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Abstract

Objective: To examine whether the loss of disability grants creates perverse incentives to forego treatment and negatively impacts health and economic welfare among individuals on highly active antiretroviral therapy (HAART) in South Africa.

Design: Three-year panel study of a sample of individuals in Khayelitsha (a large, poor black township in Cape Town, South Africa) on HAART.

Methods: Descriptive cross-tabulations and multivariate individual fixed effects regressions using self-reported health status, adherence to treatment, individual and household incomes and employment status as dependent variables and a binary indicator of disability grant status as the main independent variable.

Results: We found no statistically significant association between grant receipt and adherence to treatment, self-reported health status, or side effects from HAART. None of the individuals in the sample reported that they would be willing to forego treatment to remain eligible for grants and all respondents reported perfect or near perfect adherence to treatment. However, a loss of a disability grant was associated with substantial decreases in individual and household incomes, respectively.

Conclusion: While we found no evidence of people trading off their health for income, there still appears to be a large financial burden associated with disability grant loss, which could increase the salience of perverse incentives, especially among those who are unable to find employment. Future research should examine alternative social welfare programs for AIDS-sick individuals that minimize incentives to trade-off health for economic security.

Introduction

HIV/AIDS is an important public health and policy issue in South Africa. Recent estimates suggest that nearly 20% of all adults aged 20-64 in the country are infected with this disease (Actuarial Society of South Africa, 2005). Policies to address the adverse health and socioeconomic consequences of HIV/AIDS in South Africa include public sector provision of highly active antiretroviral therapy (HAART) and the disability grant, a cash transfer program targeting individuals who are deemed too sick or incapacitated to work and who meet an income-based means test (Department of Social Development - Republic of South Africa, 2007).

The disability grant is a small but growing component of South Africa's relatively generous and well-developed social security system. The number of individuals receiving disability grants has more than doubled since 2000, rising to 1.4 million recipients in 2008, with much of this growth attributable to increases in the number of AIDS-sick people (Department of Social Development - Republic of South Africa, 2003, Department of Social Development - Republic of South Africa, 2006, Nattrass, 2006b, Nattrass, 2006a, National Treasury (Republic of South Africa), 2008). Government grants in general, and the disability grant and old age pension in particular (the two largest transfers), are highly redistributive. Poor households with access to such grants are significantly better off than comparable households without pensioners or disability grantees (Booysen and Van der Berg, 2005, Case and Deaton, 1998, Duflo, 2000, Edmonds, 2006, Hardy and Richter, 2006, Koker et al., 2006, Leclerc-Madlala, 2006, Nattrass, 2006b, Simchowitz, 2004, Edmonds et al., 2005).

Disability grants are awarded either on a 'temporary' basis (payments are provided up to one year, whereupon the individual has to reapply for further benefits) or on a 'permanent' basis (requiring renewal every five years) (Department of Social Development - Republic of South Africa, 2007). Individuals lose eligibility once they become healthy enough to re-enter the labor force. However, because of high rates of unemployment, particularly among black South Africans, the loss of a disability grant is not necessarily followed by a shift into employment. Indeed, many people who lose their grants may find themselves trapped in a state of unemployment, with serious consequences for individual and household welfare.

For individuals who are AIDS-sick, those receiving treatment generally have their health restored within six months (Graff-Zivin et al., 2006, Smit et al., 2006, Thirumurthy et al., 2005). These individuals should lose their disability grants, as they are no longer too sick to work. However, if the person is unable

to find work after the disability grant has been terminated, and if they cannot borrow from formal institutions or extended family/social networks, then they may find their health threatened once again – most obviously by poor nutrition (which undermines the person's immune system and reduces the effectiveness of HAART).

Consequently, policymakers and researchers are concerned that individuals on HAART may have to choose between adhering to treatment and losing the disability grant, or defaulting on treatment in order to get sick enough to have the grant renewed (Leclerc-Madlala, 2006, Nattrass, 2006b, Nattrass, 2006a, Simchowitz, 2004, Hardy and Richter, 2006). That is, the disability grant system may create perverse incentives for individuals living with HIV/AIDS to forego treatment in order to maintain their income. Given that the number of people losing their disability grants per year is likely to rise to about half a million by 2010 (Nattrass, 2006a), this potential trade-off could have serious social implications and may contribute to the development of resistance to HAART (Bangsberg et al., 2004). The aim of this study is to conduct the first quantitative evaluation of the effects of disability grant loss on adherence to treatment and health and economic welfare in South Africa by using a unique panel dataset of individuals on HAART.

Methods

Setting and Data

Data used in this study were collected in Khayelitsha, a large black township of over 500,000 people situated southeast of central Cape Town. Khayelitsha is an overcrowded mix of formal housing and informal (shack type) houses, but most residents are poor and live in corrugated iron shacks without running water. Unemployment rates in the area are around 51% (City of Cape Town, 2005). Antenatal clinic data indicate an HIV prevalence of 33% (Shaikh et al., 2006).

In 2004/2005 the AIDS and Society Research Unit (ASRU) at the University of Cape Town initiated the HAART Panel Study to investigate the impact of long-term HAART on the lives of people living with AIDS. The study aimed to recruit as many people who had participated in the pilot HAART roll-out program conducted in Khayelitsha by Médecins Sans Frontières (MSF) in collaboration with the Western Cape Provincial government. This program, the first public provision of HAART in Africa, started in May 2001 and, by 2004, more than a thousand Khayelitsha residents had commenced treatment (Coetzee et al., 2004a, Coetzee et al., 2004b, Médecins Sans Frontières, 2003).

Because of patient confidentiality issues, there was no sample frame upon which to draw a representative random sample. Consequently, a snowball sample of 242 individuals who had been on HAART for at least a year was recruited through social networks via word of mouth and contacts with clinics and support groups. Over two thirds of those who joined the MSF pilot HAART project in 2001 were recruited into the study, as were over a third of the total known cohort of people in Khayelitsha who had been on HAART for longer than a year. The sample was re-interviewed in early 2006 and late 2007.

The HAART Panel sample is suitable for the purposes of this study for three reasons. First, Khayelitsha is a relatively poor area and, consequently, the majority of the sample would be eligible for the disability grant. Second, Khayelitsha is known to afford residents relatively easy access to social welfare organizations. Thus, a high proportion of eligible adults in Khayelitsha can be expected to be accessing disability grants. Third, as HAART has restored many of the participants' health it is likely that disability grant loss would be reported during the three-year study period.

Empirical Analysis

In order to examine trends in adherence to treatment, health, economic status and disability grant receipt, we calculated descriptive statistics for the individual and household welfare outcomes for each of the three survey waves. These statistics were computed for the entire sample and for those receiving disability grants to assess the potential impacts of grant loss. We also followed health and economic status over time for those individuals who lost disability grants between the first and second rounds of the survey by subsequent employment status to assess whether the impact of grant loss varied by whether or not an individual could find work.

Our measures of treatment adherence included both a 1 – 10 Likert scale, with 10 being perfect adherence, and a binary measure from the 2007 wave indicating whether the individual would hypothetically forego treatment to continue receiving disability grants. The specific health outcomes were self-reported health status (1 - 5 Likert scale, with 1 being poor and 5 being excellent health) and side effects experienced (a scale from 0 – 12, reflecting the number of different types of side effects). We considered side effects as these might reflect reduced efficacy of HAART in conditions where nutritional intake is compromised due to loss of income. For economic status, we used a binary measure of employment in the month preceding the interview and individual and household incomes (inclusive of all wages, profits, remittances, and grants).

Individual fixed effects regressions were then used to examine impacts of grant loss. Specifically, disability grant receipt was used as the main independent variable, with adherence to treatment, health (self-reported health status and side effects), employment, income, and household demographic characteristics (household size, number of pensioners, and number of children) as dependent variables. We included the demographic variables as previous research has shown them to be responsive to social welfare transfers (Edmonds et al., 2005). All specifications included binary indicators for survey wave, and interactions between survey wave and age, education, length of time since commencing HAART, and gender to account for time effects and differential trends, respectively.

We used individual fixed effects to control for time invariant unobservable characteristics that may be jointly correlated with disability grant receipt and individual and household welfare outcomes. For example, those who receive grants may be worse off/poorer than those who do not, thus leading to underestimates of the impact of grant loss. The bias may work in the opposite direction as well: those who receive grants may be better able to navigate the social security system using skills that are also beneficial in gaining employment and sustaining health. Fixed effects would account for both types of bias.

However, several issues arise with the use of fixed effects regressions. First, such models would be prone to bias from reverse causality. In our case, because grants are allocated based on health status, estimates from fixed effects models may reflect the effect of changes in health on grant status rather than the other way around. More generally, fixed effects models do not account for time-varying characteristics, such as unobserved changes in family circumstances, which may influence both grant receipt and individual and household health outcomes.

Second, fixed effects models would not capture important and plausible behavioral responses to the *potential* of grant loss. For example, if individuals forego or modulate their treatment regimen just before their grant comes up for renewal, and consequently, remain on disability grants, our estimates of the impact of grant loss on health would be downward biased. Put differently, our fixed effects estimates would be erroneously biased towards concluding that individuals do not forego treatment for economic security when this is actually the case.

We addressed these issues in several ways. Our main approach was to compare the fixed effects coefficients to those gleaned from instrumental variable models, where we used reported grant renewal prior to the first survey wave as an instrument for grant receipt status. We contend that grant renewals are

correlated with the type of grant that the individual may have initially received ('permanent grants' would not require renewal, whereas 'temporary' grants would), and therefore also with the likelihood of having a grant at any given time. Qualitative evidence suggests that doctors vary greatly in how stringently they follow disability grant laws and with regard to their propensities for prescribing 'temporary' or 'permanent' grants (De Paoli et al., 2008). Thus, conditional on individual fixed effects, the type of disability grant an individual initially received may essentially be random. Under these assumptions, grant renewal would be an ideal instrumental variable in that it would predict who loses grants but would not affect (changes in) adherence, health and socioeconomic status directly. Put differently, with the use of this instrument, we can be confident that grant loss is not determined by any of our outcome variables or by unobserved time varying characteristics. In addition, the instrumental variable strategy also helps address the concerns of dynamic behavior, where people modulate their treatment just prior to when their grants come up for renewal.

Our second approach addresses the latter scenario more directly; we followed self-reported health and side effects over time for those individuals in the bottom quartile of the income distribution, by disability grant status. Results from the SMART trial suggest that frequent breaks from treatment lead to poorer health and more side effects (SMART, 2006). As such, if individuals were actually foregoing treatment for short periods of time to renew their grants, we would expect the poorest individuals in the sample to experience worsening health and side effects over time, and that this trend may be steeper for those receiving disability grants.

As our last approach to address issues in fixed effects regression models we assessed the robustness of the disability grant coefficient across models with and without gender, age and education specific trends (i.e., interactions between dummies for survey wave and these baseline characteristics). To the extent that these trends are correlated with important time-varying characteristics, robust estimates would be consistent with the fixed effects estimates reflecting causal effects.

Finally, we investigated possible biases due to attrition across the survey waves. We used regression techniques to model the probability of leaving the panel study as a function of age, gender, level of education, employment status, household income, household size, and self-reported health at baseline.

Results

Sample characteristics, calculated from the first wave of the survey, are presented in *Table 1*. The vast majority of respondents (79%) were women.[1] The mean age was 34 years, and most individuals had completed an average of 9.5 years of schooling. Finally, 74% of respondents reported receiving a disability grant.

Table 1. Baseline characteristics for HAART Panel Study.

		Sample Size	Percent	Range	Mean
Total		242			
Gender	men	50	21%		
	women	192	79%		
Age				20-64	34 years old
Education	none	5	2%	0-12 years	9.45 years
	primary	42	17%		
	secondary	116	48%		
	grade 12/matric	79	33%		
Disability Grant	no	63	26%		
	yes	179	74%		

Table 2 presents means for household and individual income, self-reported health and number of side effects, and the proportions of individuals employed, by sample year and by receipt of disability grant. Importantly, all individuals reported perfect or near perfect adherence (9 or 10 out of 10 on the Likert scale) across all three survey waves. In addition, not a single individual indicated that they would "stop taking ARVs" to "get (back) [their] disability grant." [2] We do not report these results in the table given the lack of variation in adherence behaviors.

Table 2 highlights three main points. First, disability grant receipt appeared to be strongly associated with individual and household income. Among disability grant recipients, grant income constituted the majority of individual income

[1] This reflects the fact that women are more vulnerable to HIV than men (so one would expect more women than men to be AIDS-sick) and that men are less likely than women to participate in HAART programs, and seek medical treatment more generally (Nattrass, 2008).
[2] It should be noted, however, that 10% of respondents in 2007 agreed that "it is a common strategy for HIV-infected people who have lost their disability grant to become sick again to get the grant back."

(almost two thirds in 2004/5 and 2006, and 56% in 2007) and about 40% of household income. Second, disability grant receipt did not appear to be associated with health outcomes. Third, the disability grant system did not appear to have operated as intended: the majority of the individuals receiving disability grants reported being in good or excellent health and nearly a third of all grant recipients in the sample were employed in 2004/5 and 2006 (43% of grant recipients were working in 2007).[3] In addition, of the 42 individuals who started receiving disability grants before 2002, exactly half continued to report receipt in 2007 (not shown here). Even under the assumption that these individuals were issued permanent (five-year) grants, all of these grants should have been terminated.[4]

[3] Not only did individuals continue to receive grants after commencing employment, but several individuals actually started receiving grants while being engaged in steady wage or self-employment over the previous year (not shown here).

[4] We also estimated individual fixed effects regression models for disability grant receipt in order to explore these results further (not shown here). We regressed disability grant status on dummy variables for survey wave, and trends in self-reported health, employment, age, gender, time since commencing HAART and education. These results also suggest that the disability grant system did not work as intended: disability grant status was uncorrelated with the self-reported health and employment status trend variables and individuals who had been on HAART longer were *less* likely to lose a disability grant over time. If the grant allocation system were working as intended, we would expect less healthy, unemployed individuals who recently commenced HAART to be *more* likely to hold grants over time.

Table 2. Descriptive statistics for employment, health and income by year and disability grant receipt.

	2004	2006	2007
Complete Sample:			
Sample size	242	224	216
Disability grant recipients (%)	74	46	42
Employment (% working in month preceding interview)	34	42	52
Average individual income (Rands/month)	1,044	968	1,099
Average household income (Rands/month)	1,899	1,735	2,028
Self-reported health (1-5 scale, 5 – excellent)	3.71	3.58	3.91
Side effects (number experienced)	2.60	3.15	2.14
Disability grant recipients:			
Sample size	178	104	90
Employment (% working in month preceding interview)	30	32	43
Average individual income (Rands/month)	1,133	1,113	1,238
Contribution of disability grant to individual income (%)	65	65	59
Average household income (Rands/month)	1,920	1,826	2,134
Contribution of disability grant to household income (%)	39	40	34
Self-reported health (1-5 scale, 5 – excellent)	3.75	3.61	3.89
Side effects (number experienced)	2.61	3.43	2.78

Note: Income measures for 2006 and 2007 were adjusted to 2004 values to account for inflation.

Table 3 explores the potential negative effects of grant loss on health and income by following individuals whose disability grant was terminated (and not renewed) between the first two survey waves. On average, an individual who lost a disability grant reported significantly lower personal income in 2006, though this appears to have rebounded slightly in 2007 (see first panel of table). Household income showed a similar pattern, though the declines were smaller in relative and absolute terms. This suggests the presence of coping mechanisms among households, extended families and social networks that helped smooth income in response to the loss of grants. However, our results also suggest that these coping mechanisms may have been incomplete: household income fell substantially and had not recovered more than two years after the loss of the disability grant. The adverse effects of this drop in income would be accentuated if income and consumption are linked, as is likely among this poor sample.

For individuals losing disability grants who were unable to find employment (see second panel of *Table 3*), the situation was direr: personal income dropped by over 95% and household income fell by nearly 50%. While these individuals

reported increases in all measures of income in the final survey round, the turnaround was small in comparison to the initial decline. In addition, unemployed individuals reported being in slightly worse health and a greater number of side effects from HAART immediately after losing their grants, though these outcomes rebounded in the final survey wave.

Table 3. Descriptive statistics for health and income by year and by employment status for those who lost disability grants between 2004 and 2006.

	2004/05	2006	2007
Individuals who lost the disability grant between the 2004/05 and 2006 surveys			
Sample Size	65	65	55
Employment (% working in month preceding interview)	34	43	60
Average individual income (Rands/month)	1,259	574	874
Average household income (Rands/month)	2,049	1,669	1,727
Self-reported health (1-5 scale, 5 – excellent)	3.90	3.64	4.07
Side effects (number experienced)	2.42	2.81	2.01
Unemployed individuals who lost the disability grant between the 2004/05 and 2006 surveys			
Sample size		37	22
Average individual income (Rands/month)		61	181
Average household income (Rands/month)		1,117	1,247
Self-reported health (1-5 scale, 5 – excellent)		3.55	3.88
Side effects (number experienced)		3.76	2.50

Notes: Income measures for 2006 and 2007 were adjusted to 2004 values to account for inflation.

Results for fixed effects models evaluating the potential effects of disability grants on various measures of individual and household welfare are presented in *Table 4*. To reduce clutter, we only report coefficients on the disability grant variable. The first panel of the table illustrates results for logged income (individual and household) and employment. The estimates suggest that losing a disability grant was associated with a 74% decrease in personal income (coefficient/[coefficient + 1]). The results for household income suggest a similar pattern, though the percentage decreases are much smaller (43%). As mentioned previously, this could reflect the effect of consumption and income smoothing mechanisms among families and other social networks. We found no association between disability grant status and employment status.

In the second panel of *Table 4*, we present results for self-reported health and side effects from treatment. We found no statistically significant association between disability grant receipt and the health status indicators. The findings in this panel, as well as those presented in the first panel, are consistent with those gleaned from *Tables 2* and *3*.

Finally, the third panel of *Table 4* illustrates the association between disability grant receipt and household demographics. We found a strong positive association between grant status and the number of children under the age of 10. We found no statistically significant associations between total household size or the number of pension eligible elderly living in the household and disability grant status. Collectively, these findings suggest that the share of dependents in the household decreased in response to disability grant loss, which is consistent with the literature on the South African Old Age Pension (Edmonds et al., 2005).

Table 4. Fixed effects regression estimates of the association between disability grant receipt and individual and household welfare.

Panel 1 - Economic Variables			
	Individual Income[a]	*Household Income*[a]	*Employment*
Disability Grant	2.80*	0.764*	-0.032
	(0.240)	(0.156)	(0.055)
Sample Size	682	655	682
Panel 2 - Health Variables			
	Self-Reported Health	*Side Effects*	
Disability Grant	0.149	0.012	
	(0.129)	(0.385)	
Sample Size	679	682	
Panel 3 - Demographic Variables			
	Household Size	*No. Under 10*	*No. Pension Eligible*
Disability Grant	0.043	0.211*	0.003
	(0.196)	(0.085)	(0.045)
Sample Size	680	680	680

Notes: -Standard errors in parentheses
-[a] The natural logs of individual and household income. Zero values for the income variables were coded as 1.
-* statistically significant at 5% level
-All models include dummy variables for 2006 and 2007 survey waves, and the interaction between these variables and baseline age, time since commencing HAART and education and gender.
-Disability Grant: binary indicator = 1 if individual is a current recipient.
-Employment: binary indicator = 1 if the individual reported wage or self-employment in the month preceding the interview.
-Self-reported health: 1 – 5 Likert Scale, with 1 being poor health and 5 excellent health.
-Side effects: the total number of different side effects experienced (up to 12 possible)
-Household size, No. Under 10 and No. Pension Eligible: total number of household members in each category, respectively.

Our robustness checks indicated that our fixed effects estimates were likely unbiased and represent causal effects (not shown here). First, the instrumental variable coefficients were substantively similar to those presented in *Table 4*, though, as expected, the standard errors on the estimates were much larger. Second, we found no evidence that the health of poorest individuals in the sample, whether receiving disability grants or not, declined over the study

period, suggesting that frequent breaks from treatment were not taken during the sample period. This evidence was consistent with the individual self-reports on adherence. Third, our estimates and substantive conclusions were robust to the exclusion of age, gender and education specific time trends. Finally, survey attrition was low (11%) and only age was found to be a significant predictor of dropping out of the sample in subsequent regression analysis. Collectively, this evidence suggests that our results were not substantially biased by reverse causality, omitted time-varying factors, and attrition, and that treatment stoppage in anticipation of grant renewals or loss was not a prevalent practice among the people in our sample.

Discussion

The disability grant program is an important part of South African policy towards persons living with AIDS. Individuals who become AIDS-sick are eligible to receive this large transfer payment, which is intended to support them until they become well enough to work. However, upon grant termination, many individuals may be unable to find work due to high levels of unemployment, which could create perverse incentives to forego treatment in order to stay sick enough to remain eligible for grant payments.

The aim of our study was to examine whether the loss of disability grants had negative effects on adherence to treatment, health and economic status using data from a unique panel survey of individuals on HAART in Khayelitsha, South Africa. Our core findings are that disability grant loss was not associated with poor adherence or worsening health outcomes. Not a single individual in the sample reported an intention to trade-off grant eligibility for their health and all respondents reported perfect or near perfect adherence to treatment. On the other hand, we found that individual and household income did decline significantly with the loss of disability grants and that this fall was much steeper for those who were unable to find employment. Households appeared to partially compensate for the loss of grant income, and we found evidence that altering the demographic composition of the household away from dependents may have been one of the mechanisms used to achieve this.

Our results with respect to adherence and health do not support qualitative and anecdotal evidence that individuals may forego or modify treatment in order to continue receiving disability grant transfers. This is despite the fact that individuals who lost grants, especially those who were not employed, experienced large decreases in their own and their household's income. The discrepancy in the findings regarding adherence/health and income may be explained by households compensating for the loss of a disability grant in ways

that do not require one to sacrifice their health. For example, as our results indicated, one such compensation mechanism was altering household composition. Along these lines, our findings that the disability grant system did not work as intended suggests that individuals may have had ample opportunities to game the system, which may have precluded the need to forego treatment. Finally, individuals may not have been willing to trade-off their health under any circumstances, as the disutility from becoming AIDS-sick again far outweighs the loss of income or consumption. These points warrant further research attention.

The discrepancy between our results and the qualitative evidence may be explained by differences in sampling. It is possible that the individuals who self-selected into the HAART Panel Study, who were recruited through social networks, were healthier, wealthier and more likely to adhere to treatment than the average individual on HAART and/or those interviewed in the qualitative studies. Thus, our sample may exclude those people who are most sensitive to income loss and most likely to forego treatment as a result. However, the impact of sample selection bias on our results and conclusions may be limited given that we found no evidence of foregoing treatment or adverse health effects even among those respondents who lost their disability grant and did not find employment thereafter. These individuals lost nearly half of their household income and showed little recovery even two years (or more) after grant loss.

Aside from questions regarding the generalizability of our results, there are other limitations in our study. First, self-reported measures for adherence and health may be prone to reporting bias. For example, individuals may be reluctant to admit incomplete adherence. Future research should seek to use objective indicators, such as viral loads or CD4+ counts. Second, despite the use of fixed effects and instrumental variables, there may still be doubt as to whether our results reflect causal relationships. While our results were highly robust to changes in specification and estimator, future research should look into further sources of exogenous variation in disability grant receipt to achieve greater confidence in recovering causal effects.

In terms of policy implications, while our results suggest that individuals on HAART do not forego treatment to remain on disability grants, there still appears to be a large financial burden associated with grant loss, which could increase the salience of perverse incentives, especially among those who are unable to find employment. Future research should examine alternative social welfare programs for AIDS-sick individuals that do not assume that individuals can find work after they stop receiving transfers, thus reducing incentives to trade-off health for economic security.

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