectedly, household income is only slightly significant, and in these specifications higher household income is associated with higher levels of depression rather than lower, which one might expect. This effect size is very small however, and not stable - when we do not control for a parent's labour market status, household income becomes insignificant. Using other measures of a household's socio-economic status such as remittance income, grant income or household expenditure (in log and level formats) no significant coefficients are found. That grants are significant, and household income is not may reflect the direct control teens may have over their own grants, compared to household funds (Eyal et al. 2015). 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.

It may be the case that the parental depression variable is incorporating the effects of other parental characteristics. To account for this, we include other variables such as parent's age, whether the parent is economically active, or employed, and the parent's education levels. The inclusion of these variables does not impact on the size of the coefficients of parental depression, CSG receipt, or the interaction term for either mother or father. We find that neither maternal education nor maternal age significantly impact on teen depression. Having a mother who is economically active lowers the probability of depression by 5 percentage points, a relatively large (and stable) effect, although whether a mother is employed or not has no impact on depression, and neither does her monthly wage. In contrast, none of paternal education, economically active

[14]No gender effect exists - living in a household with a female pensioner is not a significant determinant, but rather living with any pensioner no matter their gender.

Table 3

Intergenerational Transmission of Mental Health: Determinants of Child Depression

	Child is Depressed							
	(1)		(2)		(3)		(4)	
	Mother	Father	Mother	Father	Mother	Father	Mother	Father
Parent is Depressed	0.34 ***	0.33 ***	0.32 ***	0.30 ***	0.31 ***	0.29 ***	0.37 ***	0.40 ***
CSG Receipt					-0.04	-0.11 **	-0.01	-0.04
CSG Receipt*Parent is Depressed							-0.12 **	-0.24 ***
Parent's Education			0.01 *	0.00	0.01 *	0.00	0.01 *	0.00
Parent is Economically Active			-0.05 **	-0.01	-0.05 **	-0.01	-0.05 **	0.00
Age in Years			0.01	0.01	0.00	-0.02	0.00	-0.02
Female			0.03 *	0.02 *	0.03 *	0.03 *	0.04 *	0.03 *
Years of Attained Education			0.00	0.00	0.00	0.00	0.00	0.00
Coloured			-0.11 **	-0.05 **	-0.12 **	-0.06 **	-0.12 **	-0.06 **
Log of Household Income			0.03 *	0.01 *	0.03 *	0.01 *	0.03 *	0.01 *
Pensioner Household			-0.07 **	-0.02 **	-0.07 **	-0.02 **	-0.07 **	0.00 **
Household Size			0.00	0.00	0.00	0.00	0.00	0.00
Rural			0.01	0.05	0.01	0.06	0.01	0.06
Dependent Variable Mean			0.17				0.17	
Number of Observations	1,325	459	1,320	457	1,320	457	1,320	457
F stat	112.1	35.5	9.1	3.5	8.8	3.3	8.7	3.4
Adjusted R Squared	0.17	0.17	0.19	0.17	0.19	0.19	0.20	0.21

Notes: 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 0 and 30, where a higher score indicates higher levels of depression. 4 Specifications are presented. In Specification (1), child depression is regressed on a binary variable for parental depression, either maternal or paternal. In Specification (2), a full set of relevant controls are included. In Specification (3), Child Support Grant Receipt is included, and in Specification (4), an interaction term between CSG receipt, and the parental depression term. African and Coloured learners between the ages of 15 and 19 who are income eligible for the Child Support Grant constitute the sample. Data from wave 3 of the National Income Dynamics Survey is used. A full set of province dummies is included in specifications (2) through (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.

status, wage or age have any impact on teen depression.

These estimates are performed for a number of sub-samples, as seen in Table 4 below, and the coefficient on parental depression is reported. The table reports for either the coefficient on whether a parent is depressed, for sons and daughters, and the size of the sample. All coefficients are significant at the one percent level. The strength of intergenerational transmission is always larger for daughters than sons, although the effect size for boys is not small. Paternal depression has a larger impact on daughters than sons, and this is seen in all sub-samples. Parental impact on children decreases with child age. Intergenerational transmission is significantly larger for African girls compared to Coloured girls. The size of the effect is actually larger in households which contain a pensioner, or a pensioner and a CSG recipient. This is an unexpected result. Having the other parent resident is associated with higher transmission of depression from parent to child. This is possibly due to the high correlation of depression between parents (45 percent in some samples).

Table 4

Intergenerational Transmission Effect Sizes: Gendered Sub-Samples

Dependent Variable	Child is Depressed							
	Impact of a Depressed Mother				Impact of a Depressed Father			
Samples	All		Daughter	Son	All		Daughter	Son
All: Effect, Sample Size	0.39	1,742	0.44	0.34	0.40	667	0.50	0.30
African	0.40	1,450	0.45	0.35	0.43	519	0.52	0.34
Coloured	0.36	253	0.38	0.34	0.36	124	0.46	0.33
15 Year Olds	0.64	392	0.67	0.62	0.42	156	0.60	0.24
16 Year Olds	0.44	379	0.49	0.34	0.46	156	0.47	0.53
17 Year Olds	0.35	354	0.47	0.24	0.49	137	0.68	0.27
18 Year Olds	0.36	336	0.45	0.26	0.35	124	0.43	0.31
19 Year Olds	0.34	281	0.38	0.30	0.35	94	0.48	0.27
Pensioner Household	0.39	338	0.44	0.31	0.51	129	0.60	0.33
CSG Household	0.35	1,336	0.40	0.30	0.37	466	0.40	0.32
Pension and CSG Household	0.39	293	0.43	0.33	0.51	107	0.64	0.12
Poorest Household	0.31	441	0.34	0.28	0.30	170	0.42	0.18
Other Parent Resident	0.45	658	0.51	0.38	0.38	579	0.47	0.29

Notes: This table contains the intergenerational mental health transmission effects replicated for specific samples, for sons and daughters. We estimate the impact of parental depression on whether the child is depressed, with a full set of controls. We can see that in the entire sample, having a depressed mother raises the probability of a child being depressed by 39 percentage points. The sample size is 1,745. Significance levels are not reported, as except for a very few select sub-samples (with small sample sizes), the coefficient is always significant at the 1% level. Mean depression values in these sub-samples range from 14 to 22 percent.

6.2 Non-Parametric Estimation

Following Duflo (2000), non-parametric regressions are estimated as follows:

$$Y_i = g(Age_i) + \epsilon_i$$

Where Y_i is depression, and Age_i is the age of the child in years. ϵ_i is an error term, where $\epsilon_i \sim i.i.d[0, \sigma_\epsilon^2]$, and $g()$ is the un-specified and unrestricted regression function[15]. The results can be seen in Figure 6. The predicted probability of being depressed is graphed for teenagers in Wave 1 and 3. Teens in Wave 3 have lower levels of depression than those in Wave 1. Seventeen and eighteen year olds in Wave 1 have had no exposure to the grant, whereas seventeen and eighteen year olds in Wave 3 have had thirteen and six years of potential receipt respectively (see Appendix Item A.5 for a discussion of the exogenous nature of the grant roll-out). In addition, seventeen year olds in Wave 1 do not have receipt, while seventeen year olds in Wave 3 are current grant beneficiaries.

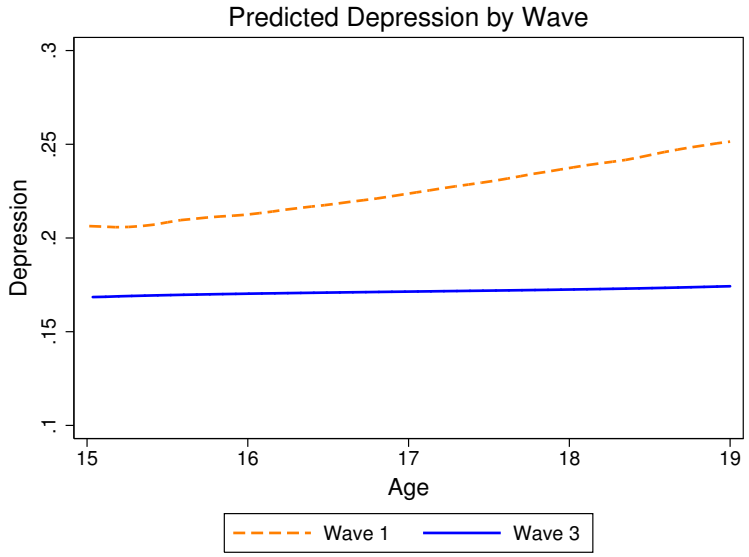

Figure 6 shows rates of teen depression, measured as a score of ten or above for the CES-D 10 score. CES-D 10 is a measure of mental health status, ranging from 0 and 30. The higher the score, the more depressed an individual is. Child depression is graphed as a function of age, in Waves 1 and 3. Teens in Wave 3 have a higher proportion of life exposed to the child support grant. Those who have been exposed for longer have significantly lower rates of depression than those exposed for shorter periods of time.

Figure 6

In Figure 7, we graph the probability of being depressed by proportion of life exposed to the CSG, for those with less than or more than half of their lives exposed. Those with more exposure have a lower probability of being depressed, and these differences are significant. These patterns continue for other representations. In Appendix Item A.6, Figure 16 shows that whether receipt was interrupted or not matters, as those with un-interrupted receipt (those born after 1995), have a significantly lower probability of depression than those whose receipt was interrupted.

[15] We use kernel weighted local polynomial regression, using the epanechnikov kernel (Cameron & Trivedi 2009).

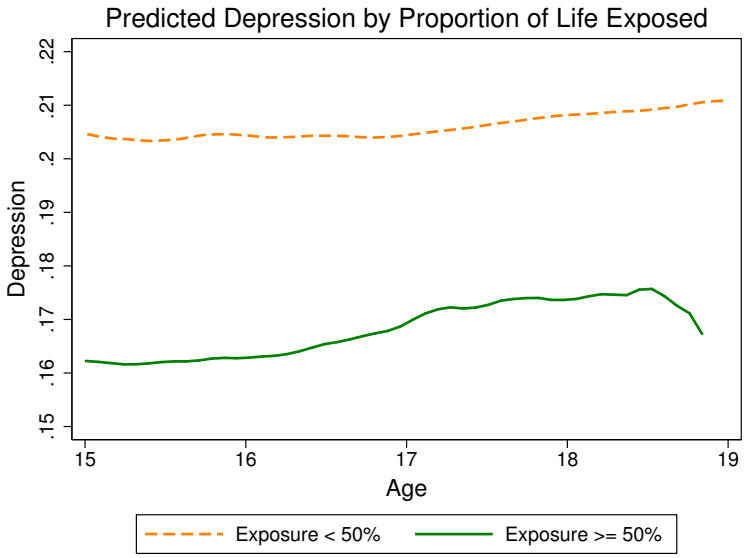

Figure 7 shows rates of teen depression, measured as a score of ten or above for the CES-D 10 score. CES-D 10 is a measure of mental health status, ranging from 0 and 30. The higher the score, the more depressed an individual is. Child depression is graphed as a function of paternal CES-D 10 score, by proportion of life exposed to the child support grant. One can see that those who have been exposed for longer than half of their lives have significantly lower rates of depression than those exposed for less than half of their lives.

Figure 7

7 Discussion

7.1 Causality

Establishing the direction of causality is difficult for the income-health relationship, and in the parent-child mental health transmission. For the latter, it seems more likely that the direction of the causality runs from parent to child. 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. This latter assumption requires testing. Apart from the impact of a child who suffers from mental illness on a parent, the recent birth of children may well impact on parental health if post-natal depression occurs after the birth.

We attempt to measure the relationship between an income shock and mental illness, and the question is whether the issue of simultaneity between mental health and income has been adequately dealt with. In Eyal et al. (2015), we argue that child support grant receipt can be considered to be random and exogenous in this particular sample, and using these estimation methods. This lends weight to the assumption that the income effect measured is a causal one. However further research is required on this topic. Godlonton & Keswell (2005) and others note the difficulty inherent in dis-entangling the direction of causality when estimating either impact.

7.2 Mechanisms

We see that girls have higher rates of depression than boys, and this has been linked in the literature to other phenomena such as higher rates of HIV in girls, feelings of powerlessness, lack of role models, being the victim of domestic abuse, and others. Girls who receive the CSG may be less likely to resort to relationships with older men who although they can provide financially, often have higher rates of HIV prevalence (Datta et al. 2015).

These results show that living in a pensioner household is associated with lower levels of depression. Research has shown that men are more likely to spend extra income on personal consumption

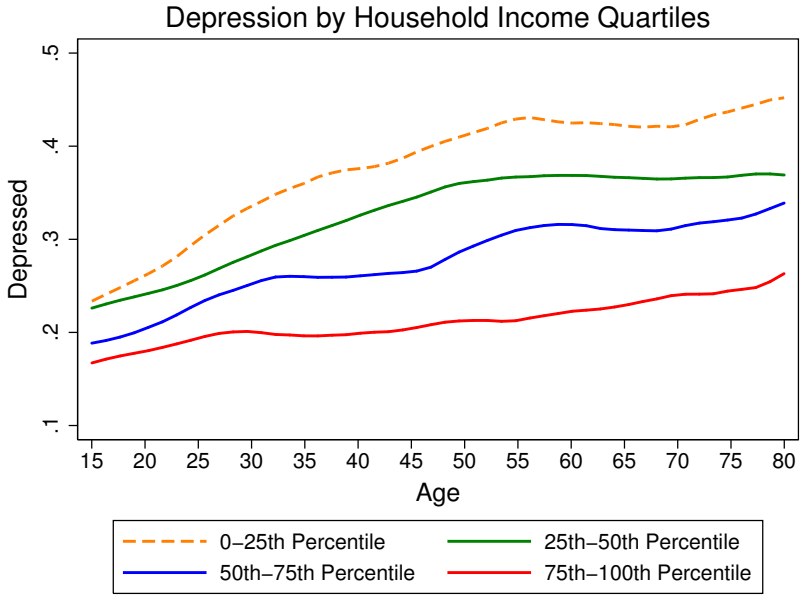

Figure 8 shows average depression graphed using a local polynomial function, measured as a score of ten or above for the CES-D 10 score. CES-D 10 is a measure of mental health status, ranging from 0 and 30. The higher the score, the more depressed an individual is. Using data from all 3 waves, depression rates are graphed by household income quartile. Average depression rises with age, but the higher your income quartile, the less likely you are to be depressed.

Figure 8

goods, while women increase spending on nutrition and educational expenses, particularly on children (Thomas 1990), and if this is the case, then pension spending may be directed to this end. However when we estimate the impact of a female pensioner in the household compared to a male, we find a smaller effect.

We see that Coloured teens have lower rates of depression than African. This could be related to underlying community factors - if Coloured communities are more tightly knit then rates of depression may be likely to be lower (Tomita & Burns 2013).

In a review of studies, Patel & Kleinman (2003) find that socio-economic problems are one of the most important factors causing mental distress. Many studies show that once education is taken into account, income is no longer related to depression. Ardington & Case (2010) find that education is a robust determinant of mental health. However in our estimates attained education is never a significant determinant of own mental health (and neither is current enrolment). This is possibly due to both a lack of variation in this variable in our age restricted sample, and the fairly high correlation between age and attained education (0.49). Paternal education has no impact on depression in our estimates, and the impact of maternal education is not stable.

7.3 Household Income

We further investigate the insignificance and instability of household income in Table 3 below, graphing the relationship between household income and average depression, by household income quartile (see Figures 8 and 9). We see again that average depression increases over age, and that the higher your household income, the less likely you are to be depressed. These are significant differences in the middle of the age distribution (see Figure 9), but greater variation exists for teens and for the elderly. Too small sample sizes are unlikely to be driving these results - the sample sizes for teens and those aged above 75 are 10,241 and 876 individuals respectively. Figure 10 shows the large overlap in teen depression levels by household income quartile. No clear pattern of a strict one directional relationship between depression and income can be found.

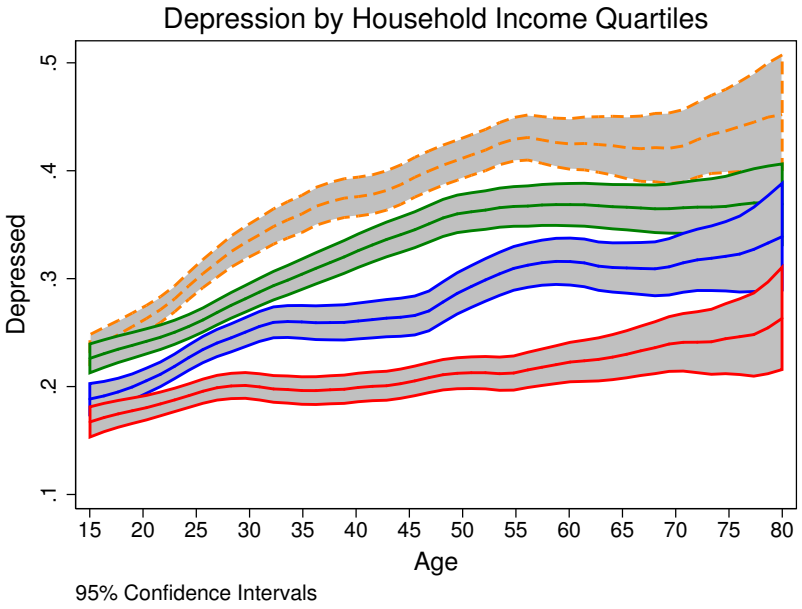

Figure 9 repeats the graph shown in Figure 8 but including 95% confidence intervals around each line. The confidence intervals are distinct in the middle of the graph, but overlap at either end. Variation is higher for teens and for adults over 75. The sample sizes respectively for these groups are 10,421 and 876 individuals, which indicates small sample sizes are not driving these results.

Figure 9

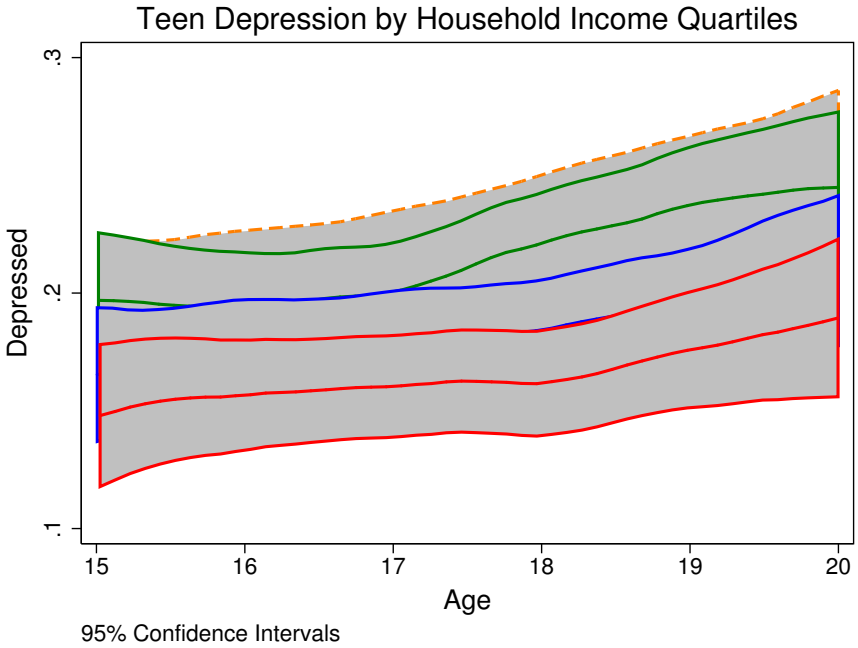

Figure 10 repeats the graph shown in Figure 9 for teens between 15 and 20. It is possible to see the overlap in confidence intervals for these groups, implying that estimation of the effect of household income for teens is likely to be inconclusive. Sample size is 10,241 individuals.

Figure 10

The CSG impact is estimated from the variation in receipt, which implies measurement through those who either lose or gain receipt. This implies a *change* in income, which has been seen to be associated with changes in mental health (Sareen, Afifi, McMillan & Asmundson 2011, Das et al. 2007, Baird et al. 2013), may be the key explanatory factor, and not absolute levels of income. A literature exists which shows that it is relative consumption that matters (Luttmer 2004), and obtaining a grant may increase utility for adolescents as their relative position improves in comparison to their peers (Baird et al. 2013). This may explain why CSG receipt matters for depression and household income does not necessarily, as the CSG improves the individual position of the teen relative to their peers, and higher household income does not necessarily imply that teens themselves have a better socio-economic position.

7.4 Transmission among Adults

We are interested in the size of the intergenerational transmission coefficient for all adults, and the other significant determinants of mental illness for all adults. We present Ordinary Least Squares estimates from Wave 3 and the pooled data set, and a fixed effects estimation in Table 5. The sample comprises African and Coloured individuals between the ages of 15 and 60. We use this sample to enable comparison to estimates in our other tables. Limiting the sample in this manner does not reduce the sample size greatly, and similar results are recorded for the full sample.

The estimates here do not contradict with those of the restricted teen sample. The transmission coefficient ranges in size from 34 to 38 percentage points, and is stable and significant across all specifications. Once again whether a mother is economically active has a positive effect for mental health. Women are seen to have higher levels of depression than men. Coloured individuals, and those living in pensioner households have lower levels of depression. Household income and attained education are not significant determinants of depression status. We allow the age depression relationship to take a quadratic form, and find a significant relationship between depression and age. Depression peaks at age 40 on average. A very similar range is found for the age maximum of depression for all 3 waves for the maternal estimates but more variability is seen in the paternal depression estimates. The time dummies included show depression levels have been decreasing since 2008.

Estimates for Wave 1 and 2 are not presented here due to space constraints. Coefficient sizes for maternal depression estimates differ only very slightly by wave, while more differences are seen for paternal depression. However the effect sizes of the parental depression coefficient do not change. Our initial estimates included controls for parental age, education and economically active status. F tests fail to reject an hypothesis of joint significance, and fairly high correlations exist between parental and own age, parental age and parental education, and parental education and parental economically active status. Based on these tests we include only parental economically active status, however the inclusion or omission does not change the size of significance of other coefficients. Omitting combinations of these variables does not have an impact on the size or significance of the other variables. The fixed effects and pooled estimates show that only maternal labour market status matters, and not paternal. Individuals who have economically active mothers are less likely to be depressed.

7.5 Who are CSG Recipients?

We have established that the CSG is protective of mental health. We do not know specifically why it is so important for those recipients who have depressed parents. It is worth investigating the nature of both child support grant recipients, and mothers who suffer from depression. To begin, in Table 6 we examine a sample of means test eligible Coloured and African mothers aged between 25 and 55 over each 3 waves, and examine their differences by recipient status. The use of this sample is motivated by the high proportion of African and Coloured recipients, and our desire to include mothers old enough to have teenagers, but who are not yet pensioners.

Some differences are as expected. Recipients are on average 4 years younger than non-recipients, and correspondingly have younger children. Recipients have more children, despite their much younger average age. They live in larger poorer households, more often in rural areas, and are more likely to live in pensioner households. They are slightly less likely to be depressed

Table 5

Intergenerational Transmission of Mental Health: Determinants of Adult Depression						
	Wave 3		Pooled Data Set		Fixed Effects	
	Maternal	Paternal	Maternal	Paternal	Maternal	Paternal
Parent is Depressed	0.37 ***	0.38 ***	0.33 ***	0.34 ***	0.34 ***	0.34 ***
Parent is Economically Active	-0.02	-0.04	-0.03 ***	0.00	-0.04 *	-0.05
Age in Years	0.01 ***	0.03 ***	0.02 ***	0.02 ***	0.03	0.05
Age Squared	0.00 ***	0.00 ***	0.00 ***	0.00 ***	0.00 **	0.00 **
Female	0.02 *	0.06 ***	0.03 ***	0.06 ***		
Years of Attained Education	0.00	-0.01 **	-0.01 ***	-0.01 ***	0.00	-0.03
Coloured	-0.11 ***	-0.09 **	-0.06 ***	-0.05 *		
Log of Household Income	0.01	0.02	0.00	0.00	-0.01	0.01
Pensioner Household	-0.04 **	-0.07 **	-0.02 **	-0.05 ***	-0.02	-0.04
Household Size	0.00	0.00	0.00	0.00	0.01	0.02
Rural	-0.02	0.01	-0.01	0.00	0.08	-0.41 ***
Wave 2			-0.04 ***	-0.03 *	-0.02	0.00
Wave 3			-0.03 **	-0.04 **	0.00	0.05
Average Depression	0.22	0.21	0.24	0.22	0.24	0.22
Average Parental Depression	0.30	0.29	0.35	0.29	0.35	0.29
Number of Observations	4,867	1,814	13,355	5,111	13,355	5,111
F stat	24.5	12.0	58.7	29.2		
Adjusted R Squared	0.21	0.22	0.17	0.17	0.17	0.22

Notes: Ordinary Least Squares and fixed effects 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 0 and 30, where a higher score indicates higher levels of depression. A full set of relevant controls are included including a set of province dummies and time dummies where appropriate. The sample comprises African and Coloured individuals between the ages of 15 and 60. We use this sample to enable comparison to estimates in our other tables. Limiting the sample in this manner does not reduce the sample size greatly, and similar results are recorded for the full sample. The paternal depression estimates have much smaller sample sizes due to the much lower numbers of resident fathers compared to mothers. Estimates for wave 1 and 2 are not presented here due to space constraints. Robust standard errors are reported, corrected for clustering. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

Table 6

Mean Charactaristics by Child Support Grant Recipient Status									
Wave	Wave 1			Wave 2			Wave 3		
	Non Recipient	Recipient		Non Recipient	Recipient		Non Recipient	Recipient	
Age in Years	40.3	36.0	***	40.7	35.6	***	40.7	36.2	***
Years of Education	7.4	**8.3**	***	8.0	**8.9**	***	8.2	**9.1**	***
Married	0.32	0.28		0.28	0.24	*	0.28	0.21	***
CES D-10 Score	9.36	9.50		8.04	7.37	**	7.24	7.53	
Depressed	0.45	0.44		0.32	0.25	**	0.29	0.29	
Life Satisfaction (Score from 1-10)	5.03	4.75	*	4.35	4.37		4.32	4.45	
Has Depressed Child	0.42	**0.33**	**	0.27	0.24		0.25	0.29	
Number of Children	1.76	2.84	***	2.03	2.96	***	1.71	2.72	***
Age of Youngest Child	12.3	6.57	***	12.4	6.54	***	13.4	7.11	***
Employed	0.59	0.51	***	0.65	0.55	***	0.65	0.54	***
Labour Force Participant	0.66	**0.75**	***	0.53	0.56		0.61	**0.68**	***
Average Monthly Wage	857	700	***	1,092	959	**	1,380	1,224	**
Main Decision Maker over:									
Expenditure	0.59	0.50	***	0.64	0.58	*	0.65	0.61	
Large Purchases	0.53	0.46	**	0.56	0.51	*	0.59	0.54	*
Who is a HH member.	0.54	0.45	***	0.55	0.49	**	0.57	0.53	
Where the household lives.	0.54	0.45	***	0.57	0.49	**	0.59	0.53	***
Where do the children go to school.	0.60	0.54	**	0.57	0.62		0.50	**0.64**	***
Household Head	0.47	0.38	***	0.53	0.43	***	0.59	0.57	
Pension Household	0.09	0.13	***	0.15	0.18	**	0.12	0.15	**
Number of CSG Beneficiaries	0.55	1.81	***	0.86	2.10	***	0.81	2.11	***
Household Expenditure	2,436	2,106	*	2,819	2,458		2,968	2,428	**
Household Size	4.13	5.26	***	4.46	5.63	***	4.18	5.15	***
Rural	0.39	0.50	***	0.42	0.49	**	0.39	0.46	**
Number of Observations	1,525	1,874		1,572	2,143		1,423	2,553	

The sample for this table comprises African and Coloured mothers between the ages of 25 and 55 who are means test eligible for the child support grant. Means are calculated for all 3 waves, and by recipient status. Variables not included for reasons of brevity: number of depressed children, happier than ten years ago, household remittance income, and household income. Child support grant beneficiaries are overwhelmingly African and Coloured, justifying the use of this sample. The significance of the differences between recipients and non-recipients is reported: * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

in Wave 2, but these differences are not significant in the other waves. Surprisingly they have higher average levels of education - this may reflect a generation effect of higher education among younger cohorts due to improvements in education provision over time. CSG recipients are less likely to be employed, but are more likely to be labour force participants. Overall, recipients are less likely to be decision makers in the household, or to be household heads.

We now move to examine the key characteristics of a sample of women by both depression and recipient status. We examine a sample of African and Coloured mothers between the ages of 25 and 55 who are means test eligible for the grant in Table 7. We first note that suffering from depression does not affect rates of receipt - approximately 55 percent of this sample are CSG recipients. Certain significant differences do exist. Mothers who suffer from depression are slightly older and less educated than mothers who do not suffer from depression. They are far more likely to have a depressed child (53 percent of depressed mothers have a depressed child compared to 16 percent of non-depressed mothers). Depressed mothers are less likely to be labour force participants (60 percent vs 68 percent), and those who are employed earn less than mothers who do not suffer from depression. Those who do not suffer from depression are slightly more likely to live with pensioners.

These patterns have changed slightly since Wave 1, where more differences existed between depression sufferers and others. In addition to the differences noted above, in 2008 depressed mothers were less likely to be married, were slightly older, and correspondingly had older children, were less likely to be employed or economically active. Depression sufferers were also significantly *more* likely to be making household decisions or to be household heads, and lived in households with lower household expenditure. These differences have fallen away with time as marriage rates have equalised across depression sufferers and non-sufferers.

In columns 3 - 6 in Table 7 we break the sample up into the four combinations by recipient and depression status. In column 4 we see that receipt appears to help depressed mothers enter the labour force, but higher rates of employment are found for depressed non-recipients compared to depressed recipients. There appears to be a complex relationship between female labour market activity, grant receipt and depression rates.

We also restrict the sample in Table 7 to those mothers whose youngest child is fifteen or over (not reported here). Sample sizes become fairly small, and the changes in average age and other variables are as expected. Some differences which are significant for the full sample of mothers become insignificant in this smaller sample, such as labour market status and years of education. An important change is that the depressed recipients are much more likely to be located in rural areas (68 percent vs. 41 percent), and have significantly larger families (5.26 vs 4.28 household members).

8 Confounding Effects and Robustness Checks

Differential attrition rates between people who suffer from depression and those who do not will cause bias. The estimations used control for the variables used to create the sample weights, which should ameliorate some sample selection. Research in the Netherlands has shown that attrition among individuals suffering from psychiatric conditions is only marginally significantly different from individuals who do not suffer from these conditions (de Graaf, Bijl, Smit, Ravelli & Vollebergh 2000). 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 (PWD)[16], the rates of attrition (excluding death) between all waves are not significantly different between PWD and people without depression, both for all adults, and for teens in particular, and for male teens. Parental depression also has no impact on one's own possibility of attrition.

Other sample selection concerns include the fact that our sample consists only of resident household members, and those who are not present may differ in characteristics (Burns & Keswell

[16]The death rate of PWD between Wave 1 and 2 is 6.5%, compared to 4.3% of people without depression (34% of adults are depressed in Wave 1). The death rate of PWD between Wave 2 and 3 is 4.5%, compared to 3.1% of people without depression (34% of adults are depressed in Wave 2).

Table 7

Means Testing across Recipient and Depression Status in Wave 3

	All			Depressed			Not Depressed		
	Depressed	Not Depressed		Non-Recipient	Recipient		Non-Recipient	Recipient	
CSG Recipient	0.54	0.55		0.0	1.0	***	0.0	1.0	***
Age in Years	38.3	37.6	*	41.8	36.5	***	40.3	36.1	***
Years of Education	8.52	8.95	**	7.70	8.96	***	8.46	9.22	***
Married	0.23	0.24		0.28	0.20	*	0.29	0.22	**
CES D-10 Score	12.8	5.2	***	12.8	12.9		5.0	5.3	*
Life Satisfaction (Score from 1-10)	3.58	4.75	***	3.58	3.58		4.62	4.82	
Has Depressed Child	0.53	0.16	***	0.51	0.54		0.15	0.18	
Number of Children	2.33	2.38		1.66	2.69	***	1.73	2.73	***
Age of Youngest Child	9.79	9.13	*	14.5	7.25	***	12.9	7.05	***
Employed	0.58	0.57		0.66	0.54	**	0.64	0.54	***
Labour Force Participant	0.60	0.68	**	0.54	0.63	**	0.63	0.70	**
Average Monthly Wage	1,168	1,324	**	1,119	1,196		1,470	1,234	***
Main Decision Maker over:									
Expenditure	0.65	0.62		0.68	0.63		0.63	0.61	
Large Purchases	0.58	0.55		0.60	0.56		0.58	0.53	
Who is a HH member.	0.57	0.53		0.58	0.56		0.56	0.52	
Where the household lives.	0.59	0.53	*	0.65	0.55	**	0.56	0.52	*
Where do the children go to school.	0.57	0.60		0.49	0.61	***	0.51	0.65	***
Household Head	0.60	0.57		0.61	0.59		0.58	0.56	
Pension Household	0.12	0.15	*	0.14	0.11		0.11	0.17	***
Number of CSG Beneficiaries	1.60	1.68		0.75	2.05	***	0.84	2.13	***
Household Expenditure	2,507	2,661		2,770	2,367	*	3,049	2,453	*
Household Size	4.75	4.85		4.25	5.01	**	4.15	5.21	***
Rural	0.42	0.44		0.37	0.45		0.40	0.46	*
Number of Observations	1,169	2,808		412	757		1,010	1,796	

The sample for this table comprises African and Coloured mothers between the ages of 25 and 55 who are means test eligible for the child support grant. Means are calculated by depression and recipient status in wave 3. The significance of the differences between recipients and non-recipients is reported: * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.11

2012). Unfortunately there is no solution to this in NIDS, and any conclusions drawn from our results must take this into account.

If teen grant recipients are fundamentally different to non recipients, we may worry that the true grant impact has not been identified. In Eyal et al. (2015), we find very few significant differences between the two groups. We believe the impact of maternal "eagerness" (Aguero et al. 2009) has dissipated by the teenage years, and controlling for some measures of eagerness show this to be the case. The unanticipated roll-out in the age threshold also makes it more likely that recipients and non-recipients are not fundamentally different.

We estimate the impact of average household level depression in place of parental depression (not reported here), and find effects which are of a similar size, direction, and significance.

Two problems impact on the sample size available for our estimations, which are missing data for either maternal or paternal depression. If the mother or the father is not resident, then we have missing data for their depression variables. We employ a strategy to mitigate this, by assigning a zero for depression to all those with missing data, and then controlling for those with missing data in the estimation with a binary variable. We find this variable is significant, and is associated with higher depression, however the size of the CSG and parental depression and interaction terms does not change, and nor does the significance.

This paper focusses on the current effect of parental depression on teen depression, which ignores any time dimension in the intergenerational depression relationship. We find that it is only current parental depression which impacts on one's own depression, and not parental depression in previous waves. See Appendix Item A.7 for a detailed analysis of the temporal aspects of this relationship.

The results presented in this paper examine the relationship between parental and child depression. We also use child CES-D 10 score as the dependent variable (and not depression), and the same results are found. Satisfaction with life, as well as the component parts of the CES-D 10 score are also used as the dependent variable and similar but not consistently identical results are found (all coefficients have the expected signs, and parental depression is always a significant negative predictor, but the significance of the CSG and interaction terms varies depending on the specification). The CES-D 10 component variables all yield similar results, which adds further weight to the claim of internal validity of the score. Using maternal CES-D 10 as the explanatory variable of interest yields similar results, although the coefficient on the interaction term is only marginally significant. Using parental CES-D 10 yields similar conclusions to the original specifications in Table 3.

9 Conclusion

The relationship between poverty and mental health is a neglected area for research in South Africa. This paper shows that a depression mitigating income effect can be found when the child support grant is received by children living with a depressed parent.We also investigate the probability that teens (and adult children) will be depressed if their parents suffer from depression. This effect is large, never averaging less than 30 percentage points, and is larger for those living with a depressed father. Girls tend to be more affected by depressed parents more than boys.

In houses where one parent suffers from depression, the presence of the other parent in the household actually increases the inter-generational transmission effect. This is likely due to the fact that there the mental illness correlation is high between parents - if one parent is ill, the other is also likely to be. The older a teenager is, the smaller the impact of parents on their mental health.

Overall we find that a depressed parent raises the probability of a teenager being depressed by 38 percentage points. CSG receipt lowers this effect by 12 percentage points or 25 percentage points, for maternal and paternal depression respectively. Similar results have been found in other countries. Fernald & Gunnar (2009) find lowered stress levels in teens who obtained a cash transfer in Mexico, with a particularly strong effect for those living with a depressed mother. When we investigate the characteristics of mothers who are depressed and receive the CSG, we find that they are more likely to live in larger families, and in rural areas. We also find higher levels of participation in the labour market for these depressed recipients (possibly implying a more hopeful

attitude exists for recipients compared to non-recipients).

Much work remains to be done in this area, in particular further investigation into the time dimension of depression, and the particular mechanisms through which the grant helps those teens with depressed parents.

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A Appendix

A.1 Child Support Grant Information

The South African Child Support Grant
Dates and Amounts of Receipt and Eligibility

Date	Amount	Age Limit	Means Test
October 1998	R 100	7	R800 in
July 1999	R 100	7	Rural Areas
July 2000	R 100	7	R1,100 in
July 2001	R 110	7	Urban Areas
April 2002	R 130	7	
October 2002	R 140	7	No change in
April 2003	R 160	9	Means Test
April 2004	R 170	11	Until 2008
April 2005	R 180	14	
April 2006	R 190	14	
April 2007	R 200	14	
April 2008	R 210	14	
October 2008	R 230	14	R 2,300
January 2009	R 240	15	R 2,400
April 2010	R 250	16	R 2,500
April 2011	R 260	17	R 2,600
January 2012	R 280	18	R 2,800
April 2013	R 290	18	R 2,900
April 2014	R 310	18	R 3,100
October 2014	R 320	18	R 3,200

Source: National Treasury Reports. The Age Limit referred to is the upper age limit, for e.g. in 2011, those aged 16 and under received 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 R2400. For married couples, the means test amount is exactly double, i.e. R4800 per month.

A.2 Calculation of the CES-D 10 Score

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

Questions (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 0 to 3, instead of 1 to 4. A score is obtained which ranges between 0 and 30, where 0 reflects no depressive symptoms, and 30 represents completely debilitating depression. A score of ten or more indicates an individual can be considered to be depressed.

A CES-D 8 score can also be calculated, which excludes positive items (5) and (8), and ranges from 0 to 24. Figure 12 below shows the distribution of both scores by age, and Figure 11 shows the distribution of CES-D 10 over age for each of the waves.

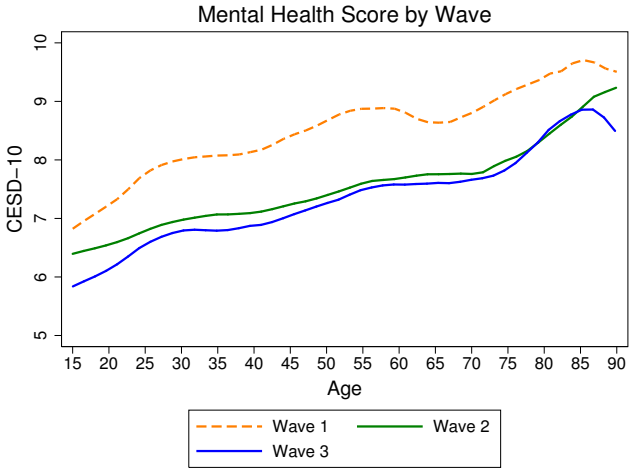

Figure 11 shows CES-D 10 (a measure of mental health status, ranging from 0 and 30), graphed by age and wave of the NIDS. The higher the score, the more depressed an individual is. Those in Wave 2 and 3 do not differ significantly, but both show individuals who are happier than those in Wave 1.

Figure 11: CES-D 10 Score by Age for NIDS Waves 1 to 3

In Figure 11, the CES-D 10 score increases over the age distribution, and thus levels of depression increase as people age. The drop at the end of the distribution has a large confidence interval due to the small sample of individuals aged 90 or above.

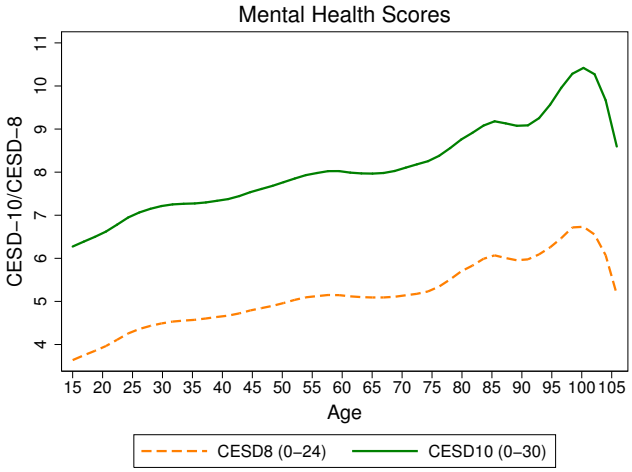

Figure 12 shows a graphic representation of the CES-D 10 (measured between 0 and 30) and CES-D 8 (measured between 0 and 24) scores, both measures of mental health status. The higher the score, the more depressed an individual is. Both variables follow the same pattern over the age distribution, and depression levels increase with age.CES-D 8 excludes two positively phrased questions from its total, while CES-D 10 includes all positive and negatively phrased questions.

Figure 12: Comparison of the CES-D 10 and CES-D 8 Scales

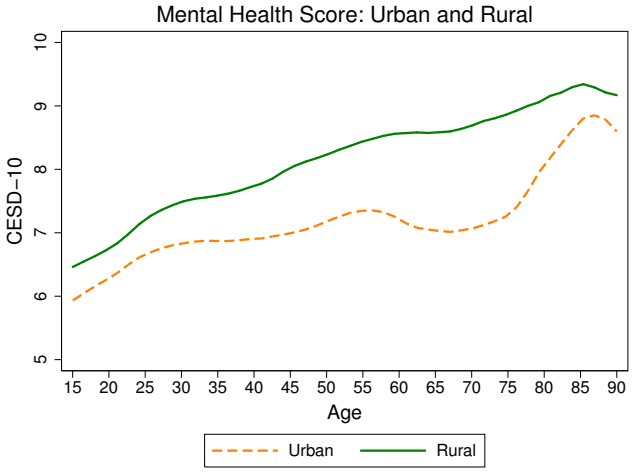

Figure 13 shows CES-D 10 (a measure of mental health status, ranging from 0 and 30), graphed by age and whether the individual lives in an urban or rural area. The higher the score, the more depressed an individual is. Those who live in rural areas are significantly more unhappy than other race groups.

Figure 13: CES-D 10 Score by Location

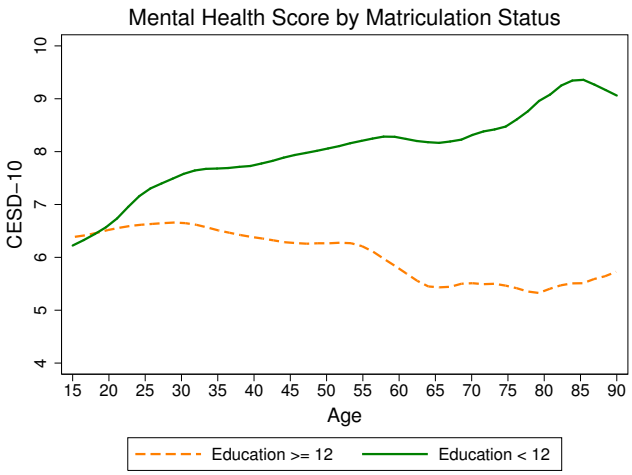

Figure 14 shows CES-D 10 (a measure of mental health status, ranging from 0 and 30), graphed by age and matriculation status. The higher the score, the more depressed an individual is. Those who have a matric are significantly happier than those who do not, and the difference increases over time. It can also be seen that levels of education decrease with age.

Figure 14: CES-D 10 Score by Matriculation Status

A.3

Determinants of Mental Health and Satisfaction Levels

	CES-D 10 (0-30)			Level of Satisfaction (1-10)			Depressed		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Actual Receipt	-1.30 **			0.33			-0.11 **		
Age Eligibility (IV)		-2.01			-0.39			-0.29 **	
Potential Duration X 10			-1.74 *			-0.20			-0.24 ***
Age in Years	-0.31	-0.48	-0.50	0.18	0.00	0.04	-0.02	-0.06 *	-0.06 **
Female	0.56 *	0.60 *	0.52	0.02	0.05	0.03	0.03	0.04	0.03
Father is Depressed	3.37 ***	3.32 ***	3.46 ***	-0.56 *	-0.61 **	-0.58 **	0.28 ***	0.27 ***	0.29 ***
Mother's Education	0.02	0.00	0.04	0.02	0.01	0.02	0.00	0.00	0.00
Years of Attained Education	0.06	0.08	0.03	-0.07	-0.05	-0.06	0.00	0.00	0.00
Coloured	-1.88 *	-1.89 *	-1.96 **	2.88 ***	2.88 ***	2.87 ***	-0.06	-0.06	-0.07
Log of Household Income	0.13	0.12	0.15	0.33 *	0.33 *	0.33 *	0.00	0.00	0.00
Household Size	0.03	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.00
Rural	-0.03	-0.01	-0.08	0.68 *	0.70 *	0.69 *	0.04	0.05	0.04
Dependent Variable Mean	5.46	5.46	5.46	4.90	4.90	4.90	0.16	0.16	0.16
Number of Observations	427	427	427	427	427	427	427	427	427
F stat	5.5	5.3	5.3	4.9	4.7	4.6	3.5	3.4	3.7
Adjusted R Squared	0.22	0.21	0.21	0.15	0.14	0.15	0.18	0.15	0.18

Notes: 3 specifications are used to estimate the impact of CSG receipt on mental health and levels of satisfaction in wave 3 of NIDS. These are CES-D 10 (a measure of depression, scaled between 0 and 30, where a higher score indicates higher levels of depression), a level of satisfaction with life variable (from 1-10, where 10 is very satisfied), and depressed, defined as a CES-D 10 score of 10 or higher. Columns (1) to (3) estimate the impact of the grant on CES-D 10 score. In column (1) (4) and (7), actual receipt is used as the CSG variable of interest. In columns (2), (5) and (8), instrumental variables estimates are presenting, using age eligibility as an instrument for actual receipt. In columns (3), (6) and (9), the impact of potential duration of CSG receipt is shown. The coefficient shown reflects the impact of an extra ten years of potential exposure to the grant. African and Coloured learners between the ages of 15 and 19, who are income eligible for the Child Support Grant constitute the sample. A full set of province dummies is included in each specification. Robust standard errors are reported, corrected for clustering. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

A.4

Determinants of Mental Health and Satisfaction Levels

	CES-D 10 (0-30)			Level of Satisfaction (1-10)			Depressed		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Actual Receipt	-0.46			0.34 **			-0.04 *		
Age Eligibility (IV)		-1.10			0.10			-0.11	
Potential Duration X 10			-0.94			-0.03			-0.11 **
Age in Years	0.03	-0.13	-0.14	0.03	-0.03	-0.06	0.00	-0.02	-0.02
Female	0.45 **	0.44 **	0.44 **	0.05	0.04	0.04	0.03	0.03	0.03
Mother is Depressed	3.48 ***	3.46 ***	3.51 ***	-0.93 ***	-0.93 ***	-0.94 ***	0.32 ***	0.32 ***	0.32 ***
Mother's Education	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00
Years of Attained Education	-0.06	-0.04	-0.06	0.03	0.03	0.03	0.00	0.00	0.00
Coloured	-2.36 ***	-2.43 ***	-2.34 ***	1.96 ***	1.94 ***	1.93 ***	-0.11 **	-0.12 **	-0.11 **
Log of Household Income	0.28	0.29 *	0.29	0.36 ***	0.36 ***	0.36 ***	0.01	0.01	0.02
Household Size	0.01	0.01	0.01	-0.03	-0.03	-0.03	0.00	0.00	0.00
Rural	-0.29	-0.26	-0.27	0.35	0.36	0.37	0.02	0.02	0.02
Dependent Variable Mean		5.65			4.86			0.17	
Number of Observations		1,322			1,322			1,322	
F stat	12.3	12.3	12.4	9.2	9.0	9.0	9.2	9.8	10.0
Adjusted R Squared	0.21	0.20	0.21	0.12	0.12	0.12	0.19	0.18	0.19

Notes: 3 specifications are used to estimate the impact of CSG receipt on mental health and levels of satisfaction in wave 3 of NIDS. These are CES-D 10 (a measure of depression, scaled between 0 and 30, where a higher score indicates higher levels of depression), a level of satisfaction with life variable (from 1-10, where 10 is very satisfied), and depressed, defined as a CES-D 10 score of 10 or higher. Columns (1) to (3) estimate the impact of the grant on CES-D 10 score. In column (1) (4) and (7), actual receipt is used as the CSG variable of interest. In columns (2), (5) and (8), instrumental variables estimates are presenting, using age eligibility as an instrument for actual receipt. In columns (3), (6) and (9), the impact of potential duration of CSG receipt is shown. The coefficient shown reflects the impact of an extra ten years of potential exposure to the grant. African and Coloured learners between the ages of 15 and 19 who are income eligible for the CSG constitute the sample. A full set of province dummies is included in each specification. Robust standard errors are reported, corrected for clustering. * implies p value < 0.10, ** implies p value < 0.05, and *** implies p value < 0.01.

A.5 Exogenous Variation in Roll-out

As discussed in Eyal et al. (2015), un-anticipated changes in the age threshold as it was raised to age eighteen led to a large amount of variation in actual and potential duration of receipt between older and younger children. It is not advisable to use actual reported duration data in any analysis[17]. Using a calculated potential duration variable allows us to exploit the exogenous variation in duration of receipt, while avoiding sample selection problems due to differential reporting of receipt duration. Younger children were exposed to receipt for a hundred percent of their lives, while teens may have had interrupted receipt, and may have been exposed to the grant for only a small percentage of their lives.

Figure 15 shows potential duration of receipt by age, in Wave 3. Potential duration of receipt increases linearly with age until age thirteen[18], hitting a maximum of fourteen years of exposure, and then declines rapidly for children older than sixteen.

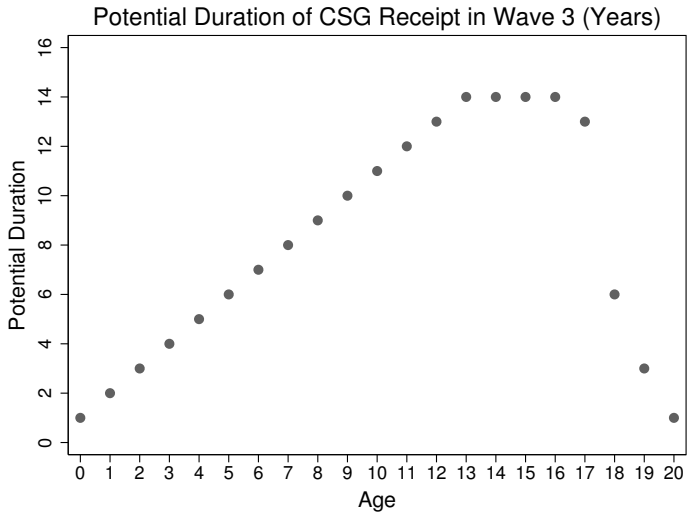

Figure 15 shows years of potential duration of receipt to the child support grant by age category, in Wave 3 of the NIDS, for individuals from birth to age twenty. For example, we can see that sixteen year old children in Wave 2 have a maximum of fourteen years of exposure to the grant, and older learners, due to the pattern of expansion, see lower and lower numbers of years of exposure (which are also interrupted). For example, nineteen year olds have had three years of exposure, in 1999, 2005, and 2006. Potential duration is calculated as age plus one for the younger ages who have been covered their entire lives, i.e. a six year old has had seven years of exposure to the CSG. Figure replicated from Eyal et al. (2015).

Figure 15

[17]Duration data is missing for many beneficiaries, and for those that do report it, it is accurate only to the year, and not to the year and month. Duration data is also only collected for those under fifteen in the NIDS.

[18]Potential duration equals age plus one in this framework. A child under the age of one is considered to have been exposed for 1 year, and so on.

A.6

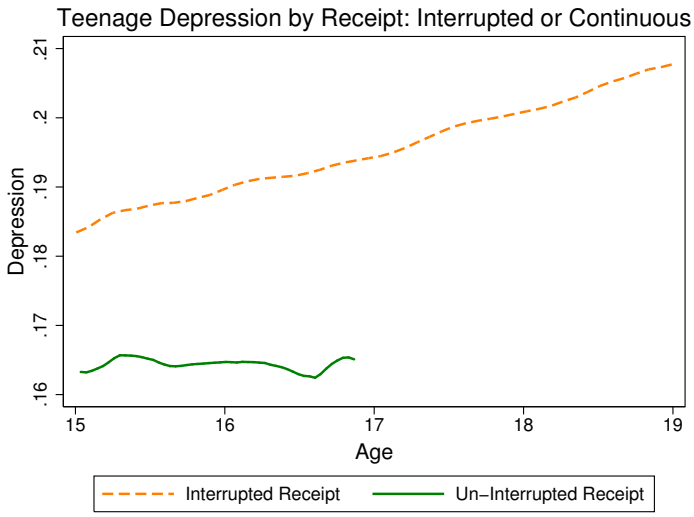

Figure 16 plots levels of depression by age, for those who have had either continuous receipt, or interrupted receipt (the latter are those born before 1995). Those with un-interrupted receipt have lower levels of depression than those without.

Figure 16

A.7 Temporal Aspects of Transmission and Income Shock Effects

We have examined the impact of both current CSG receipt and parental depression on teen depression. Questions exist as to whether time or age dimensions are important factors in the estimation of the size of these effects. The episodic nature of depression makes it difficult to adequately describe the temporal nature of intergenerational transmission. We know that current depression is a function of current factors, and the cumulative impacts of previous events.

In Table 4 we see that no specific pattern by age exists for teen depression. However in Table 2 it appears to be the case that the intergenerational transmission effect declines as teens become older. These patterns are consistent for the impact of maternal depression, but are slightly variable for paternal depression estimates, which possibly reflects the smaller sample size for these estimates. Appendix Table A.8 contains transmission matrices of current teen depression with current or past parental depression. We see that while current maternal depression has a large impact on teen depression, the probabilities of depression are not significantly different for teens whose mothers were or were not depressed in the previous wave.

Using the NIDS, we can look at both the persistence of individual depression, and the impact of parental depression on children over time, by examining correlations. Initial analysis shows an almost non-existent correlation between individual depression over waves, which could be consistent with the episodic nature of the illness. There is also very low correlation between maternal and paternal depression in previous waves to individual depression in current waves (both for teens and for all adult parent-child pairs). As expected, the correlation between parental and child depression is very high in the same wave, for all pairs and for teens in particular[19]. The presence of a pensioner in the household who is depressed also has a significant impact on both

[19]Correlation coefficients between maternal and child depression in the same wave (Wave 1) is 0.29 (all mother child pairs) and 0.21 (teens), and similar figures exist both between paternal and individual depression in all 3 waves. An increase in one's mother's CES-D 10 score of 1% is associated with a 0.40% increase in one's own CES-D 10 score (0.33% for teens). The corresponding elasticities in Wave 2 and 3 are 0.55%, and 0.50% respectively. The intergenerational correlation coefficients are similar in size, as variation in child and parental depression does not seem to be changing over time. Over all 3 waves, the rate of depression in adults who have depressed mothers is between 2.5 and 5 times the rate of depression in adults whose mothers are not depressed, while the equivalent figures for teenagers are between 2.5 and 7

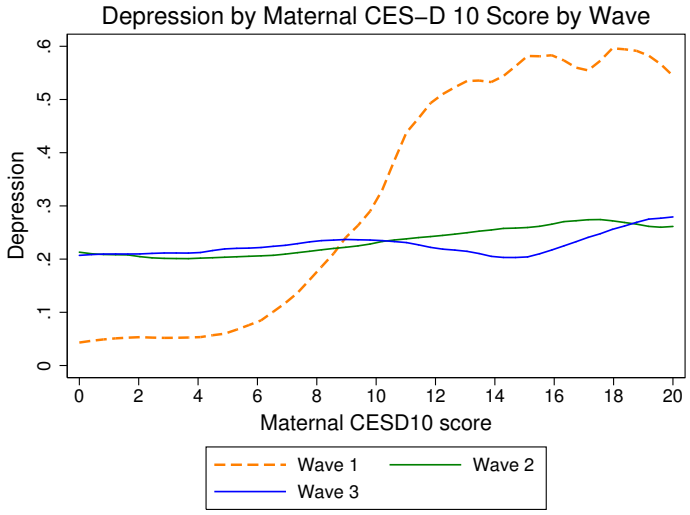

Figure 17 plots levels of depression by maternal CES-D 10, for a full sample of individuals from age 15 to 60, by maternal CES-D 10 in each wave. Own depression in the current wave (Wave 3) is positively related to maternal CES-D 10 values, and constant over the values of maternal CES-D 10 in waves 2 and 1.

Figure 17

children[20] and mothers in the same household (similar in size to that of the effect of parents on children).

We perform a number of other tests. Table 3 is re-estimated using the maternal and paternal depression values not from Wave 3, but rather Wave 2. For the paternal estimates, we find an insignificant coefficient both on paternal depression in Wave 2, and on the interaction term between CSG receipt in Wave 3 and paternal depression in Wave 2. CSG receipt in Wave 3 still has a negative and significant coefficient - receipt lowers the probability of depression. If we use as a CSG variable whether the individual gained receipt between waves 2 and 3, we find an insignificant coefficient on the CSG variable, and the interaction term.

These results suggest that only paternal depression in the current wave has any impact on own depression, and only CSG receipt in the current wave has any impact on own depression. Exactly similar results are found for the impact of maternal depression in previous waves.

These finding are given more weight in Figure 17, where we plot levels of depression by maternal CES-D 10, for a full sample of individuals from age 15 to 60, by maternal CES-D 10 in each wave. Own depression in the current wave (Wave 3) is positively related to Wave 3 maternal CES-D 10 values, displays no consistent pattern in relation to maternal CES-D 10 values in previous waves. Similar findings can be seen for paternal CES-D 10 values in Figure 18.

[20]The presence of a pensioner in the household who has depression has a 0.26 correlation with the individual depression of non-pensioners in Wave 1.

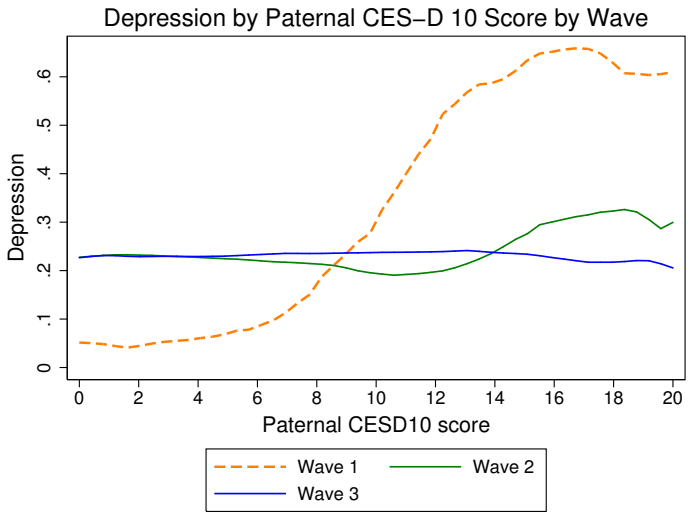

Figure 18 plots levels of depression by paternal CES-D 10, for a full sample of individuals from age 15 to 60, by maternal CES-D 10 in each wave. Own depression in the current wave (Wave 3) is positively related to paternal CES-D 10 values, and constant over the values of paternal CES-D 10 in waves 2 and 1.

Figure 18

A.8

Transmission Matrices: Teen and Parental Depression Persistence over Time

		Teen Depressed					
Wave 1		Wave 1		Wave 2		Wave 3	
		0	1	0	1	0	1
Teen Depressed	0	---	---	81.1	18.9	78.4	21.6
	1	---	---	79.6	20.4	79.9	20.1
n, p value of t test		---	---	1,927	0.48	1,795	0.51
Mother Depressed	0	85.9	14.1	82.9	17.1	80.4	19.6
	1	67.2	32.8	79.3	20.8	80.8	19.2
n, p value of t test		1,446	0.00	1,974	0.04	2,430	0.83
Father Depressed	0	86.7	13.3	86.5	13.5	79.6	20.4
	1	65.6	34.4	81.1	18.9	79.9	20.1
n, p value of t test		584	0.00	762	0.05	957	0.91

This table contains the average levels of depression in the African and Coloured teen population who are aged 15 to 19 in wave 1, by own depression status in waves 2 and 3, and by mother and father depression status. We report the sample size for each cross tabulation, and the p value when checking for significant differences between the two variables. For e.g. when checking to see if mean teen depression in wave 2 differs by wave 1 teen depression status, we find a p value of 0.48, implying there are no significant differences.