POLICY RESEARCH WORKING PAPER 2508

Sources of Financial Assistance for Households Suffering an Adult Death in Kagera, Tanzania

Mattias Lundberg
Mead Over
Phare Mujinja

Why do some households manage better than others in overcoming the impact of an adult death? The household's ability to cope is a function of the resources it can command, including its access to private networks for social insurance and credit. Public intervention can reduce vulnerability *ex ante*, or target assistance *ex post*, to the hardest-hit households.

The World Bank
Development Research Group
Infrastructure and Environment
December 2000

POLICY RESEARCH WORKING PAPER 2508

Summary findings

The AIDS crisis in Africa and elsewhere compels us to design appropriate assistance policies for households experiencing a death. Policies should take into account and strengthen existing household coping strategies, rather than duplicate or undermine them.

Lundberg, Over, and Mujinja investigate the nature of coping mechanisms among a sample of households in Kagera, Tanzania in 1991–94. They estimate the magnitude and timing of receipts of private transfers, credit, and public assistance by households with different characteristics. Their empirical strategy addresses three common methodological difficulties in estimating the impact of adult death: selection bias, endogeneity, and unobserved heterogeneity.

Lundberg, Over, and Mujinja find that less-poor households (those with more physical and human capital) benefit from larger receipts of private assistance than poor households. Resource-abundant households are wealthy in social assets as well as physical assets. Poor households, on the other hand, rely relatively more on loans than private transfers, for up to a year after a death. This suggests that credit acts as insurance for households where informal interhousehold assistance contracts are not enforceable. A donor in Kagera can be sure that assistance to a wealthy household will be reciprocated, whereas a poor household may not be able to return the favor. Assistance to the poor is more likely to come with more formal arrangements for repayment. Formal-sector assistance is targeted toward the poor immediately following the death.

The impact of adult deaths on households may be mitigated either *ex ante*, through programs that minimize poverty and vulnerability, or *ex post*, by assistance targeted to the poorest and most vulnerable households. In addition, to the extent to which micro-credit programs improve access and lower the total costs of borrowing, they may not only stimulate growth and investment but also help resource-poor households overcome the impact of an adult death in the areas hard-hit by the AIDS epidemic.

This paper—a product of Infrastructure and Environment, Development Research Group—extends research on the household-level impact of adult death which informed the World Bank Policy Research Report *Confronting AIDS: Public Priorities in a Global Epidemic*. Copies of this paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Viktor Soukhanov, room MC2-523, telephone 202-473-5271, fax 202-522-3230, email address vsoukhanov@worldbank.org. Policy Research Working Papers are also posted on the Web at www.worldbank.org/research/working papers. The authors may be contacted at mlundberg@worldbank.org, meadover@worldbank.org, or pmujinja@muchs.ac.tz. December 2000. (30 pages)

SOURCES OF FINANCIAL ASSISTANCE FOR HOUSEHOLDS SUFFERING AN ADULT DEATH IN KAGERA, TANZANIA

Mattias Lundberg, Mead Over, Phare Mujinja[1]

[1] Michigan State University and the World Bank, the World Bank, and the Muhimbili University College of Health Sciences, respectively; email addresses mlundberg@worldbank.org and meadover@worldbank.org and pmujinja@muchs.ac.tz. We thank USAID, DANIDA, the World Bank Research Committee and UNAIDS for research support. The data collection was the product of a collaborative effort by a team including Martha Ainsworth, Godlike Koda, Innocent Semali, George Lwihula and the second and third authors. Stefano Bertozzi, Joe Kutzin, Indrani Gupta, Kathleen Beegle and Daniel Dorsainvil contributed to data preparation. Seminar participants at the University of East Anglia and at the Workshop on the Economics of AIDS organized by the International AIDS Economics Network in Durban, South Africa provided helpful comments on an earlier draft. Lundberg would also like to thank the Overseas Development Group of the University of East Anglia for a generous research fellowship.

The entire village is in mourning, but every household is mourning in its own way.

(Kagera villager[2])

All happy families are alike, but each unhappy family is unhappy in its own way.

(Tolstoy, *Anna Karenina*)

Introduction

This paper examines some of the ways in which households respond to tragedy. Using a panel dataset from the Kagera region of western Tanzania, we examine household responses to death; with a special focus on the ravages of HIV and AIDS. The ability to cope means ensuring not only the welfare of household members around the time of the death, but also their well-being in the future. While death is among the most severe traumas that can visit a household, some are able to overcome even this crisis.

AIDS has been reported in nearly every country in the world; but more than 90 percent of adult HIV infections are in developing countries, and more than 60 percent, around 25 million, are in sub-Saharan Africa (UNAIDS 2000). By the end of 1999, more than 50 million people had been infected with HIV, and 19 million had already died from AIDS and AIDS-related illnesses (*ibid.*). More than 12 million children in sub-Saharan Africa have been orphaned by AIDS (*ibid.*). In 1999, roughly 5.4 million more people became infected with HIV world-wide; two-thirds of these new HIV infections were in sub-Saharan Africa (*ibid.*).

AIDS has had a horrifying impact on life and health in central and southern Africa. In Zimbabwe, for example, estimated life expectancy at birth is 22 years shorter than it would have been in the absence of AIDS (U.S. Bureau of the Census 1996, 1997). By the end of 1999, an estimated 1.3 million people were living with HIV in Tanzania, and more than one million had died of AIDS (UNAIDS 2000). HIV prevalence among those attending antenatal clinics in Dar es Salaam rose from four percent in 1986 to 14 percent in 1995/96 (UNAIDS 1998). More than ten percent of children under 15 in Uganda, and more than three percent in Tanzania, have lost their mother or both parents to AIDS (UNICEF 1999). In Tanzania, 20 percent of under-five mortality is due directly to AIDS (*ibid.*). A study from the Mwanza region of Tanzania (Boerma *et al.* 1997) found that AIDS had increased mortality rates by one-third: an estimated 42 percent of today's 15-year-olds will die before their sixtieth birthday.

Projections of the consequences for economic growth vary, but it has been estimated that the AIDS epidemic will reduce the growth of GDP per capita in Tanzania by .10 to .90 percent per year

(Cuddington 1993; Over 1992; Bloom and Mahal 1997). Most studies from central and southern Africa show that HIV infection rates are higher among the wealthier and more educated segments of the population (Ainsworth and Semali 1998). AIDS is ravaging the ranks of the skilled and educated, with potentially tragic consequences for future growth. The AIDS epidemic is consuming a greater share of government resources that could have been put to other uses. World Bank research indicates that in poor countries, the annual average cost of treating one AIDS patient was significantly greater than the annual cost of educating ten primary school students (World Bank 1999). Compounding the impact on aggregate growth, the children of HIV-infected parents may be withdrawn from school if the family can no longer pay fees or buy supplies, or if the child's labor is needed at home, on the farm, or in the marketplace.

The consequences of HIV and AIDS for the household are not the same as other diseases and other causes of death. Because the virus is mainly sexually transmitted, AIDS usually strikes prime-age adults, at the peak of their productive and income-earning years, who are often heads of families. Other things being equal, fatal illness increases household expenses (for health care, and ultimately funerals) at the same time as it reduces household income (due to diminished labor time). Yet according to preliminary work using this dataset, households are at least partly able to compensate for, and in time recover from, the death of a family member (see e.g. Over *et al.* 1996). We will try to understand one way in which households cope, by looking at the household's receipt of transfers and other unearned income around a death. We will also attempt to shed some light on the following questions:

- How well do informal institutions for risk-spreading help households after a death?
- How effectively do formal-sector interventions support household coping efforts?
- What policies might be implemented to increase the effectiveness of local risk-bearing institutions?

Previous research using this dataset has found that vulnerability to shocks varies across households, and this may significantly affect the path of development and the distribution of well-being in the long run. This confirms research from other areas which shows that the risk-mitigating actions of households lead to slower growth as well as lower current income (Rosenzweig and Wolpin 1993, Platteau 1991, Rosenzweig and Binswanger 1989; Banerjee and Newman 1993, 1998).

It has also been suggested that mechanisms for informal insurance are fragile and incomplete – they work best for small idiosyncratic shocks, and do not adequately protect the poorest (Jalan and Ravallion 1997; Alderman and Paxson 1992; Coate and Ravallion 1989). Even when it does work,

---

[2] Quoted in Rugalema 1999.

informal insurance may lead to greater divisions between rich and poor (Fafchamps 1992; Hoff 1998).

Thus there is considerable opportunity for public sector intervention, but it is necessary to see where are the gaps in the household's ability to self-insure. What are the unique characteristics of households that cope successfully that enable them to overcome the tragedy relatively quickly? We identify three sources of financial assistance available to households following a death: private transfers, private borrowing, and assistance from public or other formal organizations. The evidence suggests that on average, private transfers provide by far the majority of assistance, but not all households rely equally on these sources. Some households benefit more from private assistance networks, while others depend relatively more on credit or formal assistance.

There is some evidence that assistance from public institutions or NGOs may "crowd out" private assistance: that is, reduce the incentive for private donors to provide assistance (see e.g. Cox and Jimenez 1992). Estimates of this crowding out effect range from negative one-for-one (Becker 1974) to positive, where public assistance actually stimulates private transfers (Lampman and Smeeding 1983). The descriptive evidence from Kagera is that private transfer receipts increase with income. In that case, even if there is some crowding out of private transfers, the loss to the poor is relatively small; and the net social benefit of public transfers may be positive. In an earlier version of this paper we could not find any impact of formal assistance on private transfers. In any event, we do not model the crowding-out effect here.

The evidence suggests that households differ systematically in the characteristics and factors that condition the household's response to the crisis. Previous research has established that the epidemic is more likely to affect some segments of the population before others (Ainsworth and Semali 1998), and that the impact of the crisis differs significantly across, for example, wealth class (World Bank 1999). In order to identify the determinants of the household's receipt of financial assistance, we need to control for the household-specific factors that influence both the household's exposure to the epidemic and the nature of its response. In the analysis below, we therefore control for attrition bias, endogeneity, and unobserved heterogeneity. The plan of the paper is as follows: we first describe the survey and data; next, we examine the use of finance from the three sources mentioned above and correlate receipts with death and a range of household characteristics. Finally, we discard the unrealistic assumptions supporting the descriptive analysis (homogeneity and exogeneity) to reveal robust and generalizable links between a household's characteristics and access to and use of various sources of financial assistance.

Survey description

The data come from a four-round panel survey in the Kagera region of northwestern Tanzania, conducted between 1990 and 1994. The region is west of Lake Victoria and borders the Rakai district of Uganda to the north, and Rwanda and Burundi to the west. More than 80 percent of the population lives in the rural areas, most of them in agriculture. The farming system consists of tree crops (bananas and coffee), annual crops (maize, sorghum and cotton) and livestock.

Adult mortality is relatively high in Kagera, partly due to the early spread of HIV and AIDS. The first recorded case of AIDS in the region was in 1983, but the virus was probably present at least a decade earlier. The region is a crossroads for goods traffic, and was affected by the war between Tanzania and Uganda in the late 1970s. More recently, it has provided a haven for refugees fleeing Rwanda and Burundi.

A population-based seroprevalence survey in Bukoba, the regional capital, in 1987, found that roughly a quarter of the prime-aged (15-50) adults were infected with HIV, as were up to 10 percent in the surrounding areas.

Although AIDS has severely affected parts of central and southern Africa, and is widely prevalent in the survey region, it is not the largest cause of death in the sample. The survey was conducted over a three-year period from 1990 to 1994, during which some 9.6 percent of sample individuals died (compared to a crude death rate in Tanzania of 1.4 percent in 1995 [World Bank 1999]). About 40 percent of sample deaths can be directly attributed to AIDS. Including deaths in the year prior to the survey period, 44 percent of household-wave observations have experienced a death at some point in the past.

The region was stratified by cluster and village, and all households within selected villages were given an initial enumeration survey. From that enumeration, 838 households were selected to receive the first round of the complete household survey. Since adult mortality was still a relatively rare event, households that indicated recent experience with severe illness in the initial enumeration were oversampled. Altogether, 913 households were interviewed at least once.[3] The total sample consists of 3368 household-wave observations.

After each round, some households dropped out and were replaced. Of the original sample drawn from the enumeration, 6 percent dropped prior to their first interview. Of the remaining sample of households, 10 percent dropped out prior to the end of the survey (round 4) (Ainsworth 1995). This attrition rate compares favorably to other panel surveys. The surveys in the Luxembourg

[3]Although 816 households were selected from the enumeration sample for the first round, a further 24 households were added by the field team from the list of replacement households, so that 840 households were interviewed in round 1. One household was mistakenly interviewed twice in each round; both sets of observations for that household were dropped, yielding a round 1 sample of 838 households.

Income Study, for example, have an average dropout rate of around 22 percent after three rounds, or about 7 percent per round (Singh 1995); World Bank Living Standards Measurement Surveys have a per-round dropout rate of about 12 percent (Glewwe and Jacoby 2000); and the Kagera study has a per-round (per-wave) dropout rate of 2.5 percent.

It might be expected that those households that are most severely affected by a death are more likely to drop out. After all, only intact households can remain to be interviewed again, and the disaster can be so severe as to destroy the household. If that is the case, the sample is biased in favor of "more successful," or less severely affected households. This would minimize any measurement of the impact of the disease, and weaken our ability to draw meaningful inferences from the analysis. Examination of the data does not suggest any systematic bias. While households that drop out are smaller, with fewer assets, they have younger household heads with more education. Households that drop out are also less likely to have suffered a death than households that remain.[4] This suggests that more mobile households drop out, rather than more adversely affected ones.

Another source of potential bias in the data is that the replacement households may be systematically different from the remaining population. In addition, households joining the survey after the first passage do not have the opportunity to complete all four waves. For example, the replacement households joining between waves 1 and 2 could at most complete three waves (2, 3, and 4). If these households are systematically different, the fact that we observe them for a shorter amount of time may further bias the results. T-tests for significant differences between the replacement households and the original population reveal that replacement households do receive significantly fewer transfers and formal assistance. This may reflect bias in the sample; on the other hand, it more likely reflects the fact that the replacement households are also less likely to suffer a death. However, since the original sample was chosen with an oversampling of households with a recent illness, it could be that the replacements are randomly drawn, but the original sample is biased towards exaggerating the impact of a death.

Comparing replacement households with drop-out households does reveal some differences: replacement households are wealthier, older, and larger than those that drop out, but there is no difference in death experience. While these casual examinations leads us to believe that there is no bias in the sample, we control for both drop-out and replacement in the initial analysis below. We will show, however, that it is the household's characteristics underlying the probability of dropping out which matter, and not the act of dropping out itself. We control for these and other unobserved characteristics in the econometric analysis.

[4] T-tests available.

In much of the analysis below, we also drop 10 observations for which some data are missing, and we drop 14 observations for which the dependent variables are extreme outliers – that is, they fall outside the interval formed by the mean ± 10 standard deviations. Five of these 14 observations are for households that have experienced a death in the past.

The impact of AIDS on households, and household responses to the crisis

Previous analysis of this dataset (see Over *et al.* 1996 and World Bank 1999) has found that households with a death have higher total expenses as well as higher expenditures on all components of consumption than households in which no death has occurred. This is not because death makes one wealthy, but because in this sample, wealthier households are more likely to suffer a death.

The impact of a death on well-being depends largely on the resources available to the household. Not all households suffer in the same way, or to the same extent, or for the same length of time. For the poorer half of households in the sample, both food expenditure and food consumption fall dramatically in the six months following a death (Figure 1). For the non-poor half, food expenditure and consumption actually rise following a death. This again suggests that households are heterogeneous both in the impact of the crisis and in the ways they respond to it.

Why does the impact of a death differ so dramatically across households? If the ability to cope differs across wealth class, is it simply that wealthier households are wealthier, and are better "self-insured?" However, the consequences of a death may differ according to the type of coping mechanism used by the household, and not just the level. To see this we must first examine the characteristics of households in which people die, and how households respond to a death. The household can conceive of a hierarchy of responses to a crisis, which can be classified, for example, by reversibility. According to this criterion, re-allocating labour is preferable to selling productive assets such as a bullock team.

The adverse events that households face can be distinguished by ubiquity and recurrence. Some shocks affect only individual households, independently of others. Non-infectious illness, injuries, and (except in epidemics) death are examples of such "idiosyncratic" shocks. Drought, in contrast, usually affects entire regions. Some shocks, such as unemployment, may be related both to individual characteristics and common events such as business cycles. Some shocks may be repeated over time. Deaton (1997) found that the ability of households to maintain consumption diminishes as the "autocorrelation" in shocks rises. Households can draw on assets to smooth consumption over the course of one drought; a succession of droughts is more difficult to overcome. On the other hand, some degree of repetition makes it possible to learn from experience – to apply the lessons learned during one event to future events, thereby lessening their adverse consequences. Gertler and Gruber

(1997) found that households in Indonesia are better able to insure consumption against more frequent risks such as illness and idiosyncratic unemployment than against rare shocks such as death.

Kinsey, Burger and Gunning (1998) argue that poor households are relatively constrained in their choice of coping mechanisms: "the relatively poor tend to smooth income more than consumption while the relatively wealthy tend to smooth consumption alone (p.90)." The choice of response may reflect limited opportunities among poor households, rather than differences in preferences.

Table 1 presents bivariate correlations of the dependent variables (transfers, credit, and official assistance), as well as a range of characteristics that may determine both the ability of the household to withstand the shock and the household's receipts of outside assistance.[5] The first set of columns compares means across death experience. Households that have experienced a death receive more net private transfers than households that have not suffered a death, but the difference is not statistically significant. They also receive less in credit than those without a death – in fact, those with a death appear to be net lenders – but again the within-variance is sufficiently large to eliminate differences between the groups. Households with a death do receive more assistance from NGOs, government, or other formal institutions.

As noted above, households with a death are larger and wealthier (in terms of physical assets). They are more likely to have older and female household heads. Also, consistent with the earlier discussion of attrition, households with a death are more likely to have arrived in wave 1 of the survey and remain for all 4 waves. Households with a death are less likely to drop out and less likely to be chosen as a replacement.

The variables describing household human and physical capital are highly correlated with each other. The last two columns in the table give the factor loadings and coefficients for the first principal components of these characteristics, which explain 82 percent of the variation in all 6 variables. Since the coefficients are positive for all variables except the age of the household head, the index can be interpreted loosely as an index of household resources (i.e. human and physical capital). We use the index in the empirical work in the following section.[6]

Transfers and borrowing in response to an adult death

As mentioned earlier, the bereaved household can cope economically with a death in many ways: seek financial assistance either from friends and relatives, or from a formal government or non-government assistance agency; change the mix of crops grown on family plots; alter members' time

[5] This table includes the 14 outliers that we drop from the analysis below.

allocation between labor market participation, work at home and school; sell assets; recruit or shed household members; or reduce consumption of some or all household members. The objective of this paper is to learn more about the receipt of formal and informal transfers and credit.

Private inter-household transfers are observed throughout the world, and they often comprise a significant part of household income. More than 90 percent of rural households in India report receiving private transfers (Cox and Jimenez 1990), as do 20-75 percent of households in Eastern Europe and the former Soviet republics (Barberia, Johnson and Kaufmann 1998), and 15 percent of households in the U.S. (Cox and Jimenez 1990). Private transfers account for 39 percent of income among the urban poor in El Salvador, nearly half of income among the poorest in Malaysia (*ibid.*), and one-third to two-thirds of income in the transition economies of Eastern Europe (Barberia, Johnson and Kaufmann 1998).

Why are there private transfers? For what reason does a household give something to another? The motivations for these private actions have specific implications for public policy (see e.g. Cox 1987). The choice of intervention depends significantly on the structure of existing, "informal," institutions. Transfers may be made in payment for some previous, unobserved, transaction of goods or services. In that case, they serve no insurance function at all. On the other hand, they may be motivated out of altruism: I care for you, and help you when you need it, and I give no thought to what you might do for me. It is simply your happiness that makes me happy. In the economics jargon, your welfare is an argument in my objective function. Finally, transfers may be a part of an informal insurance system: I will help you today, but with my help I am purchasing your promise to help me in the future. In other words, under the insurance interpretation, transfers are either the purchase of future obligations, or repayment for past obligations.

Although casual comparisons show limited use of credit, and no difference across experience of death, an empirically sound distinction between credit and transfers may be difficult to make. It is well known that credit can have an insurance function (cf. Evans-Pritchard 1940 and Scott 1976 on reciprocal gift-giving, Platteau and Abraham 1987, Eswaran and Kotwal 1989, and Udry 1990, 1994 on credit). Fafchamps and Lund (1998) argue that local informal assistance can be described as "quasi-credit." That is, when limited enforcement constrains participation in mutual assistance programs, risk is mitigated by a combination of low- or zero-interest loans, combined with gifts.

However, there may be a significant difference between credit and transfers, in that the former requires a more formal and explicit arrangement (even though that arrangement can be flexible). When the informal exchange contract is unenforceable, the donor will insist on a more

[6] This combination also has the advantage of outperforming the log of assets by itself as a proxy for household resources in the regressions.

formal arrangement that forces the recipient to reciprocate, or protects his donation with some security. To the extent that the loans are given at positive interest rates, or that collateral is pledged with a positive probability of default, that increases the cost of finance relative to a scheme of *repeated interest-free mutual assistance.*

This raises the question of the distribution of the sources of finance. Do all households have access to these resources? Table 2 describes the incidence of (positive net) receipts by source. We distinguish in this table by (wave 1) wealth and by death experience. Among the poorer half of households, 60 percent receive some formal assistance, less than half are net recipients of private transfers, and one-sixth are net borrowers in the private credit market. Among the wealthier half of households, two-thirds receive some formal assistance, more than half are net recipients of private transfers, and the same percentage are net borrowers in the private credit market.

There is a greater distinction between households that have experienced a death in the past and those that have not. The former are more likely to receive private transfers (60 percent v. 44 percent) and public assistance (68 percent v. 60 percent). On the other hand, they are slightly less likely to borrow (17 percent v. 18 percent). The majority (56 percent) of the 670 poor households that have experienced a death receive formal assistance, as does the majority (62 percent) of non-poor households with a death.

While Table 2 shows that there is little difference in the incidence of access to sources of financial assistance across wealth class – that is, the proportion of households using each source is broadly similar – there may be greater differences in the amounts received across classes. Figure 2 describes the cumulative distribution of transfers received.[7] The smooth curve rising monotonically from zero to one is a Lorenz curve for total expenditures – in which equality is impliedby the diagonal line from zero to one. The other lines are concentration curves – that is, the proportion of assistance from each source that go to each cumulative proportion of the total income (expenditure) distribution. In principle, if the curve depicting the distribution of an item is above the Lorenz curve, it is relatively more equitable than the prevailing income distribution, in the sense that that segment of the population receives a larger share of that item than it receives of aggregate income; if it is below the Lorenz curve, that segment of the population receives proportionally less of it than would be consistent with its share of aggregate income. If the distribution curve is above the diagonal, then that segment of the population also receives more in absolute terms than other parts of the population.

This figure shows that formal assistance is more equitably distributed than private transfers, although both are progressively distributed (since they are both above the Lorenz curve). The more striking feature of this figure is the distribution of private credit (we superimpose a smoothed curve to

ease interpretation). These curves are all net, so that private transfers are those received minus those given out, and credit is the difference between borrowing and lending. The credit curve can be interpreted in terms of progressivity, but it also shows that the poorer half of the population are net borrowers, while the wealthier half are net lenders. The poorer half, in this figure, borrow more than they would be expected to if the distribution of credit reflected the prevailing income distribution; they also borrow more than average, and they borrow more than the wealthy. The credit curve is far more variable in the top half of the income distribution, which reflects the fact that a few wealthy households account for the majority of borrowing and lending activity.

Figure 2 shows that private assistance is proportional to total income (expenditure), but the amount of both private transfers and formal assistance received by the poor is significantly less in absolute terms than that received by the wealthy. The wealthy are also more likely to receive private transfers from other regions within Tanzania, or abroad.[8]

Estimating transfer receipts and borrowing

If one were to solve a system of structural equations for all of these household response variables for transfers received, $r_{i,t}$, as a function of whether there has been a death, $D_{i,t}$, (a dummy variable equal to one if a death has occurred to household i prior to period t), and the included exogenous variables from all the equations, the result would be the following equation:

$$r_{it} = \pi_0 + X_{i,t}\,\Pi + \theta\, D_{i,t} + \eta_i + \varepsilon_{it} \qquad (1.)$$

where π_0 is a constant term, $X_{i,t}$ is a row vector of all the exogenous variables included in all the structural equations, Π is a column vector of parameters and the parameter θ measures the total impact of death on remittances via both direct and indirect routes. The error term is composed of two parts: an unobserved, household-specific error η_i, and a random error ε_{it}. Assuming that the occurrence of a death is exogenous to the system of response variables and independent of the two error terms, it would in theory be possible to estimate the parameter θ consistently by ordinary least squares. More efficient estimates could be obtained by applying error components estimation techniques.

While the data set contains a great many variables measured at the community level which can reasonably be supposed to be exogenous to household decisions, deciding *a priori* which of these variables belongs in each of the structural equations requires strong assumptions. Rather than

---

[7] All curves are in terms of adult-equivalent units.

[8] This is in line with the work of Reardon, Delgado and Matlon (1992) who found that households invest in migration and remittance channels, and Rosenzweig (1988), who found that households in India arrange marriages for their daughters to areas with low income covariance.

attempting to distinguish those exogenous variables which directly affect one of the endogenous response variables from those which have only indirect effects, we choose to move the vector $X_{i,t}$ of exogenous variables into the error terms. With this change, we rewrite equation (1) in the simpler form:

$$r_{it} = \pi_0 + \theta D_{i,t} + \eta^*_i + \varepsilon^*_{it}, \qquad (2.)$$

where the augmented error terms now include the $X_{i,t}$ variables as follows

$$\eta^*_i + \varepsilon^*_{it} = X_{i,t}\Pi + \eta_i + \varepsilon_{it} . \qquad (3.)$$

If the augmented errors are independent of whether a death has occurred, it is possible to estimate the response of transfers to death by ordinary least squares. However, there are several reasons to suspect that the errors are not independent. Among the causes of possible correlation between the errors and $D_{i,t}$ are attrition bias in the sample and correlation between the excluded socio-economic variables and $D_{i,t}$.

Table 3 presents both ordinary least squares (OLS) and instrumental variable (IV) estimates of the response of transfers to death. In addition to a dummy variable for whether a death has occurred, the regressions include two dummies for attrition. One, called "Survey end" captures households which could not complete all four waves because they started late, in passage 2 or later rather than in passage 1. The other, called "Left Survey" equals one for households which could not be interviewed despite an attempt by the survey team.[9]

Except for the time trend variable, all right-hand-side variables are instrumented in the IV estimates of columns (2), (4) (6) and (8). The Davidson-Mackinnon test rejects exogeneity of the instrumented variables in three of the four equations, indicating that the OLS estimates are probably inconsistent. Comparison of the OLS and IV estimates in Table 3 reveals that correcting for endogeneity dramatically increases the response of transfers to death by factors of 3.6, 6.9 and 7.3 for the three components of total receipts and by a factor of 3.9 for the total (although the impact of death is insignificant to private credit in this table).

In contradiction to the bivariate comparisons of Table 2, the IV estimates show two of the three components of transfers, net private transfers and formal assistance, to respond significantly to death, both in statistical terms and in relation to their absolute level. In a sample for which total net receipts average 1,470 Tanzanian shillings per adult equivalent member each six months, the household is estimated to receive an additional 5,300 shillings after a death. The IV estimates of the impact of death on receipt of private transfers are illustrated in Figure 3.

Tables 4 and 5 relax the assumptions of Table 3 that transfers received respond to a death in the same way for all households and that higher levels of receipts endure permanently after a death. Table 4 allows response to vary across households in two specific ways. Inclusion of the time since the death and its square allows a response to become attenuated over time. Estimation by error components two-stage least squares (EC2SLS) controls for unobserved persistent household-specific variables which affect receipts (Baltagi 1995).

First, note that the Davidson MacKinnon (1993) test rejects the use of OLS for private transfers and formal assistance, although not for credit. Note also that the Hausman test fails to reject the use of EC2SLS against the fixed effects alternative. Comparing IV to the more efficient EC2SLS estimates, both death and time-since the death remain statistically significant. On the other hand, controlling for the household-specific error component renders the attrition variables insignificant, suggesting that this technique successfully controls for the unmeasured household characteristics that are associated with both receipts and attrition.

In Table 5, using only EC2SLS, we expand our analysis of the variation in transfer response to consider the effect of household resources on the size and timing of receipts. The results show that receipts respond to death and to the time since the death, and that the response varies according to the amount of household resources. Household resources are indexed using the coefficients of the first principal component as presented in Table 2.

The regressions indicate that receipts do respond to the death, and to the time since the death, and that the response varies according to the resources the household can command. We use the results of the regressions to simulate the evolution of the household's receipts of assistance following a death. Figure 4 presents the simulation of the median household's receipts of total assistance (the sum of private transfers, formal assistance, and private credit) for the 30 months following the death. The solid curve shows the predicted receipts of total financial assistance; the dashed lines show the 90% confidence interval. The vertical (left) axis depicts the rate of receipts in thousandTSh per capita. The horizontal line in each panel, labelled on the right axis, is the counterfactual estimate of receipts for households that have not suffered a death. The impact of a death on receipts is computed as the statistically significant difference between the solid curve and the counterfactual.

[9] In addition to suggesting the bias resulting from uncorrected endogeneity in estimating household responses, Table 3 also suggests that attrition matters: the dummy variables representing attrition are statistically significant in the IV regressions. But see the discussion of Table 4 below.

The median household receives financial assistance at the rate of about 30,000 TSh per year[10] immediately after the death, and continues to receive assistance until 18 months after the death.[11] In total, the median household receives roughly 144,000 TSh in financial assistance during that 18-month period, which is more than this household's estimated per-capita expenditures for the period.

At first glance, this is evidence of a well-functioning informal insurance network. The bereaved household is significantly compensated for the death. However, the question then arises whether this insurance system exists for all households. If so, does it function as well for all classes of households? To answer this question, we simulate the evolution of financial assistance following a death for typical poor and wealthy households. In addition, we distinguish financial assistance by source, to see whether the private response to a death differs from the response of public and non-governmental institutions.

The top three panels of Figure 5 (5a, 5b and 5c) present the estimated response and its 90% confidence interval for households at the tenth percentile of household resources; i.e. very poor households. The bottom three panels (5d, 5e, and 5f) present the same calculations for a household at the ninetieth percentile of household resources. As in Figure 4, the horizontal line labelled at the right border in each panel represents the estimated counterfactual: i.e. what would have happened in the absence of a death.

Figure 5d shows that the less poor receive transfers at the rate of about 40,000 Tsh per household member per year immediately after the death, and continue to receive private transfers until between 18 and 30 months later. On the other hand, the poorest households receive no statistically identifiable private assistance (Figure 5a).

Contrast the picture for private transfers with those of formal assistance and private borrowing. The less poor also receive formal assistance, but not until about nine months after the death. They receive some, but not much, private credit. On the other hand, the lack of significant amounts of private transfers for the poorest households, apparently forces them to depend on the latter two forms of receipts. However the total amount flowing from these is less than ten thousand shillings (per half-year) on the date of the death, half that received by the less poor on that day, and poor households continue to receive transfers for only a year, as opposed to the eighteen months that private transfers endure for the less poor (panels 5a and 5d).

---

[10] The surveys were conducted at six-month intervals, and the figures here use the half-year as the time unit. The estimate of 30,000 TSh per year is twice the point estimate (14,600) illustrated in the figure; in other words, the annualized rate at which these households receive transfers immediately following a death.

[11] We compute the assistance received as the area under the curve and above the counterfactual, from the date of the death until the date at which the estimate is not significantly different from zero (that is, when the 90% confidence interval crosses the counterfactual).

The bottom of Table 5 presents estimates of the size of the response at the two ends of the household resource distribution for the different components of receipts. Six months after the death, resource-rich households are receiving transfers at the annual rate of 27,000 TSh. At the same time, the resource-poor households receive no private transfers, but do get assistance from formal institutions at the rate of 4,400 TSh per year, and are borrowing an additional 4,600 TSh per year. One year after the death, the rich are still receiving private transfers at a rate of 17,000 TSh per year, whereas the poor have stopped receiving any assistance, whether in the form of private transfers, formal assistance, or credit.

Figure 6 and column (4) of Table 5 present the household's total receipts of financial assistance, again by the number of months since the death and index of household resources. In total, the resource-poor household could possibly receive assistance at the rate of 18,800 TSh per adult equivalent member one month after the death, which is a respectable half of the 37,000 TSh received by the resource abundant household (though the estimate for the poor is not statistically significant). If the distribution of financial assistance were maintained at this rate over time for all households, it would be an impressively progressive allocation. As a percentage of total income, the annual rate of receipts would amount to a quarter of per-capita expenditure for the poor, and 13 percent of per-capita expenditure for the rich.

Over the course of the first year following a death, poor households receive about 52,400 TSh per capita, while rich households receive about 176,000 TSh per capita.[12] This is still progressive, as it represents about 70 percent of total per-capita expenditures of the poor, and 63 percent of total per-capita expenditures for the rich. However, the receipts of assistance by resource-poor households diminish rapidly with time, and are completely gone within one year after the death, while those of the resource abundant household persist for almost two years. While the total received by the poor is 52,400 TSh (all in the first year), the rich receive a total of about 280,000 TSh per capita in the 30 months following the death, coincidentally, exactly the annual per-capita expenditure among rich households.

Conclusions

This paper has tried to understand one of the mechanisms by which households deal with a death. Clearly, some households fare much worse than others. But that observation itself motivates the key question: why do some households manage better than others? The household's human and

[12] This is the integral of the point estimate curve in panels 6a and 6b, from 0 to 12 months after the death, above the counterfactual.

physical capital – the ability to self-insure – is part of the answer. Households with sufficient resources may not need formal-sector assistance.

Resource-abundant households rely more on private transfers, whereas resource-poor households rely relatively more on credit. These results seem to support the hypothesis of Fafchamps and Lund, that credit acts as insurance in cases where informal contracts are not enforceable. In Kagera, a donor household will make transfers to a rich household, and trust that the recipient will repay in the future. There is an implicit contract for repayment. For poor households, the contract must be explicit: I will help you if you are poor and in crisis, but I want an explicit promise of repayment, not merely an implicit one. I don't trust that you will be able to repay; I need some guarantee. If this is true, it means that the impact of the death is potentially even worse for poor households – not only are they hit harder, but they must bear a larger part of the burden alone.

Thus resource-abundant households are wealthy not only in physical and human assets, but also in "social" assets, or social capital. They have a larger, broader, and presumably wealthier network of friends and relatives on whom they can depend in times of crisis. They are more likely to receive private assistance, and they receive more assistance, than poorer households. In an environment of incomplete and unenforceable contracts, a larger social network provides greater resources for common risk-pooling.

These quasi-insurance transactions are personalized functions of the characteristics of donor and recipient, not impersonal market transactions. The expected returns to gifts given depend on information about the ability of the recipient to reciprocate in the future – that is, expected future creditworthiness or vulnerability. Thus it may be reasonable even for a poor donor to give more to a wealthy recipient than to another poor recipient, if the expected returns to gifts made to a wealthy household exceed those of gifts to a poor household.

Those outside the network, the resource-poor, can only have access to the risk-pooling resources through formal credit contracts. Even assuming the rate of interest is actuarially fair, the cost of risk aversion is far greater for the poor than for the rich, since the risk of default and loss of collateral is not zero. For the rich, inability to reciprocate the assistance will reduce access to future assistance, but will not imply the loss of currently productive assets.

What are the policy implications of these findings? First, government and non-government agencies made a substantial difference to resource poor households which had suffered an adult deaths in Kagera, Tanzania in 1990-1994. According to the point estimates in Table 5, formal sources accounted for more than a third of all financial assistance received by the poorest households a month after the death. Second, the amount of such formal assistance was substantial in absolute terms. Computing the integral under the estimated profile of formal assistance in panel 5b gives an

estimated total of 30,500 Tsh per adult equivalent over the eighteen months until receipts cease. At an annual rate of 20,300 Tsh, or about 70 1991 US dollars, this amount compares favorably with Tanzania's 1991 per capita GNP of 110 US dollars.

Third, since panel 5e shows that resource abundant households receive assistance also, though with a lower priority than do the poor households, suggests that formal assistance programs could provide more assistance to the poorest households by limiting the amount given to the better-off. This suggestion must not be taken lightly, however, since strict adherence to progressive targeting criteria can undermine the political support for a subsidy program (Sen, 1995, Gelbach and Pritchett 1997). In addition, it is difficult to design accurate targeting mechanisms (Lundberg and Diskin 1995), and attempts to reduce false positives (capture by non-needy households) often lead to increases in false negatives (omitting truly needy households).

Finally, resource poor households in Kagera avail themselves even more of loans than they do of formal assistance in response to a death. And they do so even more than do resource abundant households. Many of the loans taken in this sample may be "quasi-credit," that is, flexible arrangements in which repayment is contingent on changes in the fortunes of borrower and lender. The Kagera survey did not elicit interest rates, so further data is required before we can estimate the actual costs of borrowing; but it is safe to say that the costs of insuring consumption against a death are higher for poor households than non-poor households. Credit and transfers are structurally different: interest rates on loans are likely to be positive, and loans may require the borrower to forfeit collateral with a positive probability of default. The evidence suggests that the poor are excluded from the relatively more flexible transfer scheme, and rely more on private credit. Thus, to the extent that micro-credit programs improve access and lower the total costs of borrowing, they may be effective not only for their usual purpose of stimulating investment in micro-enterprises, but also in helping the most resource poor households to cope with the impacts of an adult death in areas hard-hit by the AIDS epidemic.

References

Ainsworth, M. and I. Semali, 1995. "The Impact of Adult Deaths on Household Composition." Washington, DC: World Bank. Manuscript.

_____ and _____, 1998. "Who is Most Likely to Die of AIDS? Socioeconomic Correlates of Adult Deaths in Kagera Region, Tanzania," in M. Ainsworth, L. Fransen, and M. Over (eds.) *Confronting AIDS: Evidence from the Developing World.* Brussels, Belgium: The European Commission and Washington, DC: World Bank.

Alderman, H. and C. Paxson, 1992. "Do the Poor Insure? A Synthesis of the Literature on Risk and Consumption in Developing Countries." Policy Research Working Paper No.1008. Washington, DC: World Bank.

Baltagi, B.H., 1995. *Econometric Analysis of Panel Data.* Chichester, New York: Wiley.

Banerjee, A. and A. Newman, 1993. "Occupational Choice and the Process of Development." *Journal of Political Economy,* 101:274-298.

_____ and _____, 1998. "Information, the Dual Economy, and Development." *Review of Economic Studies,* 65:631-653.

Becker, G.S., 1994. "A Theory of Social Interactions" *Journal of Political Economy,* 82:6:1063-1093.

Barberia, L., S. Johnson, and D. Kaufmann, 1998. "Social Networks in Transition." William Davidson Institute Working Paper no.102. Ann Arbor, MI: University of Michigan.

Bloom, D.E. and A.S. Mahal, 1997. "Does the AIDS Epidemic Threaten Economic Growth?" *Journal of Econometrics,* 77:1:105-124.

Boerma, T.J., J. Ngalula, R. Isingo, et al., 1997. "Levels and Causes of Adult Mortality in Rural Tanzania with Special Reference to HIV/AIDS." Health Transition Review, 7: Supplement 2:63-74.

Coate, S. and M. Ravallion, 1989. "Reciprocity without Commitment: Characterisation and Performance of Informal Risk-Sharing Arrangements." Discussion Paper no. 96, Development Economics Research Centre, University of Warwick.

Cox, D., 1987. "Motives for Private Income Transfers." *Journal of Political Economy,* 95:3:508-546.

Cox, D. and E. Jimenez, 1990. "Achieving Social Objectives through Private Transfers: W Review." *World Bank Research Observer,* 5:2:205-218.

_____ and _____, 1992. "Social Security and Private Transfers in Developing Countries: The Case of Peru." *World Bank Economic Review,* 6:1:155-169.

Cuddington, J.T., 1993. "Modelling the Macro-economic Effects of AIDS with an Application to Tanzania." *World Bank Economic Review,* 7:2:173-189.

Davidson, R. and MacKinnon, J., 1993. *Estimation and Inference in Econometrics.* New York: Oxford University Press.

Deaton, A., 1997. *The Analysis of Household Surveys.* Baltimore, MD: Johns Hopkins University Press.

Eswaran, M. and A. Kotwal, 1989. "Credit as Insurance in Agrarian Economies." *Journal of Development Economics,* 31:37-53.

Evans-Pritchard, E.E., 1940. *The Nuer*. Oxford: Clarendon Press.

Fafchamps, M., 1992. "Solidarity Networks in Pre-Industrial Societies: Rational Peasants with a Moral Economy." *Economic Development and Cultural Change*, 41:1:147-174.

Fafchamps, M. and S. Lund, 1998. "Risk-Sharing Networks in Rural Philippines." Palo Alto, CA: Stanford University. Manuscript.

Gelbach, J.B. and L. Pritchett, 1997. "More for the Poor is Less for the Poor: The Politics of Targeting." Policy Research Working Paper No. 1799. Washington, DC: World Bank.

Gertler, P. and J. Gruber, 1997. "Insuring Consumption Against Illness." NBER Working Paper No.6035. Cambridge, MA: NBER.

Glewwe, P. and H. Jacoby, 2000. "Recommendations for Collecting Panel Data," in M. Grosh and P. Glewwe (eds) *Designing Household Survey Questionnaires for Developing Countries.* Washington, DC: The World Bank.

Hoff, K., 1998. "Wealth Distribution, Economic Efficiency and Incentives: Theory and Application to the Rural Sector." Presented to joint World Bank/Government of Brazil International Seminar on Income Distribution, Poverty and Growth, Brasilia.

Jalan, J. and M. Ravallion, 1997. "Are the Poor Less Well Insured? Evidence on Vulnerability to Income Risk in Rural China." Washington, DC: World Bank. Manuscript.

Kinsey, B., K. Burger and J.W. Gunning, 1998. "Coping with Drought in Zimbabwe: Survey Evidence on Responses of Rural Households to Risk." *World Development*, 26:89-110.

Lampman, R. and T. Smeeding, 1983. "Interfamily Transfers as Alternatives to Government Transfers to Persons." *Review of Income and Wealth*, 29:1:45-66.

Lundberg, M. and P. Diskin, 1995. "Targeting Assistance to the Poor and Food Insecure." Technical Paper No.9, SD Publication Series. Washington, DC: US Agency for International Development, Office of Sustainable Development, Bureau for Africa.

Over, M., 1992. "The Macroeconomic Impact of AIDS in Sub-Saharan Africa." Technical Working Paper No.3. Africa Technical Department, Population, Health and Nutrition Division. Washington, DC: World Bank.

Over, M., M. Ainsworth, K. Beegle, *et al.*, 1996. "Coping With AIDS: Summary of Research Results on the Economic Impact of Adult Mortality from AIDS and Other Causes on Households in Kagera, Tanzania." Prepared for a discussion at a workshop in Bukoba, Tanzania. Washington, DC: World Bank. Manuscript.

Platteau, J-P., 1991. "Traditional Systems of Social Security and Hunger Insurance: Past Achievements and Modern Challenges," in E. Ahmad, J. Dreze, J. Hills, and A. Sen (eds), *Social Security in Developing Countries.* Oxford: Clarendon Press.

Platteau, J-P. and A. Abraham. 1987. "An Inquiry into Quasi-Credit Contracts: The Role of Reciprocal Credit and Interlinked Deals in Small-scale Fishing Communities." *Journal of Development Studies*, 23:4:461-490.

Reardon, T., C. Delgado, and P. Matlon, 1992. "Determinants and Effects of Income Diversification amongst Farm Households in Burkina Faso." *Journal of Development Studies*, 28:2:264-296.

Rosenzweig, M.R., 1988. "Risk, Implicit Contracts and the Family in Rural Areas of Low-Income Countries." *The Economic Journal*, 98:1148-1170.

Rosenzweig, M.R. and H. Binswanger, 1989. "Wealth, Weather Risk, and the Composition and Profitability of Agricultural Investments." Economic Development Center Bulletin No. 89, University of Minnesota.

Rosenzweig, M.R. and K. Wolpin, 1993. "Credit Market Constraints, Consumption Smoothing, and the Accumulation of Durable Production Assets in Low-Income Countries: Investments in Bullocks in India." *Journal of Political Economy*, 101:2:223-244.

Rugalema, G.H.R., 1999. *Adult Mortality as Entitlement Failure.* Ph.D. Thesis submitted to the Institute of Social Studies, The Hague, The Netherlands.

Scott, J., 1976. *The Moral Economy of the Peasant.* New Haven: Yale University Press.

Sen, A. 1995. "The Political Economy of Targeting," in D. van de Walle and K. Nead (eds), *Public Spending and the Poor.* Baltimore, MD: Johns Hopkins University Press.

Singh, C., 1995. "A Comparative Analysis of Attrition in Household Panel Studies." Comparative Research on Household Panel Studies, PACO, CEPS/INSTEAD, Differdange, Luxembourg. Manuscript.

U.S. Bureau of the Census, 1996. "World Population Profile 1996, with a Special Chapter Focusing on Adolescent Fertility in the Developing World." Washington, DC: U.S. Department of Commerce, U.S. Government Printing Office. Cited in World Bank 1997b.

U.S. Bureau of the Census, 1997. "HIV/AIDS Surveillance Database, Version 1.1, Release 0. Washington, DC: International Programs Center. Cited in World Bank 1997b.

Udry, C., 1990. "Credit Markets in Northern Nigeria: Credit as Insurance in a Rural Economy." *World Bank Economic Review*, 4:3:251-269.

_____, 1994. "Risk and Insurance in a Rural Credit Market: An Empirical Investigation in Northern Nigeria." *Review of Economic Studies*, 61:3:495-526.

UNAIDS, 2000. *Report on the Global HIV/AIDS Epidemic.* Geneva: Joint United Nations Programme on AIDS.

_____, 1998. *The Impact of HIV and Sexual Health Education on the Sexual Behaviour of Young People: A Review* (updated). Geneva: Joint United Nations Programme on AIDS.

UNICEF 1999. *The Progress of Nations.* New York: United Nations Children's Fund.

World Bank, 1999. *Confronting AIDS: Public Priorities in a Global Epidemic.* Policy Research Report, 2nd Edition. Washington, DC.

Table 1. Descriptive Statistics, by Death Experience

Variable name	*No death* mean	sd	*Any death* mean	sd	t-test	*Principal components* Factor loadings	Regression parameters[b]
Net private transfers[a]	1.041	(23.199)	1.931	(16.671)	(1.243)		
Formal assistance[a]	0.341	(1.843)	0.520	(1.691)	(2.895) **		
Net private credit[a]	0.135	(5.335)	-0.077	(2.810)	(1.383)		
Total receipts[a]	1.517	(24.160)	2.374	(17.261)	(1.151)		
Attrition	0.053	(0.225)	0.039	(0.193)	(2.004) *		
Survey end	0.067	(0.250)	0.037	(0.190)	(3.892) **		
Log assets	2.491	(0.658)	2.584	(0.611)	(4.244) **	0.458	0.436
Log BMI	1.313	(0.049)	1.313	(0.048)	(0.138)	0.276	2.407
Male hh head	0.785	(0.411)	0.658	(0.475)	(8.138) **	0.437	0.454
HH head age	48.576	(16.207)	50.031	(18.116)	(2.419) *	-0.291	-0.009
HH head education	4.158	(3.172)	4.133	(3.205)	(0.223)	0.614	0.120
Log RAAE	0.472	(0.226)	0.497	(0.222)	(3.208) **	0.352	0.772
Resources index	0.004	(0.760)	-0.005	(0.777)	(0.334)		
Death	0.000	..[c]	1.000	..	..		
Time since death	0.000	..	19.188	(10.740)	..		
Time since death squared	0.000	..	483.438	(450.364)	..		
Resources X Death	0.000	..	-0.005	(0.777)	..		
Resources X Time since death	0.000	..	-0.718	(16.458)	..		
Resources X Time since death squared	0.000	..	-26.737	(482.316)	..		
N	1896		1462				

[a] Thousand TSh per adult equivalent.

[b] OLS, intercept = -5.012.

[c] Zero variance: variable is a constant.

* significant at 5%, ** significant at 1%, + significant at 10%.

Table 2. Incidence of assistance by source

	Private transfers	Formal assistance	Private credit	Total assistance	Number of households
Poor households	812	1030	293	1092	1686
with death	379	445	105	498	670
without death	433	585	188	594	1016
Non-poor households	895	1119	295	1076	1682
with death	491	560	140	575	800
without death	404	559	155	501	882
All households					
with death	870	1005	245	1073	1470
without death	837	1144	343	1095	1898
Number of households receiving assistance	1707	2149	588	2168	3368

Table 3. Household Receipts of Transfers and Credit, Controlling for Endogeneity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Net private transfers		*Formal assistance*		*Net private credit*		*Total net receipts*	
	OLS	*IV*	*OLS*	*IV*	*OLS*	*IV*	*OLS*	*IV*
Death	1.222	4.478	0.167	1.150	-0.048	-0.347	1.341	5.281
	(4.62) **	(3.91) **	(4.75) **	(5.48) **	(0.68)	(1.27)	(4.71) **	(4.50) **
Left survey	-0.558	15.122	0.033	-4.491	0.140	-0.329	-0.384	10.302
	(0.88)	(3.07) **	(0.40)	(4.98) **	(0.83)	(0.28)	(0.57)	(2.05) *
Survey end	-0.867	-7.396	0.065	2.498	0.208	-0.660	-0.594	-5.558
	(1.49)	(1.88) +	(0.84)	(3.46) **	(1.33)	(0.70)	(0.95)	(1.38)
Elapsed time	6.886	19.210	1.700	-3.071	0.681	0.992	9.267	17.131
	(2.75) **	(3.80) **	(5.10) **	(3.31) **	(1.02)	(0.82)	(3.44) **	(3.31) **
Intercept	-0.272	-3.191	0.135	0.222	-0.038	0.133	-0.175	-2.836
	(0.95)	(3.91) **	(3.53) **	(1.48)	(0.50)	(0.68)	(0.56)	(3.39) **
				3343				
F-tests of joint significance								
Death	(21.33) **	(15.29) **	(22.55) **	(30.01) **	(0.46)	(1.62)	(22.21) **	(20.29) **
Dropouts	(1.45)	(5.47) **	(0.42)	(15.29) **	(1.20)	(0.35)	(0.59)	(2.54) +
Davidson-Mackinnon exogeneity test (F)		(7.39) **		(55.90) **		(0.71)		(6.07) **
R-squared	(0.01)		(0.02)		(0.00)		(0.01)	
Observations	3343	3343	3343	3343	3343	3343	3343	3343
No of hh	912	912	912	912	912	912	912	912

Absolute value of t-statistics in parentheses, unless noted.

* significant at 5%; ** significant at 1%; + significant at 10%

Table 4. Household Receipts of Transfers and Credit, Controlling for Endogeneity and Heterogeneity

	(1)	(2)	(3)	(4)	(5)	(6)
	Net private transfers		*Formal assistance*		*Net private credit*	
	IV	*EC2SLS*	*IV*	*EC2SLS*	*IV*	*EC2SLS*
Death	17.506	16.215	5.549	0.250	3.208	2.681
	(2.37) *	(3.21) **	(2.83) **	(0.29)	(1.89) +	(2.03)
Time since death	-0.575	-1.049	-0.155	0.195	-0.358	-0.280
	(0.87)	(2.37) *	(0.88)	(3.40) **	(2.35) *	(2.33)
Time since death squared	-0.004	0.015	-0.003	-0.006	0.007	0.005
	(0.23)	(1.53)	(0.67)	(4.75) **	(1.97) *	(2.03)
Left survey	15.214	-0.786	-4.387	0.073	-0.678	-0.067
	(2.76) **	(0.90)	(3.00) **	(0.30)	(0.54)	(0.12)
Survey end	-4.911	-1.263	3.403	-0.071	-0.319	0.169
	(1.09)	(1.34)	(2.84) **	(0.24)	(0.31)	(0.27)
Elapsed time	45.878	18.855	7.216	4.719	1.636	1.668
	(3.27) **	(2.19) *	(1.94) +	(2.74) **	(0.51)	(0.83)
Intercept	-5.867	-2.272	-0.803	-0.534	0.027	-0.101
	(3.78) **	(2.43) *	(1.95) +	(2.37) *	(0.08)	(0.41)
		3343	3343			
F-tests of joint significance						
Death	(5.81) **	(4.63) **	(7.15) **	(10.18) **	(2.33) +	(2.03)
Time since death	(2.50) +	(3.63) *	(4.90) **	(11.28) **	(2.79) +	(2.75)
Dropouts	(3.94) *	(1.24)	(7.03) **	(0.08)	(0.24)	(0.30)
Davidson-MacKinnon exogeity test (F)	(5.68) **		(47.61) **		(1.78)	
Hausman test, RE v FE		(3.08)		(2.47)		(2.60)
R^2 within		(0.02)		(0.00)		(0.00)
R^2 between		(0.01)		(0.01)		(0.00)
R^2 overall		(0.02)		(0.00)		(0.00)
Observations	3343	3343	3343	3343	3343	3343
No of hh	912	912	912	912	912	912

Absolute value of t-statistics in parentheses, unless noted.

* significant at 5%; ** significant at 1%; + significant at 10%

Table 5. Household Receipts of Transfers and Credit, Controlling for Household Resources

	(1) *Net private transfers*	(2) *Formal assistance*	(3) *Net private credit*	(4) *Total net receipts*
Death	10.941	0.481	3.016	15.280
	(2.13) *	(0.53)	(2.28) *	(2.68) **
Time since death	-0.792	0.140	-0.294	-1.025
	(1.75) +	(2.03) *	(2.40) *	(2.11) *
Time since death squared	0.013	-0.004	0.006	0.016
	(1.34)	(2.88) **	(2.09) *	(1.48)
Resources X death	9.382	-2.860	-0.990	4.499
	(1.46)	(2.37) *	(0.61)	(0.62)
Resources X time since death	-0.333	0.342	0.028	0.184
	(0.43)	(2.60) **	(0.14)	(0.21)
Resources X time since death	0.002	-0.006	0.000	-0.007
squared	(0.10)	(1.92) +	(0.01)	(0.34)
Elapsed time	12.174	4.162	1.960	19.101
	(1.59)	(2.60) **	(1.06)	(2.15) *
Intercept	-1.308	-0.432	-0.190	-1.971
	(1.40)	(2.14) *	(0.86)	(1.80) +
F-tests of joint significance				
Death	(1.85)	(7.27) **	(1.97)	(2.90) *
Resources X death	(3.47) *	(5.11) **	(0.79)	(2.73) *
Resources and death	(4.01) **	(8.04) **	(1.37)	(4.23) **
Hausman test, RE v FE	(4.77)	(3.03)	(6.61)	(3.84)
R^2 within	(0.02)	(0.00)	(0.00)	(0.02)
R^2 between	(0.00)	(0.01)	(0.00)	(0.01)
R^2 overall	(0.01)	(0.00)	(0.00)	(0.01)
Observations	3343	3343	3343	3343
N of hhno	912	912	912	912
Predicted receipts following a death (thousand TSh per capita):				
One month after the death				
Poor	0.816	3.223	3.721	9.441
	(0.10)	(2.26) *	(1.88) +	(1.08)
Rich	18.463	-1.698	1.846	18.559
	(2.67) **	(1.30)	(1.06)	(2.39) *
Six months after the death				
Poor	-1.026	2.215	2.304	4.176
	(0.22)	(2.39) *	(2.05) *	(0.79)
Rich	13.504	0.228	0.704	14.604
	(3.27) **	(0.26)	(0.70)	(3.06) **
Twelve months after the death				
Poor	-2.486	1.118	0.969	-0.615
	(0.75)	(1.60)	(1.21)	(0.16)
Rich	8.544	1.890	-0.294	10.465
	(3.29) **	(3.32) **	(0.48)	(3.45) **

Absolute value of t-statistics in parentheses, unless noted.

* significant at 5%; ** significant at 1%; + significant at 10%

Figure 1. Short-term Impact of Death on Food Expenditure and Food Consumption per Adult Equivalent

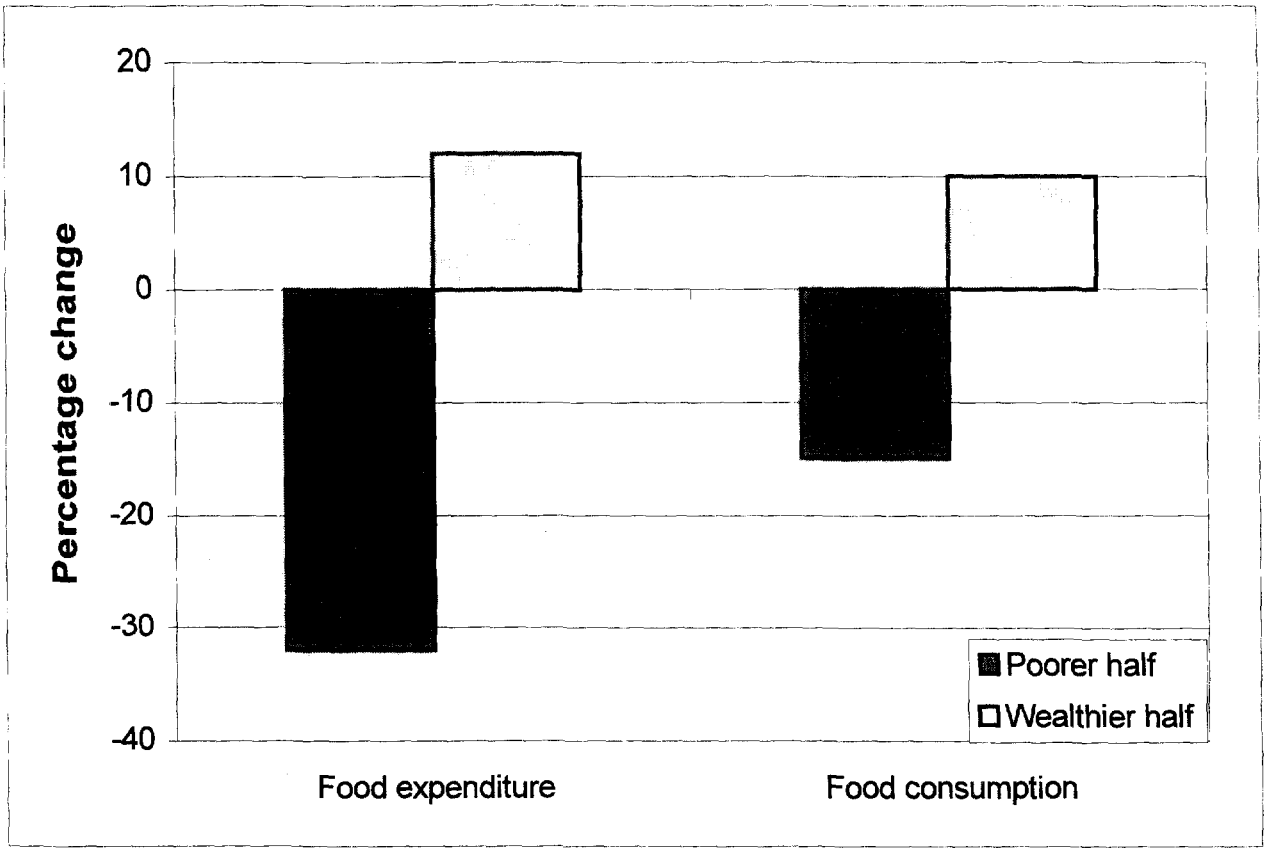
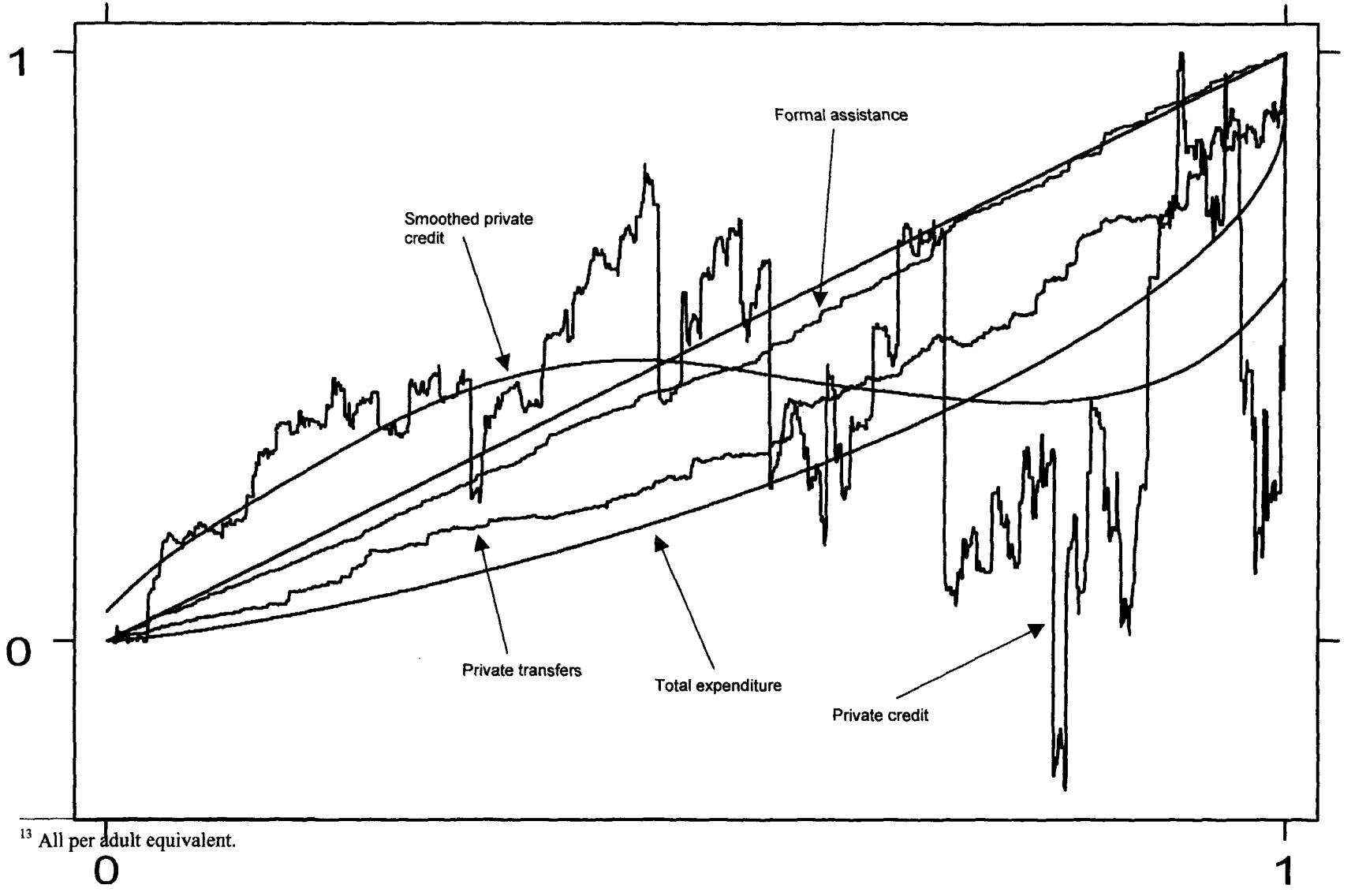
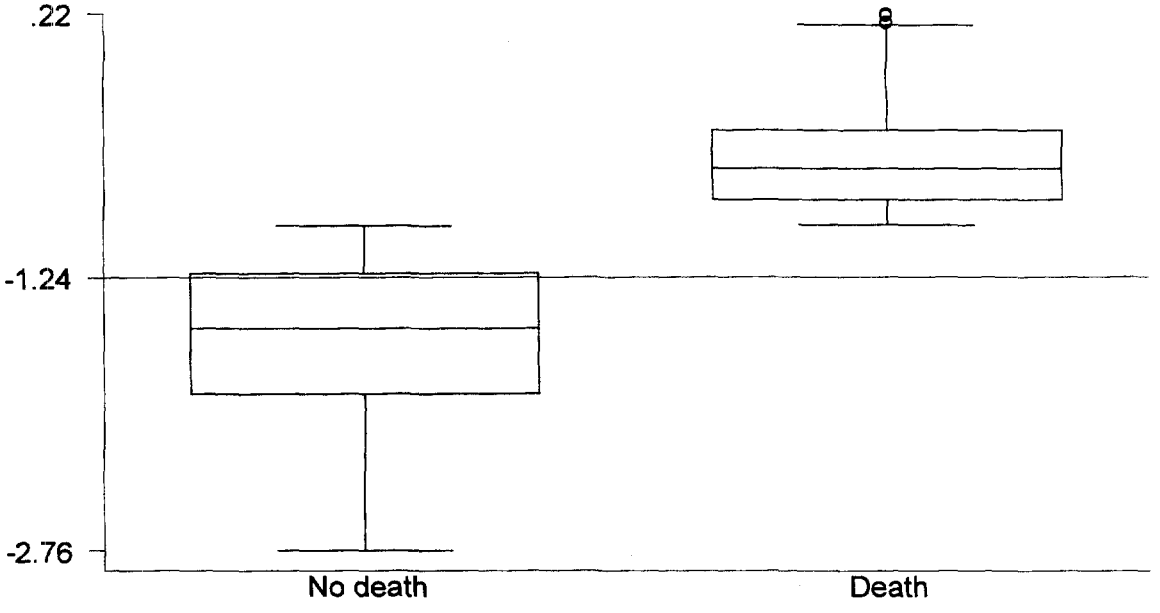


Figure 2. Concentration Curves for Private Transfers, Private Credit, and Formal Assistance[13]



[13] All per adult equivalent.

Figure 3. Predicted Net Private Transfer Receipts by Predicted Death (Thousand TSh)[14]

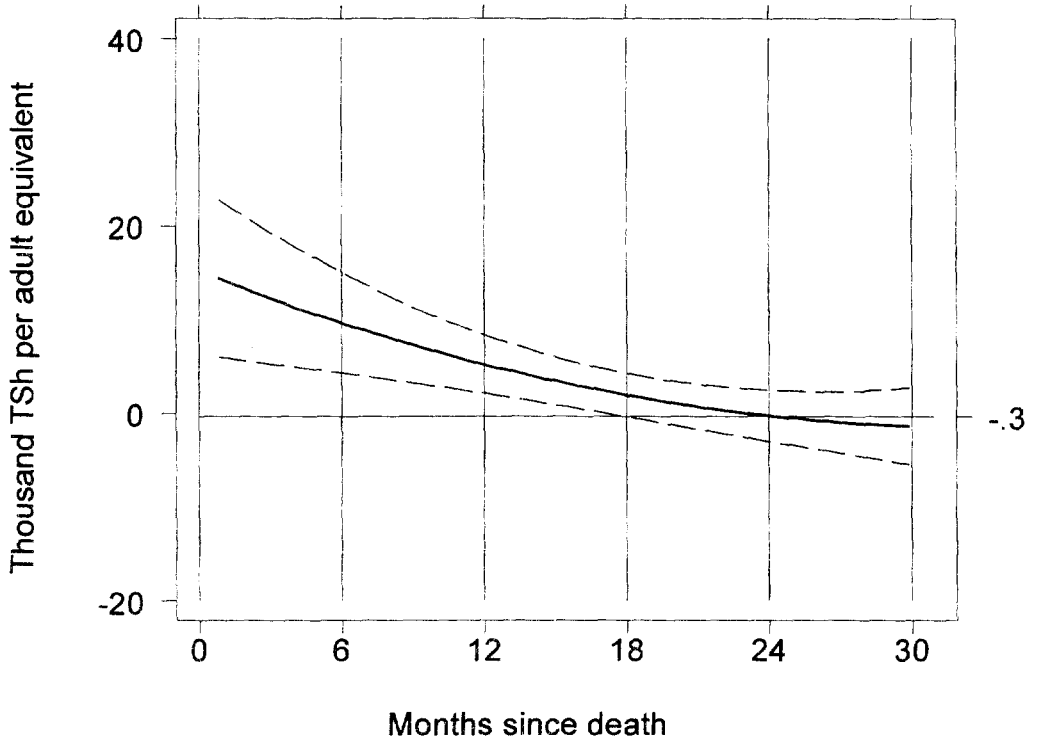


[14] Predicted deaths come from a linear probability model. Death is predicted for observations with a predicted probability of death greater than or equal to .5. The table below describes the prediction, which has a corresponding Pearson chi^2 statistic of 143.55.

Actual deaths	Predicted deaths		
	0	1	Total
0	1392	495	1887
1	784	672	1456
Total	2176	1165	3343

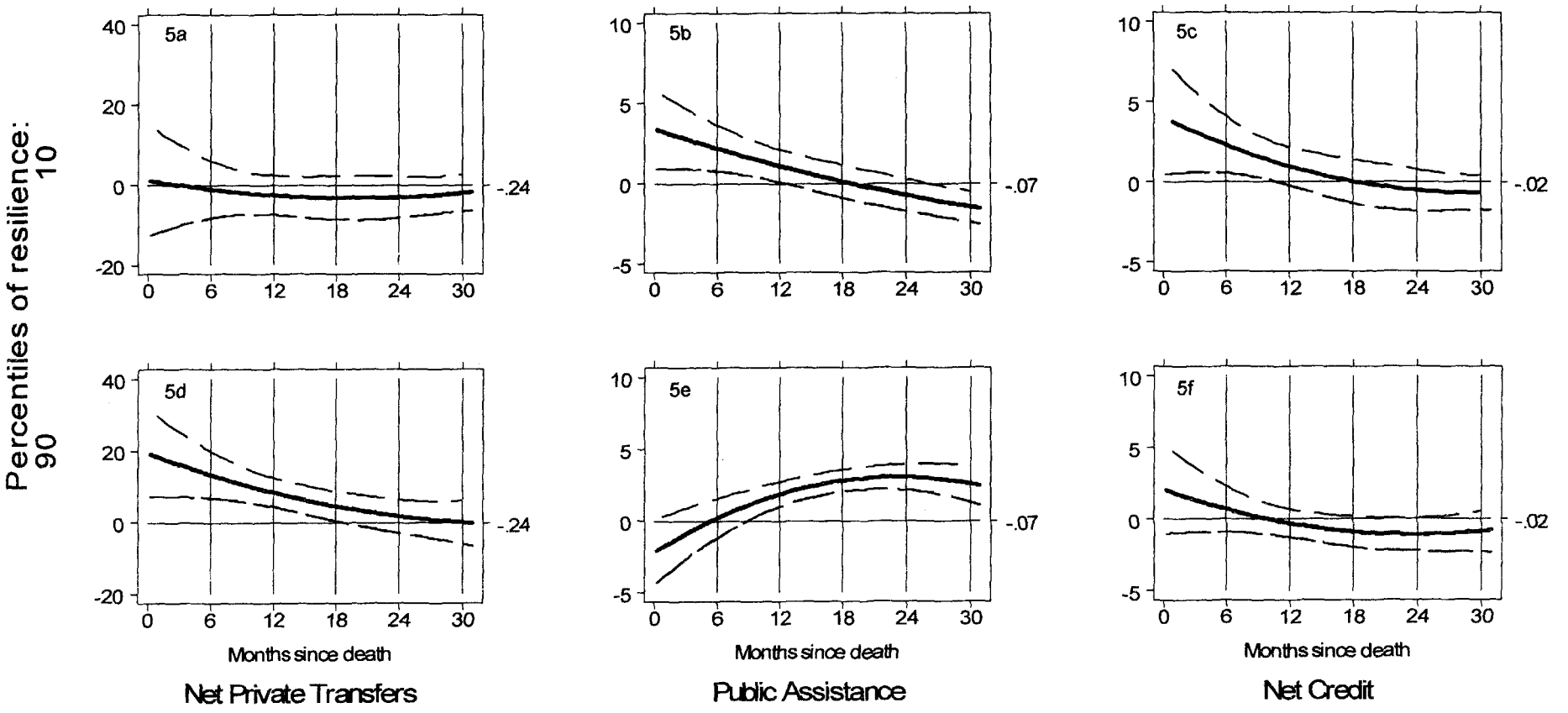
Predicted net transfer receipts are taken from an error-correction 2SLS regression on death, where the first stage is the linear probability model of death, and the second stage prediction uses the fitted values from the first stage regression.

Figure 4. Total Assistance Received by Median Household Following a Death[15]



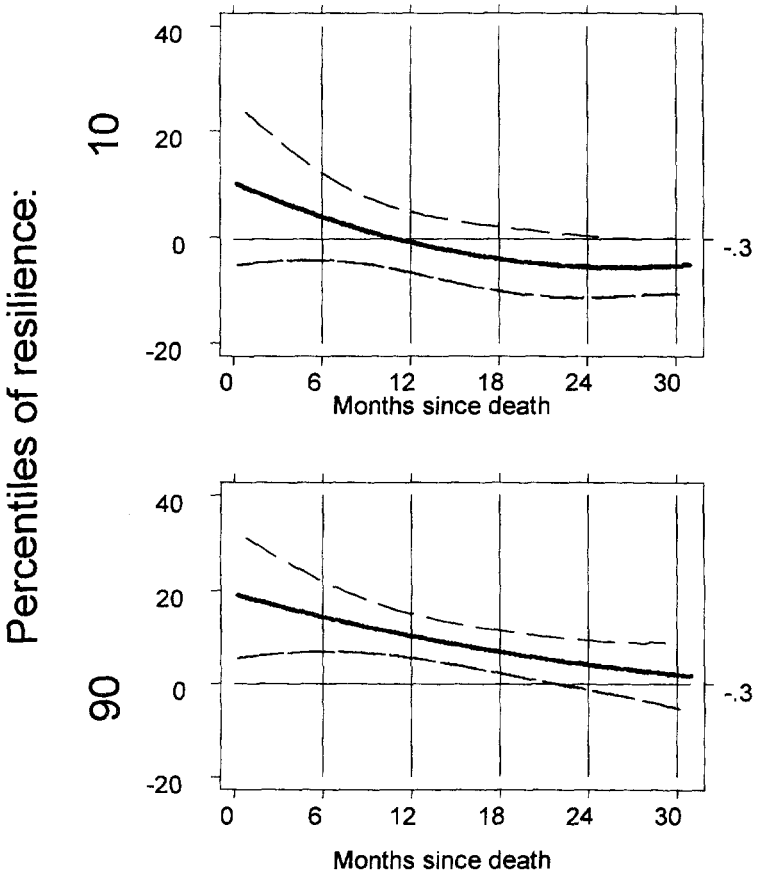
[15] The solid curve is the estimates of the sum of net receipts of private transfers, formal assistance, and private credit following a death. The dashed lines show the 90% confidence interval. The vertical (left) axis depicts the rate of receipts in thousand TSh per capita. The horizontal line, labelled on the right axis, is the counterfactual estimate of receipts for households that have not suffered a death. The impact of a death on receipts is computed as the statistically significant difference between the solid curve and the counterfactual. In this figure, death has a statistically significant positive impact on the amount received, which continues for the 18 months following the death.

Figure 5. The Evolution of Transfers, Credit and Assistance Following a Death[16]



[16] See note 15. In this figure, death has no statistically significant impact on the amount of private transfers received by resource-poor households (5a), whereas it increases the private transfers received by resource-rich households for up to 18 months (5d).

Figure 6. The Evolution of Transfers, Credit and Assistance Following a Death[17]



[17] See note 15.

Policy Research Working Paper Series

	Title	Author	Date	Contact for paper
WPS2493	Annuity Markets in Comparative Perspective: Do Consumers Get Their Money's Worth?	Estelle James Dimitri Vittas	November 2000	A. Yaptenco 31823
WPS2494	The Relevance of Index Funds for Pension Investment in Equities	Ajay Shah Kshama Fernandes	November 2000	A. Yaptenco 31823
WPS2495	The Australian Annuity Market	David M. Knox	November 2000	A. Yaptenco 31823
WPS2496	Perspectives on the Sources of Heterogeneity in Indian Industry	Somik V. Lall G. Chris Rodrigo	November 2000	R. Yazigi 37176
WPS2497	State Policies and Women's Autonomy in China, India, and the Republic of Korea, 1950–2000: Lessons from Contrasting Experiences	Monica Das Gupta Sunhwa Lee Patricia Uberoi Danning Wang Lihong Wang Xiaodan Zhang	November 2000	M. Das Gupta 31983
WPS2498	Sustaining Economic Welfare: Estimating Changes in Per Capita Wealth	Kirk Hamilton	November 2000	L. Rivera 82819
WPS2499	The Treatment of Non-Essential Inputs in a Cobb-Douglas Technology: An Application to Mexican Rural Household-Level Data	Isidro Soloaga	December 2000	L. Tabada 36896
WPS2500	Investigating Corruption	Canice Prendergast	December 2000	H. Sladovich 37698
WPS2501	Anti-Corruption Policies and Programs: A Framework for Evaluation	Jeff Huther Anwar Shah	December 2000	A. Santos 31675
WPS2502	Implications of the Currency Crisis for Exchange Rate Arrangements in Emerging East Asia	Masahiro Kawai Shigeru Akiyama	December 2000	A. Azarcon 36049
WPS2503	Proposed Strategy for a Regional Exchange Rate Arrangement in Post-Crisis East Asia	Masahiro Kawai Shinji Takagi	December 2000	A. Azarcon 36049
WPS2504	Social Capital and the Quality of Government: Evidence from the United States	Stephen Knack	December 2000	P. Sintim-Aboagye 38526

Policy Research Working Paper Series

	Title	Author	Date	Contact for paper
WPS2505	Family Altruism and Incentives	Roberta Gatti	December 2000	R. Bonfield 31248
WPS2506	Ethnicity and Wage Determination in Ghana	Abigail Barr Abena Oduro	December 2000	R. Bonfield 31248
WPS2507	Public Expenditures and Environmental Protection: When Is the Cost of Funds Irrelevant?	Gunnar S. Eskeland	December 2000	H. Sladovich 37698

1/16