DIW Berlin

German Institute
for Economic Research

Discussion Papers

611

Michael Grimm

Mortality and Survivors' Consumption

Berlin, July 2006

Opinions expressed in this paper are those of the author and do not necessarily reflect views of the institute.

IMPRESSUM

DIW Berlin
German Institute for Economic Research
Königin-Luise-Str. 5
14195 Berlin
Tel. +49 (30) 897 89-0
Fax +49 (30) 897 89-200
http://www.diw.de

ISSN print edition 1433-0210
ISSN electronic edition 1619-4535

Available for free downloading from the DIW Berlin website.

Mortality and survivors' consumption

Michael Grimm*
Department of Economics, University of Göttingen
DIAL Paris and DIW Berlin

Second draft: July 17, 2006

Abstract

In developing countries illness shocks can have a severe impact on household income. Few studies have so fare examined the effects of mortality. The major difference between illness and mortality shocks is that a death of a household member does not only induce direct costs such as medical and funeral costs and possibly a loss in income, but that also the number of consumption units in the household is reduced. Using data for Indonesia, I show that the economic costs related to the death of children and older persons seem to be fully compensated by the decrease of consumption units. In contrast, when prime-age adults die, survivors face additional costs and, in consequence, implement coping strategies. It is shown that these are quite efficient and it seems that in terms of consumption households even over-compensate their loss, although they may face a higher vulnerability in the longer term. The results suggest that the implementation of general formal safety nets can give priority to the insurance of other types of risks, such as unemployment, illness or natural disasters.

***JEL* Classification:** D12, I12, J12, O12.

Key words: Mortality, consumption smoothing, risk, micro-model of consumption growth, Indonesia.

*University of Göttingen, Department of Economics, Platz der Göttinger Sieben 3, 37073 Göttingen, Germany; Email: mgrimm@uni-goettingen.de.

I am very grateful for financial support for the research for this paper from the German Research Foundation (DFG). I also thank Philippe Bocquier, Denis Cogneau, Philippe de Vreyer Stephan Klasen, Rudolf Winter-Ebmer and Natalia Weißhaar as well as participants of the VfS workshop on Population Economics in Frankfurt/Oder and participants of the VfS conference on Development Economics in Berlin for very useful comments and suggestions. Nevertheless, any errors remain my own responsibility.

1 Introduction

To what extent shocks such as droughts, natural disasters, illness or mortality affect household income is an important topic in development economics. In most low and middle income countries only few people are covered by formal insurances against such shocks. Hence, it is important to know how households manage such risks ex-ante and cope with them once any harm has occurred. Private informal coping mechanisms can include measures such as drawing on savings, selling assets, increasing labor supply, reallocating expenditures, receiving transfers from relatives or other social support networks, and borrowing from local (mostly informal) credit markets.[1]

Decreasing life expectancy in countries strongly affected by the AIDS epidemic as well as rising health inequalities in transition countries raise the question how in particular illness and mortality affect household income, both in the short and in the long run. Illness of a household member generally involves two types of costs. First, costs of diagnosing and treating the illness, and, second, the possible loss in income associated with reduced labor supply and productivity of the ill person and of the persons providing care.

Empirical studies for developing countries suggest that the immediate impact of illness on household income is quite strong, but that in average households manage, except in case of severe illnesses, to compensate rather well the related costs. For instance, in an earlier study Pitt and Rosenzweig (1986) found only small effects of illnesses on farm profits in Indonesian farm households. They observed that households substituted reduced family labor by hiring labor from outside the household which allowed to maintain previous consumption levels. For Thailand, Townsend (1995) even found that the percentage of the year that an adult male is sick had no impact at all on household consumption. Kochar (1995) analyzed for the case of South India the effect of illness in the household in more detail. She found that illness to the male lowered wage income and increased informal borrowing during peak periods of agricultural cycles, but that there were no effects during slack periods and no effects of female illnesses. These results also suggest that families living in low-income countries are able to insure illness shocks fairly well. Lindelow and Wagstaff (2005) and Wagstaff (2005) emphasized based on studies on China and Vietnam that unearned income is one of the most important channels of the used informal insurance mechanisms.

Gertler and Gruber (2002) used an original Indonesian data set to consider also the intensity of illness shocks. They found that while families were able to fully insure minor illnesses, they were not able to insure illnesses that limited their ability to physically perform activities of daily living. They es-

[1] For a recent review on this topic, see Dercon (2005). See also the findings from a set of country case studies by Skoufias and Quisumbing (2003).

timated that families were only able to insure less than 40 percent of the income loss from severe illnesses. Dercon (2004) observed rural Ethopian households over time and also found that serious illness shocks had a significant negative impact on food consumption.

Only few studies have so fare examined the effects on household income related to mortality. The major difference between illness and mortality shocks is that a death of a household member does not only induce costs such as funeral costs and possibly losses in income, but that mortality reduces also the number of consumption units in the household. Therefore, whether the economic costs of household mortality are positive or negative depends on the balance between the funeral costs and the income loss on the one hand and the value of the basket formerly consumed by the deceased household member on the other hand. Accordingly the evidence in the literature is quite contrasting.

Beegle (2005) found for the region of Kagera in northwest Tanzania—a region strongly affected by the AIDS epidemic—only small and insignificant changes in labor supply of individuals in households having experienced a prime-age adult death. While some farm activities were temporarily scaled back and wage employment fell after a male death, households did neither shift cultivation towards subsistence food farming nor reduced their diversification over income sources. However Beegle did not identify the impact on household income related to prime-age adult mortality. Dercon and Krishnan (2000), estimated the effect of male and female adult mortality on the nutrition status (measured by the body-mass-index) of surviving household members in rural Ethiopia. They also found no significant effects of mortality. Mather, Donovan, Jayne *et al.* (2004) analyzed the effect of prime-age adult mortality on rural household outcomes such as crop production, farm and non-farm profits using a set of household surveys for Kenya, Malawi, Mozambique, Rwanda, and Zambia, however in most cases without a panel dimension in the data. They found that in almost all cases, although affected households may well have suffered negative effects on household crop production and income, the average affected household had similar ex-post land cultivated, total land area, and total income. In contrast, many studies found a huge impact of parental mortality on children's schooling (see e.g. Gertler, Levine and Ames, 2003; Yamano and Jayne, 2003; Yamauchi and Buthelezi, 2005) suggesting that some coping strategies might have severe negative inter-generational effects.

Major drawbacks of these studies are that they only focus on adult mortality and that they distinguish only insufficiently between the immediate impact, and the impact after coping strategies have been implemented. Moreover, these studies fail to explain how the rather small effects of mortality on household outcomes can be reconciled with the fact that households themselves see the death of a household member generally as a major economic shock and tend to report high financial costs related to that death.

I try to fill some of these gaps in the literature, using panel data from the Indonesian Family Life Survey (IFLS). A special feature of this data is that it contains besides rather objective measures of household income and consumption also information about the subjective perceptions of households regarding the economic impact of the death of a household member. Households were asked to estimate the approximate costs during the past five years which where necessary to overcome this shock. Interestingly, using this data one also finds on the one hand that households perceive a death of a household member as a very costly shock, but that on the other hand per capita growth of household consumption does not negatively but rather even positively react to the death of a household member.

The question is, how these two observations can be reconciled. Abstracting from measurement error as source for that discrepancy, one could argue that households only perceive the direct costs introduced by a death as the funeral costs or the loss of an income but that they do not account appropriately for the money which can be saved due to the fact that also the number of consumer units in the household decreased. It could also be that the surviving household members have the tendency to over-compensate the loss through their coping strategies. Hence, the short term or immediate impact could indeed be income decreasing, but the long term impact could be income increasing. Obviously, from a policy point of view, it is very important to distinguish these various cases and to find out if households economically suffer when household members die.

To answer this question I proceed as follows. In Section 2, I lay out the theoretical framework. In Section 3, I present the data. In Section 4, I exploit the information on the consequences of economic shocks provided by households in the IFLS. In Section 5, I estimate, also with the data from the IFLS, household consumption growth equations using various estimators controlling in each time for the occurrence of deaths by age, alternative shocks and various household characteristics. I also try to account for the possible endogeneity of deaths with respect to household consumption growth. In Section 6, I analyze the difference between the households' subjective perceptions and the results obtained by the growth regressions. In Section 7, I conclude and draw some policy implications.

2 Theoretical framework

As theoretical framework I use an intertemporal consumption model with income uncertainty (see e.g. Deaton, 1992; Sadoulet and de Janvry, 1995). It is assumed that each household h maximizes intertemporal expected utility u defined over per adult equivalent consumption of a single aggregate good c_h. Households are risk averse and have a planning horizon T. Each period t, household h earns a risky income $y_{h,t}$. The household has the possibility

in any period to save or borrow at an interest rate r and has access to a risk-free asset A_h.[2] It is assumed that the household starts with an endowment $A_{h,0}$ and that it is not allowed to be in debt in T. Abstracting from a possible bequest motive, assets $A_{h,T}$ will be equal to zero at the end of the household's life. With the time discount rate ι and interest rate r, household h's economic problem in t' is to choose the optimal level of consumption, and correspondingly of savings or borrowing $s_{h,t}$, that maximizes the expected utility:

$$\text{Max}\left[u(c_{h,t'}) + \sum_{t=t'+1}^{T} \frac{1}{(1+\iota)^{t-t'}} Eu(c_{h,t})\right], \tag{1}$$

subject to the constraints:

$$c_{h,t} = y_{h,t} - s_{h,t}, \tag{2}$$

$$A_{h,t} = (A_{h,t-1} + s_{h,t})(1+r), \tag{3}$$

$$A_{h,T} = 0, \tag{4}$$

where $A_{h,t}$ represents assets at the end of period t.

Like consumption, income $y_{h,t}$ is here also expressed in per adult equivalent units and given by:

$$y_{h,t} = \frac{\bar{w}_t l_{h,t}}{n_{h,t}}, \tag{5}$$

where $\bar{w}_t$ is the exogenous wage rate, $l_{h,t}$ the amount of family labor, and $n_{h,t}$ the number of adult equivalent units in the household. It is assumed that production and consumption decisions are separable.

With T large enough the household's maximization problem results in the standard permanent income result that the marginal utility of current consumption is equal to the discounted expected marginal utility of future consumption (Deaton, 1992):

$$u'(c_{h,t}) = \left(\frac{1+\iota}{1+r}\right) Eu'(c_{h,t+1}). \tag{6}$$

If in addition it is assumed that preferences are quadratic, separable across periods, and time invariant, and that the time discount rate is constant and equal to the interest rate, then changes in consumption from period to period depend only on unexpected changes in permanent income.

[2]These are strong assumptions in the context of Indonesia, but are not completely unrealistic given the existence of many local informal credit markets.

Fluctuations or transitory income variations should be smoothed (Deaton, 1992). Hence, consumption follows permanent income. Expected permanent income depends on the expected exogenous wage rate, the expected amount of family labor and the expected number of adult equivalent units in the household.

Unexpected changes in household size, for instance through premature mortality will affect the number of consumption units in the household $n_{h,t}$ and depending on age and activity status the amount of family labor $l_{h,t}$. Hence, permanent income is modified and households have to adjust their consumption path. The direct impact on permanent income of joining or leaving household members depends whether the individual is a net contributor to or a net consumer of household income per adult equivalent, i.e. to what extent the nominator and the denominator of Equation (5) change. More precisely, assuming that household size can increase with births $b_{h,t}$ and immigration $i_{h,t}$ into the household and decrease with emigration $e_{h,t}$ and deaths of household members $d_{h,t}$, it is straightforward to formulate the following hypotheses about the *direct* impact of these demographic changes on the expected utility:

$$\frac{\partial Eu(c_{h,t})}{\partial i_{i\epsilon h,t}} > 0, \quad \frac{\partial Eu(c_{h,t})}{\partial e_{i\epsilon h,t}} < 0, \quad \frac{\partial Eu(c_{h,t})}{\partial d_{i\epsilon h,t}} < 0$$

if individual i is a net contributor to household income (i.e. he or she earns more than he or she consumes) and

$$\frac{\partial Eu(c_{h,t})}{\partial i_{i\epsilon h,t}} < 0, \quad \frac{\partial Eu(c_{h,t})}{\partial b_{i\epsilon h,t}} < 0, \quad \frac{\partial Eu(c_{h,t})}{\partial e_{i\epsilon h,t}} > 0, \quad \frac{\partial Eu(c_{h,t}}{\partial d_{i\epsilon h,t}} > 0.$$

if individual i is a net consumer of household income (i.e. he or she earns less than he or she consumes).

However, it is very likely, that other household members will respond to such a shock and adopt strategies which match as closely as possible their desired consumption path. In what follows such actions are named 'the indirect impact'. If these strategies are effective, i.e. when the insurance mechanism is perfect, permanent income will not change. The shock would only present a transitory income variation and the household would remain on his optimal consumption path. In contrast, if permanent income changes, the insurance mechanism would be imperfect, which would also imply that separability would break down as production is affected by the desired pattern of consumption (Sadoulet and de Janvry, 1995).

In Section 5, I derive a reduced form of the structural model presented above, which can be used to test whether demographic shocks, and especially mortality, affect permanent income or if they represent only transitory shocks which are smoothed.

3 Data

To analyze empirically the questions raised in the previous sections, I use three waves of the Indonesian Family Life Survey (IFLS) conducted by RAND, the University of California Los Angeles and the University of Indonesia's Demographic Institute. The IFLS is an ongoing longitudinal socioeconomic and health survey. It is representative of 83% of the Indonesian population living in 13 of the nation's current 26 provinces. The first wave (IFLS1) was conducted in 1993 and covers 33,083 individuals living in 7,224 households. IFLS2 sought to re-interview the same respondents in 1997. Those who had moved were tracked to their new location and, where possible, interviewed there. A full 94.4% of IFLS1 households were located and re-interviewed, in that at least one person from the IFLS1 household was interviewed. This procedure added a total of 878 split-off households to the initial households. The entire IFLS2 cross-section comprises 33,945 individuals living in 7,619 households. The third wave, IFLS3, was conducted in 2000. It covered 6,800 IFLS1 households and 3,774 split-off households, totaling 43,649 individuals. In IFLS3, the re-contact rate was 95.3% of IFLS1 households. Hence, nearly 91% of IFLS1 households are complete panel households.[3]

The IFLS contains among other things detailed information on the sociodemographic structure of households, their employment, their expenditures, their self-consumed production, made and received transfers, and financial and material assets. In addition a community survey which was added in each round to the IFLS allows to link community characteristics including infrastructure to each household. To measure consumption I add expenditures for all food and non-food items including home-produced consumption, but excluding expenditures for durable consumption goods, which are considered as savings. For each year household consumption is expressed in 1993 prices and adjusted by regional price deflators to the Jakarta price level.

The unit of analysis is the household and consumption is expressed in per adult equivalent units. To account for age specific needs and economies of scale, I use the following equivalence scale, which is often used in poverty and welfare analysis:

$$\text{Adult equivalent consumption} = \frac{\text{Household consumption}}{(\text{Adults} + 0.5 \times \text{Children})^{0.9}}, \qquad (7)$$

where children are defined over the age group 0 to 15. As discussed for instance by Woolard and Klasen (2005), that scale gives relatively little weight to children and assumes relatively low economies of scale. But, in Indonesia large households have usually also many children, and, hence, both

[3]For details see Strauss, Beegle, Sikoki *et al.*, (2004).

parameters together imply considerable economies of scale. Given that in developing countries the budget share of food items, for which economies of scale are typically low, is very high especially in poor households that scale should result in an appropriate measure of household's consumption. However, obviously the exact form of such a scale is always debatable (see e.g. Deaton and Paxson, 1998a). Hence, the sensitivity of the results to some alternative scales will be examined.

It is possible to derive from the household roster births, immigration, emigration and deaths to the households including the dates when these events occurred. Regarding health status, the survey provides self-assessments. Moreover, the survey contains a specific section, where households were asked if they faced any economic shock or hardship during the past five years, such as a death of a household member, a natural disaster, a price shock or a drought. In 1993 households were also asked to enumerate the measures taken by the household to overcome this shock and to provide an estimate of the total costs involved. Whereas in 1997 only the occurrence of shocks was registered, in 2000 the survey asked households besides the measures undertaken also to declare separately in the case of a death the direct costs such as funeral costs as well as the costs which occurred through the loss of earnings if the deceased person was occupied. This 'subjective information' on the impact of a death of a household member will be compared with more objective and indirect information of changes in household consumption.

Without going into details of the Indonesia's recent social and economic development, it is important to remember that Indonesia was one of the hardest hit countries during the Asian financial crisis. The crisis started to be felt in the South-East Asia region in April 1997 and began to hit Indonesia in December 1997, just after IFLS2 was conducted. The sustained crisis period continued then in Indonesia more than a year. But in 2000, when IFLS3 was conducted, the population had returned roughly to its pre-crisis standard of living, with some people even a little better off (Strauss, Beegle, Dwijanto *et al.*, 2002). However, public health expenditure fell significantly during the crisis. In addition, the 1997/98 drought, which was a consequence of *El Niño*, and some serious forest fires caused serious health problems and a sharp drop in food production in some regions. Rukumnuaykit (2003) showed that the drought and smoke pollution had significant adverse effects on infant mortality in rural areas. However, Strauss *et al.* (2002) found that adult body-mass-indices did not worsen and that the fraction of preschool-aged children with very low heights for their age and gender even fell over the 1997-2000 period.

4 Households' perceptions of the impact of deaths

Table 1 describes how households perceived a death of a household member. Roughly 10% of all households knew one or several deaths in their household during the five years preceding the survey. In 1993 the median costs reported by households to overcome a death of a household member during these five years is more than 260 thousand Ruphias (in prices of 1993), this corresponds to roughly 36% of the median of yearly household consumption per adult equivalent. In the year 2000, regarding the medical and funeral costs involved, the median household among those affected by a death declared to have spent 325 thousand Rupiah, which corresponds to approximately 33% of the median of yearly household consumption per adult equivalent in that year. Roughly 55% of the deceased household members did not have a monthly income, but among the 45% who had the median loss in earned income corresponded according to the households' declarations to almost 1.5 million Rupiah, which is almost one and a halve times the median of yearly household consumption per adult equivalent. In sum, the information provided in this section suggests that households perceive a death of a household member as a substantial reduction in their disposable income. As Figure 1 shows, to cope with that shock almost 40% of all households declared to have received assistance or transfers from other households. In addition almost a quarter of all households took loans, sold assets and used savings. 12% of all households in 1993 and 21% in 2000 declared to have increased labor supply.

[insert Table 1 and Figure 1 here]

Households were not asked directly to what extent these measures were effective in compensating the costs induced by the death, but given the low percentage of households having declared to have reduced expenditures—5% in 1993 and 13% in 2000—it is possible that households are on average quite effective in coping with such shocks. This will be analyzed in detail in next section using household consumption level and growth regressions.

5 The impact of mortality on household consumption growth

5.1 The econometric model

Based on the structural model presented in Section 2, I derive now a reduced form model of the problem allowing to test whether demographic change, and in particular mortality, affects household consumption per adult equivalent or if such shocks are smoothed.

First, I estimate a panel fixed effects (FE) model of the level of consumption on variables of demographic change and a set of control variables:

$$\ln c_{h,t} = \alpha_h + \delta X_{h,t} +$$

$$+\kappa b_{h,t} + \sum_j \lambda_j i_{j,h,t} + \sum_j \mu_j d_{j,h,t} + \sum_j \nu_j e_{j,h,t} + \zeta S_{h,t} + \tau T_t + \varepsilon_{h,t}, \quad (8)$$

$$\text{with} \quad j = 1, \ldots, a^{\max}.$$

The fixed effect α_h captures all the household-specific time-invariant effects. The demographic shocks are included using dummy variables for births ($b_{h,t}$), immigration ($i_{j,h,t}$), deaths ($d_{j,h,t}$) and emigration ($e_{j,h,t}$) of individuals of age j occurring in household h between $t-1$ and t. The vector $S_{h,t}$ controls for the occurrence of other (self-reported) household specific economic shocks, such as whether the household was affected between $t-1$ and t by a crop loss due to bad climatic conditions, by a natural disaster, by unemployment of a household member, or by a significant price decrease of goods it produces and sells. The vector $X_{h,t}$ contains a set of additional control variables such as age and age squared of the household head The period dummy T_t takes the value zero for the period 1993 to 1997 and one for the period 1997 to 2000. The term $\varepsilon_{h,t}$ stands for the household specific error term with mean zero.

In such a setting it is very likely that the household fixed effects are correlated with the other included regressors, and hence the FE model should be preferred to a random-effects formulation (RE). A Hausman specification test confirms that assumption.

When estimating Equation (9) and finding that $\mu_j = 0$ then the data would suggest that households are perfectly insured, because survivors' consumption does not respond to the death of a household member of age j, i.e. the risk is fully shared through market or non-market institutions. In contrast, if $\mu_j < 0$ households face an imperfect insurance and lose, and, conversely, if $\mu_j > 0$ the direct effect of mortality is positive or the insurance system of households over-compensates the negative effects due to the death of a household member of age j.

Alternatively to the FE or 'Within' estimator in Equation (9), one can also use a first difference estimator (FD):

$$\Delta \ln c_{h,t} = \delta \Delta X_{h,t} +$$

$$+\kappa \Delta b_{h,t} + \sum_j \lambda_j \Delta i_{j,h,t} + \sum_j \mu_j \Delta d_{j,h,t} + \sum_j \nu_j \Delta e_{j,h,t} + \zeta \Delta S_{h,t} + \varepsilon_h. \quad (9)$$

However, given that only two periods are analyzed (1993-1997 and 1997-2000), the results of the FE and FD estimator are equivalent, and, hence, only FE will be reported.

Next, I formulate a model, where I regress instead of the levels of consumption the average annual growth rates of consumption on the demographic change variables. In such a model of household consumption growth, it makes sense to condition on the level of consumption at the beginning of the period to account for possible conditional convergence. The remaining regressors then measure only the effect of new information. That model reads:

$$\dot{c}_{h,t} = \alpha_h + \beta \ln c_{h,t-1} + \delta X_{h,t} +$$

$$+\kappa b_{h,t} + \sum_j \lambda_j i_{j,h,t} + \sum_j \mu_j d_{j,h,t} + \sum_j \nu_j e_{j,h,t} + \zeta S_{h,t} + \tau T_t + \varepsilon_{h,t}. \quad (10)$$

Obviously, the inclusion of lagged consumption as a regressor may present econometric problems, because there might be persistent unobserved characteristics that influence growth over time, hence the error term is correlated with $\ln c_{h,t-1}$. Then the coefficient of the lagged dependent variable is biased and so are the coefficients of the other correlated explanatory variables in Equation (10).

A partial solution can be to instrument lagged consumption in the FE model, but in principle generalized method-of-moments estimator (GMM) should be used in this case (Arellano and Bond, 1991). However, GMM implies to instrument initial consumption by lagged levels or differences. Given that only three waves of data, i.e. two growth rates, are available, GMM cannot appropriately used. Hence, I rely on the partial solution and use an instrumental variable approach (IV). As instruments I use the logarithm of mean household consumption per adult equivalent in the community, gender and the education level of the household head and a dummy variable for urban residence of the household. Tests show that the instruments are relevant and exogenous, i.e. they significantly affect initial consumption while in a regression with initial consumption and the other exogenous regressors, they have no significant impact on the growth rate. However, a Hausman test does not reject exogeneity of initial consumption in the growth regression, and, hence it can be assumed that the obtained results are in any case quite robust.

Another econometric problem stems from the fact, that household mortality might also be endogenous with respect to the growth rate of household consumption.[4] For instance, a sharp drop in household consumption

[4]Obviously, this applies also to the other included demographic shocks e, b and i, but given the focus on household mortality, the issue will not be addressed for these other variables.

per capita might hinder a household to prevent the death of an ill household member through appropriate health investments. Or, conversely, the household sells assets to increases nutrition and medical expenditures and just prevents by this measure the death of an ill member. To address this problem I also try to instrument household mortality. As instruments I use whether the household head is male and the crude death rate in the community. The crude death rate is computed over the sample population and is therefore certainly only a rough measure of community specific mortality conditions. A better measure would be age-specific mortality rates computed via regional census data. However, these statistics were not available.

Alternatively, I use survey information on self-assessed health as an instrument. Adults had to declare whether they feel 'very healthy', 'somewhat healthy', 'somewhat unhealthy' or 'unhealthy'. I assume that adults who died between $t-1$ and t and who declared themselves 'very healthy' or 'somewhat healthy' in $t-1$ died through an exogenous cause. Obviously, this is not a perfect measure, because some empirical studies suggest that self-assessed health depends itself on income (see e.g. Crossley and Kennedy, 2000). However, Deaton and Paxson (1998b) argue that such measures predict very well subsequent mortality (even after controlling for objective measures of health status). Another problem might be that accidents are also not completely exogenous to income. Poor people might be more exposed to natural disaster, traffic accidents or physical violence.

Table 2 presents some descriptive statistics of the dependent and explanatory variables used for estimation.

[insert Table 2 here]

5.2 Estimation results

Table 3 shows the results of the level and growth regressions. As mentioned above, the usual Hausman specification tests show that FE should indeed be used instead of RE. The test statistics also show that the hypothesis that all household fixed effects are zero can be comfortably rejected. The IV approach suggests a slightly slower convergence than the model without instrumentation, but again the econometric tests indicate that exogeneity of initial consumption cannot be rejected (see note of Table 3).

Four types of deaths are distinguished: the death of a child (0-14 years old), the death of an adult man (15-59), the death of an adult woman (15-59), and the death of an elderly person (60 years and older). The related coefficients in the three models differ not in their signs, but as one can expect in their magnitude. In the level regression the coefficients associated with demographic change inform about the percentage change in levels, in the growth regressions the coefficients inform about the percentage point change in growth rates. Surprisingly, in all specifications all types of deaths, except

that of an adult woman, have a significant positive effect on consumption. In the growth regressions, the occurrence of a death of a child increases the annual growth rate of household consumption per capita by roughly seven to eight percentage points. The death of an elderly person is associated with an increase by roughly five percentage points. And even the death of an adult man increases the growth rate by about six percentage points. These effects may appear very large. But, for instance, if in a four-person household an inactive person dies, then the *direct* effect of that death would be to increase consumption per survivor by 33 percent, which is about seven times the median growth rate in the sample.

[insert Table 3 here]

Emigration of household members has a similar effect—in direction and magnitude—on household consumption. All coefficients are significantly positive and different from zero. The highest effect is related to the emigration of an older household member and the lowest to the emigration of a child. Births and immigration, i.e. the increase of the number of household members, has a negative effect. The birth of child reduces on average the annual growth rate of household consumption per capita by roughly three percentage points, which is a bit less than the median growth rate in the sample. The effect of an immigrating older person is slightly lower and those associated with the immigration of male and female adults are slightly higher.

All these results are robust with respect to a wide range of equivalence scales. For instance using simply consumption per capita as measure yields very similar results. Regarding mortality the coefficients related to children and older persons are a bit higher those related to male and female adults a bit lower. Assuming very high economies of scale, i.e. a scale parameter of 0.5, the coefficients related to mortality shrink a bit, but remain positive and significantly different from zero. In this case only the coefficients related to immigration are not anymore significant.

Hence, the estimated parameters for the demographic shocks suggest that generally an additional member consumes more than it earns. This seems plausible for a newborn, a child or an older retired person, but surprises for an adult in age of activity.[5] Some of the individuals in age of activity who died, may have known a period of illness and thus inactivity

[5]Woolard and Klasen (2005), found—at least partially—similar evidence for the case of South-Africa. They considered the change in the share of children, female and male adults in household income and consumption growth regressions. An increasing share of children had a positive effect when income growth was explained, but an insignificant effect when consumption growth was explained. An increase of the share of female and male adults had a positive or insignificant effect—depending on the period—on income growth, and an insignificant effect on consumption growth (except for female adults in one of both periods examined).

before their death, and hence their disappearance may imply an economic relief for these households. Given the data structure, it is not possible to identify the exact activity status the month preceding the death. But it is possible to compare the activity status of deceased and survivors for various female and male age groups in the preceding survey year. Table 4 shows that for all groups, except for young men in the first period, the activity rates are higher for survivors than for the deceased. Particularly important is the difference for women between 45 and 59 years old, and persons older than 60 years. The lower activity rates of the deceased might be due to illness preceding the death. This would suggest that the true economic shock for the household is illness, because it reduces labor market participation and causes medical expenditures, but later mortality brings economic relief. However, if adult deaths are classified according to their activity status at the survey date, and the same regressions as in Table 3 are performed, the related coefficients come still out as positive and significantly different from zero, for both active and inactive adults.

[insert Table 4 here]

In this context it is also interesting to ask, whether especially in farm households labor is so abundant, that the marginal productivity of each household member is so small, that the disappearance of a household member is not associated with a significant loss in income, and, hence consumption. However, introducing an interaction effect of 'mortality' and 'being a farm-household' comes not out as significant when the regressions of Table 3 are re-estimated, suggesting that mortality has not a different effect whether it occurs in farm or non-farm households.

Klasen and Woolard (2000) showed for the case of South-Africa that household formation, including immigration into and emigration from households is largely determined by access to resources. For instance getting married and leaving the household necessitates having a job. Conversely, schooling and unemployment forces persons, in absence of any social security benefits, to stay or to return to a household where at least some persons are active. The IFLS data contains some information about the motivation of joining and leaving household members. Emigration by male adults is mainly motivated by having found or looking for work (table not presented). For women marriage and following the spouse or parents is more important, but work plays still a significant role. In contrast immigration is first of all, for both men and women, motivated by other and especially familial considerations. Hence, these findings are in line with those of Klasen and Woolard (2000) and are consistent with the estimated coefficients related to emigration and immigration in Table 3.

In sum, even if the presented statistics suggest that in many cases losing or gaining a new household member is directly linked to more or less

resources per capita respectively, all results together also imply that surviving household members are very efficient in coping with demographic, and especially mortality shocks. In this respect it is interesting to check whether the effect of a death on household consumption depends on the time which elapsed since the death. These hypotheses are examined in next section, but before it is worth to discuss the coefficients of some other included control variables in Table 3 and to check if the results hold if the endogeneity of household mortality is taken into account.

The effects of other shocks by which households were possibly affected are in most cases not significantly different from zero. This might be due to the fact that these shocks occur not very frequently (see Table 2) or that these things are badly measured in the survey, or it might again suggest that households, at least on average, are very efficient in coping with such shocks.

As discussed above, household mortality might be endogenous with respect to growth of household consumption. To take this endogeneity into account, household mortality is instrumented and the fixed effects model is re-estimated. To limit the variables which have to be instrumented, only a dummy variable indicating whether the household knew at least one death during the past period is considered. Table 5 shows that the positive effect of mortality on household income holds when the possible endogeneity is taken into account. However, a Sargan test of overidentifying restrictions shows that the instruments are only hardly valid, and hence the result should be taken with caution (see note of Table 5).

[insert Table 5 here]

Another mean to test if endogeneity might be a problem is to look at death events which can be assumed to be exogenous to household income, like deaths resulting from accidents. As discussed above, an acceptable proxy of such deaths might be to pick up those which concerned adults who declared themselves at the beginning of the period as to be 'healthy' or 'somewhat healthy' (vs. 'somewhat unhealthy' and 'unhealthy'). Table 6 shows that there is no systematic difference regarding the impact of 'accidental' deaths and other deaths. The positive impact of deceased adult men on survivors' consumption still holds.[6] The impact of deceased adult women is not significant, for both 'accidents' and other causes.

[insert Table 6 here]

To sum up, the consumption growth regressions clearly suggest that mortality has a rather positive and not negative impact on the consumption level of survivors. This may either imply that households report in their

[6]May be because accidents are, as mentioned above, not completely exogenous.

self-assessment the direct and immediate impact of mortality which consists essentially in medical costs preceding the death, funeral costs and a possible income loss and they disregard the reduction in consumer units. Or it could imply that the 'gross costs' are indeed high, but that households take not into account in their self-assessment the efficiency of their coping strategies, such as higher labor supply, the sale of assets and disaving or the reception of informal transfers from relatives and friends outside the household. Both possibilities are examined in more detail in next section.

6 Reconciling households' perceptions with the results from growth regressions

To check whether households' perceptions rely essentially on the short term and direct impact, I re-estimate the fixed-effects model and include interaction effects between the mortality dummies and the number of months which have elapsed between the beginning of the period and the most recent death event within the household in that period. If the direct impact is negative due to funeral costs and possibly an immediate loss of income and the medium-term effect is positive due to less consumers in the household and/or efficient coping mechanisms, the interaction term should have a negative sign; the closer the death to the end of the period, the heavier household income per capita should be affected by the direct costs. The results in Table 7 show that the interaction effects are never significant whether deaths are considered in general or deaths are separated by age groups.[7]

[insert Table 7 here]

Next, I investigate to what extent survivors react to household mortality. Two types of reactions are considered in detail: the sale of assets (or disaving) and higher labor supply.

Whether households insure themselves against the death of a breadwinner by building up assets in good years, which they deplete in bad years is investigated by regressing growth of household wealth on the mortality dummies, initial wealth and the same control variables than those used in the consumption growth regressions. Wealth is evaluated at its current value using the households' self-assessments and deflated to 1993 (Jakarta) Rupiahs. It includes farm and non-farm land (used for business or not), houses and buildings (used for business or not), vehicles (used for business or not), livestock, hard stem plants, heavy and small farm and other business equipment, household appliances, jewelry, financial savings and receivables. Table 8 shows that whereas a death of a child and an older person have no significant impact on changes in wealth over time, a death of an adult has a

[7] This was also the case if duration entered the interaction effect with a quadratic term.

significant negative impact on household wealth, suggesting that survivors try to cope with the death of an adult household member by depleting assets to finance current consumption. The estimations imply depending on the model used a reduction of the annual growth rate of household wealth by approximately five to seven percentage points. If this effect is compared to that of adult mortality on consumption growth—both evaluated for the median household—the regression results suggest that a death of an adult man implies 120 thousand Rupiahs less wealth per adult equivalent and year and 55 thousand Rupiahs higher consumption per adult equivalent and year. Hence, households seem indeed to deplete assets to cover the direct costs involved with a death, but in doing so rather over-compensate the total loss. Again, it is interesting to find that such a wealth effect is not observed for the death of children and older persons. For them, the direct medical and funeral costs seem to be completely compensated by the decrease in consumer units.

[insert Table 8 here]

The second coping strategy which is considered is labor supply. Table 9 shows the estimated parameters of two probit models which describe the association between mortality and the propensity of individuals (older than 15 years) to work and earn an income in the year 2000, controlling for other shocks, sex, age, age squared, education, household size, the position in the household and urban/rural residence. The first model is estimated on those individuals active in 1993 and the second on those individuals inactive in 1993. Household mortality is measured with one dummy variable taking the value one if the individual has known in her/his household at least one death during the period 1993 and 2000. An analysis for the sub-periods 1993 to 1997 and 1997 to 2000 cannot be done, because the detailed employment information of the IFLS2 is not available, and therefore no consistent variable for labor market status in 1993, 1997 and 2000 can be constructed. The first model shows clearly that household mortality increases the propensity of individuals to work. If an individual is confronted with a death within her/his household the probability of a survivor to work increases by 1.9 percent if the individual was already active in 1993 and by 6.1 percent if the individual was inactive in 1993 (both marginal probabilities evaluated at the sample mean). These orders of magnitude are obviously rather low, but they possibly would have been come out higher, if it had been possible to estimate the probit models also by sub-periods and, hence, to capture the labor supply effect directly after the death event. Interestingly, most of the other economic shocks are also associated with higher labor supply. In contrast, immigration of new persons into the household is associated with lower labor supply. These results are in line with evidence provided by Yamauchi and Buthelezi (2005) who showed using South-African data that

the death of working prime-age adult household members increases labor supply among older boys. For the case of South India, Kochar (1995) also found increased labor supply as the key response to adult mortality.

[insert Table 9 here]

A third possibility of survivors to cope with household mortality is to rely on transfers from other households. Unfortunately, transfers have not been asked in a consistent way over the three surveys and it seems that they are strongly affected by measurement error. Even when concentrating only on those transfers received by the household head and the spouse from their parents, siblings and children outside the household, it was not possible to identify any significant effect of household mortality, neither when the amount of transfers is considered nor when simply the fact that they received transfers is considered. In general it was very difficult to explain any variation in transfers. The only variables which had really some explanatory power were regional dummies, suggesting that transfers occur in particular in specific regions. However, between 60 percent and 75 percent of all households declared to have received transfers from family members outside the household.

Finally, I tested whether mortality has any significant impact on children's school enrollment. Again I used a probit model to estimate school enrolment in t conditional on enrolment status in $t-1$, but restricted the sample in each case to children who given their age and initial educational achievement should indeed have been enrolled in t. However, I did not find any significant impact of mortality on school enrollment.

7 Conclusion

The results from this study suggest that the effect of mortality on survivors' consumption strongly depends whether a child, an older person or a prime-age adult person dies, i.e. what seems to matter is what happens to the households' dependency ratio. The economic costs related to the death of children and older persons like medical expenses preceding the death and funeral cost seem to be fully compensated by the decrease of consumption units in the household. In contrast, when prime-age adults die, survivors face additional costs due to the loss of income earned by the deceased household member and, hence, they have to implement appropriate coping strategies. Two of them have been analyzed in detail: the depletion of assets and higher labor supply. Both are shown to respond positively to adult mortality. For instance, the estimations suggest that the death of an adult household member implies on average during the three to five years following the death a reduction of household wealth per adult equivalent by 120 thousand Rupiahs per year and an increase of consumption per adult equivalent by 55 thousand

Rupiahs per year. This suggests that survivors perceive, when asked about the economic impact of a death, first of all the direct impact of mortality and disregard the efficiency of their coping strategies and the reduction of consumer units in the household, which is related to that death.

While a death of a household member is without doubt tragic and costly in its own right, it is interesting to find, that on average survivors even over-compensate the economic costs induced by mortality and are, in terms of consumption per adult equivalent obviously better off than before. It is interesting to note that the results of this study are in line with another study on Indonesia, where on a higher aggregation level, it is shown that mortality modifies only slightly poverty and inequality measures over time (see Cogneau and Grimm, 2004). However, the depletion of assets to smooth consumption, may involve lower consumption and higher deprivation and vulnerability in the longer term. If productive assets are sold it might be difficult for a household to generate a constant stream of income in the future. Selling durable consumption goods like a radio may help to maintain consumption of non-durable goods constant but may lower utility through the deprivation in other domains. It may also lower the ability to face future shocks. In the underlying theoretical model of this paper, assets entered not directly the utility function, hence, this possibility was excluded.

The ability of households to cope rather well with mortality shocks suggests that the implementation of general formal safety nets which are widely absent in Indonesia—as in most developing countries—can give priority to the insurance of other types of risks, such as unemployment, illness or natural disasters. This has to be examined in detail. However, it should also be noted, that obviously the regression results inform only about the average impact. Hence, specific groups, which are less protected through informal insurance mechanisms, for example due to a low asset base, low human capital and few income diversification possibilities, might more suffer under mortality shocks.

The finding that Indonesian households are quite efficient in coping with economic shocks has also be shown by other studies. For instance, Thomas, Smith, Beegle *et al.* (2002) found that Indonesian households following the financial crisis in 1997/98 adopted strategies to mitigate the effects of the crisis, which appear to have been most successful at least for those at the top of the income distribution. Frankenberg, Smith and Thomas (2003), report that "a wide array of mechanisms were adopted in response to the financial crisis. Households combined to more fully exploit benefits of scale economies in consumption. Labor supply increased even as real wages collapsed. Households reduced spending on semi-durables while maintaining expenditures on foods. Rural households used wealth, particularly gold, to smooth consumption." Cameron and Worswick (2003), showed that rural Indonesian households compensated successfully income losses from crop loss through higher labor supply avoiding to reduce consumption expenditure.

They also showed that household members did not need to increase their total hours of work as the crop losses appear to reduced the value of their time in household farming allowing them to take on extra jobs. However, despite these strategies for managing and coping with risk, vulnerability to consumption shortfalls remains high in developing countries and further development of safety nets is therefore necessary. The study of Gertler, Levine and Ames, (2003) also showed that in some Indonesian households coping with shocks implied to withdraw children from school, which may have substantial costs in the long run, by shifting the burden to the next generation.

References

Arellano M. and S. Bond (1991), Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *Review of Economic Studies*, 58: 277-297.

Beegle K. (2005), Labor Effects of Adult Mortality in Tanzanian Households. *Economic Development and Cultural Change*, 53 (3).

Cameron L. and C. Worswick (2003), The Labor Market as a Smoothing Device: Labor Supply Responses to Crop Loss in Indonesia. *Review of Development Economics*, 7 (2): 327-341.

Cogneau D. and M. Grimm (2004), The Measurement of Income Distribution Dynamics when Demographics are correlated with Income. DIAL Working Paper DT/2004/12, DIAL, Paris.

Crossley T.F. and S. Kennedy (2000), The Stability of self-assessed Health Status. SEDAP Research Paper No. 26, McMaster University, Hamilton, Ontario, Canada.

Deaton A. (1992), *Understanding Consumption.* Oxford: Oxford University Press.

Deaton A. and C. Paxson (1998a), Economies of Scale, Household Size, and the Demand for Food. *Journal of Political Economy*, 106 (5): 897-930.

Deaton A. and C.H. Paxson (1998b), Ageing and Inequality in Income and Health. *American Economic Review*, 88 (2): 248-253.

Dercon S. (2004), Growth and Shocks: Evidence from rural Ethopia. *Journal of Development Economics*, 74 (2), 309-329.

Dercon S. (2005), Risk, Insurance, and Poverty: A Review. In S. Dercon, *Insurance Against Poverty* (pp. 9-37), Oxford: Oxford University Press.

Dercon S. and P. Krishnan (2000), In Sickness and in Health: Risk Sharing within Households in Rural Ethopia. *Journal of Political Economy*, 108 (4): 688-727.

Frankenberg E., J.P. Smith and T. Duncan (2003), Economic Shocks, Wealth and Welfare. California Center for Population Research Working Paper No. ccpr-009-03, University of California, Los Angeles.

Gertler P. and J. Gruber (2002), Insuring Consumption against Illness. *American Economic Review*, 92 (1): 51-70.

Gertler P., D. Levine and M. Ames (2003), Schooling and Parental Death. Center for International and Development Economics Research Working Paper No. C03-128, Department of Agricultural and Resource Economics, University of California, Berkeley.

Klasen S. and I. Woolard (2000), Surviving Unemployment without State Support: Unemployment and Household Formation in South-Africa. IZA Discussion Paper No. 237, IZA, Bonn.

Kochar A. (1995), Explaining Household Vulnerability to Idiosyncratic Income Shocks. *American Economic Review*, 85 (2): 159-164.

Lindelow M. and A. Wagstaff (2005), Health Shocks in China: Are the Poor and Uninsured less Protected? World Bank Policy Research Working Paper No. 3740, World Bank, Washington D.C.

Mather D., C. Donovan, T.S. Jayne, M. Weber, E. Mazhangara, L. Bailey, K. Yoo, T. Yamano and E. Mghenyi (2004), A Cross-country Analysis of Household Responses to Adult Mortality in Rural Sub-Saharan Africa: Implications for HIV/AIDS Mitigation and Rural Development Policies. MSU International Development Working Papers No. 82, Michigan State University, East Lansing, Michigan.

Pitt M. and M.R. Rosenzweig (1986), Agricultural prices, food consumption and the health and the productivity of Indonesian farmers'. In I. Singh, L. Squire and J. Strauss (eds.), *Agricultural household models: Extensions, applications and policy*, Baltimore: Johns Hopkins University Press.

Rukumnuaykit P. (2003), Crises and Child Health Outcomes: The Impacts of Economic and Drought/Smoke Crises on Infant Mortality and Birthweight in Indonesia. Mimeo, Michigan State University, East Lansing, Michigan.

Sadoulet E. and A. de Janvry (1995), *Quantitative Development Policy Analysis.* Baltimore: Johns Hopkins University Press.

Skoufias E. and A.R. Quisumbing (2003), Consumption Insurance and Vulnerability to Poverty: A Synthesis of the Evidence from Bangladesh, Ethiopia, Mali, Mexico and Russia. Paper presented at the conference 'Staying Poor: Chronic Poverty and Development Policy', University of Manchester, 7 to 9 April 2003.

Strauss J., K. Beegle, A. Dwiyanto, Y. Herawati, D. Pattinasarany, E. Satriawan, B. Sikoki, B. Sukamdi and F. Witoelar (2002), Indonesian living standards three years after the crisis: evidence from the Indonesia Family Life Survey, Executive Summary, RAND Corporation.

Strauss J., K. Beegle, B. Sikoki, A. Dwiyanto, Y. Herwati and F. Witoelar (2004), The Third Wave of the Indonesia Family Life Survey (IFLS3): Overview and Field Report. WR-144/1-NIA/NCHID, RAND Corporation.

Thomas D., J.P. Smith, K. Beegle, G. Teruel and E. Frankenberg (2002), Wages, employment and economic shocks: Evidence from Indonesia. *Journal of Population Economics*, 15 (1): 161-193.

Townsend R.M. (1995), Consumption Insurance: An Evaluation of Risk-Bearing Systems in Low-Income Economies. *Journal of Economic Perspectives*, 9 (3): 83-102.

Wagstaff A. (2005), The Economic Consequences of Health Shocks. World Bank Policy Research Working Paper No. 3644, World Bank, Washington D.C.

Woolard I. and S. Klasen (2005), Determinants of Income Mobility and Household Poverty Dynamics in South Africa. *Journal of Development Studies*, 41 (5): 865-897.

Yamano T. and T.S. Jayne (2005), Working-Age Adult Mortality and Primary School Attendance in Rural Kenya. *Economic Development and Cultural Change*, 53 (3).

Yamauchi F. and T. Buthelezi (2005), Impact of Prime-age Adult Mortality on Labor Supply and Schooling Decisions. Evidence from South-Africa, Mimeo, International Food Policy Research Institute, Washington D.C.

Tables and Figures

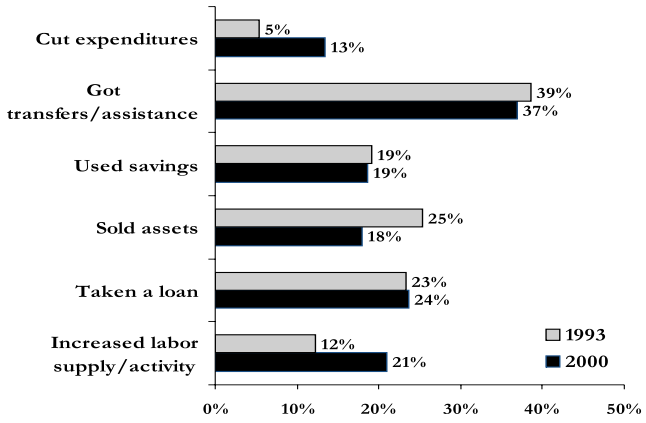
Table 1
Occurrence of deaths and related costs

	1993	1997	2000
Share of HH having known a death within the past 5 years	0.10	0.10	0.09
Median cost to overcome the death within past 5 years[a,b,c]	263.7		
In relation to yearly median consumption per adult equiv.	0.36		
Median cost of medical and funeral[a,c,d]			325.1
In relation to yearly median consumption per adult equiv.			0.33
Median yearly income of the deceased [a,c,d]			0
Median yearly income of the deceased (if occupied)[a,c,d,e]			1509.7
In relation to yearly median consumption per adult equiv.			1.56

Notes: [a] Not available in 1997 (IFLS 2). [b] Not available in 2000 (IFLS 3). [c] In thousands of real Rupiah (1993, Jakarta). [d] Not available in 1993 (IFLS 1). [e] 45% percent of all declared deaths in this section of the survey concerned household members with an income.

Source: IFLS1, IFLS2 and IFLS3; computations by the author.

Figure 1
Measures taken to overcome a death
(Multiple answers possible)



Source : IFLS1, IFLS3 (data not available in IFLS2); computations by the author.

Table 2
Description of the sample used

	1993/1997		1997/2000	
	Mean	S.D.	Mean	S.D.
Household head male	0.850		0.828	
Age of hh head	45.7	14.0	48.8	13.7
HH head no education	0.194		0.177	
HH head primary education	0.508		0.517	
HH head secondary ed. and more	0.298		0.306	
Household size	4.7	2.1	4.6	2.0
Share young (0-15) in hh	0.307		0.279	
Share older (60 and older) in hh	0.109		0.131	
Urban residence	0.456		0.452	
Death of a child	0.010		0.007	
Death of an adult man	0.025		0.018	
Death of an adult woman	0.016		0.014	
Death of an older person	0.057		0.055	
Emigr. of a child	0.136		0.131	
Emigr. of an adult man	0.214		0.200	
Emigr. of an adult woman	0.197		0.205	
Emigr. of an older person	0.008		0.017	
Birth	0.276		0.193	
Immigr. of a child	0.091		0.079	
Immigr. of an adult man	0.112		0.142	
Immigr. of an adult woman	0.110		0.124	
Immigr. of an older person	0.022		0.020	
Crop loss (hh level)	0.112		0.097	
Natural disaster (hh level)	0.018		0.012	
Unemployment (hh level)	0.036		0.035	
Price shock (hh level)	0.078		0.040	
Annual growth of real monthly hh cons. p.a.e.	0.090	0.197	0.031	0.230
Yearly hh cons. p.a.e. (in 1000 rupiahs)	1254	3793	1398	1499
Annual growth of real hh wealth	0.111	0.325	0.021	0.342
Real hh wealth (in 1000 rupiahs)	31500	155000	27900	84200
n	6303		6303	

Notes: Stocks are measured at the beginning of the period.

Source: IFLS1, IFLS2 and IFLS3; compuations by the author.

Table 3
Level and growth regressions of household consumption per adult equivalent

	FE reg (level)			FE reg (growth rate)			FE IV reg (growth rate)		
	Coeff.		S.E.	Coeff.		S.E.	Coeff.		S.E.
ln Consumption / IV				-0.389	***	0.004	-0.359	***	0.019
Death of a child	0.170	***	0.063	0.065	***	0.021	0.067	***	0.022
Death of an adult man	0.083	**	0.039	0.062	***	0.013	0.062	***	0.013
Death of an adult woman	-0.023		0.046	0.013		0.016	0.012		0.016
Death of an older person	0.084	***	0.025	0.053	***	0.009	0.053	***	0.009
Emigr. of a child	0.038	***	0.018	0.032	***	0.007	0.032	***	0.007
Emigr. of an adult man	0.073	***	0.015	0.045	***	0.006	0.045	***	0.006
Emigr. of an adult woman	0.055	***	0.016	0.040	***	0.006	0.040	***	0.006
Emigr. of an older person	0.128	**	0.051	0.066	***	0.017	0.067	***	0.017
Birth	-0.062	***	0.015	-0.030	***	0.005	-0.031	***	0.005
Immigr. of a child	-0.062	***	0.022	-0.035	***	0.008	-0.035	***	0.008
Immigr. of an adult man	-0.066	***	0.018	-0.036	***	0.006	-0.036	***	0.006
Immigr. of an adult woman	-0.039	**	0.019	-0.027	***	0.007	-0.027	***	0.007
Immigr. of an older person	-0.105	***	0.040	-0.046	***	0.014	-0.046	***	0.014
Crop loss (hh level)	-0.016		0.021	-0.002		0.007	-0.003		0.007
Natural disaster (hh level)	0.068		0.048	0.020		0.016	0.021		0.016
Unemployment (hh level)	-0.025		0.032	0.004		0.011	0.003		0.011
Price shock (hh level)	0.046	*	0.025	0.008		0.008	0.009		0.009
1997-2000 dummy	-0.027	***	0.008	0.051	***	0.003	0.042	***	0.006
Constant	11.502	***	0.128	4.628	***	0.060	4.291	***	0.218
ρ (fraction of var due to α_h)	0.659			0.726			0.693		
H0: all α_h=0 (P > F)	0			0			0.006		
H0: RE efficient, FE not (P > χ^2)	0			0			0		
Adj. R^2	0.027			0.254			0.256		
n	12606			12606			12606		

Table notes and source, please see next page.

Notes: $*$ significant at the ten percent level. $**$ significant at the five percent level. $***$ significant at the one percent level. Other included control variables in the level regression are age and age squared of the household head. The growth regressions include in addition household size and the share of young (0-15 years old) and older (60 years and older) household members. In the IV regression household consumption per adult equivalent is instrumented using the logarithm of mean household consumption per adult equivalent in the community, gender and the education level of the household head and a dummy variable for urban residence of the household. Tests show that the instruments are relevant and exogenous, i.e. they significantly affect initial consumption while in a regression with initial consumption and the other exogenous regressors, they have no significant impact on the growth rate. However, a Hausman test (comparing FE reg with FE IV reg) does not reject exogeneity of initial consumption in the growth regression.

Source: IFLS1, IFLS2 and IFLS3; estimations by the author.

Table 4
Activity rates in $t-1$ of those who died between $t-1$ and t
and those who survived to t

	1993–1997[a]		1997–2000[b]	
	Survivors	Deceased	Survivors	Deceased
Men, 15-44	0.707	0.783	0.705	0.632
Men, 45-59	0.896	0.787	0.929	0.818
Women, 15-44	0.406	0.377	0.384	0.270
Women, 45-59	0.512	0.280	0.458	0.291
All, 60 and older	0.480	0.223	0.345	0.207

Notes: [a] 'What was your primary activity during the past week? — Working/trying to work/helping to earn income. [b] 'Did you work in the last 12 months?' — Yes.

Source: IFLS1, IFLS2 and IFLS3; computations by the author.

Table 5
Growth regressions of household consumption per adult equivalent
Instrumenting household mortality

Dependent variable	Panel FE reg			Panel FE IV reg		
Growth rate	Coeff.		S.E.	Coeff.		S.E.
Death in the household	0.050	***	0.007	0.075	***	0.029
Instrumental variables						
Household head male				0.028	***	0.007
Crude death rate in commun.				0.499	***	0.151
Constant				0.063	***	0.008
ρ (fraction of var due to α_h)	0.725			0.726		
H0: all α_h=0 (P > F)	0			0		
H0: IV valid, Sargan test (P > χ^2)				0.014		
Adj. R^2	0.254			0.254		
n	12606			12606		

Notes: $*$ significant at the ten percent level. $**$ significant at the five percent level. $***$ significant at the one percent level. Both regressions include all control variables noted in Table 3 (Panel FE reg), including the dummies for emigration, birth and immigration. Tests show that the instruments are relevant and exogenous, i.e. they significantly affect the dummy variable for a death event in the household while in a regression with the death dummy and the other exogenous regressors, they have no significant impact on the growth rate. However, the Sargan test of overidentifying restrictions shows that one has to doubt the validity of the instruments.

Source: IFLS1, IFLS2 and IFLS3; estimations by the author.

Table 6
Growth regressions of household consumption per adult equivalent
Distinguishing deaths by 'accident' and other causes

Dependent variable	Panel FE reg		
Growth rate	Coeff.		S.E.
Death of a child	0.063	***	0.021
Death of an adult/older man by 'accident'	0.040	**	0.016
Death of an adult/older woman by 'accident'	0.027		0.019
Death of an adult/older man not by 'accident'	0.052	**	0.021
Death of an adult/older woman not by 'accident'	-0.018		0.022
ρ (fraction of var due to α_h)	0.724		
H0: all α_h=0 (P > F)	0		
Adj. R^2	0.253		
n	12606		

Notes: $*$ significant at the ten percent level. $**$ significant at the five percent level. $***$ significant at the one percent level. The regression includes all control variables noted in Table 3 (Panel FE reg), including the dummies for emigration, birth and immigration.

Source: IFLS1, IFLS2 and IFLS3; estimations by the author.

Table 7
Growth regressions of household consumption per adult equivalent
Introducing time interaction effects

Dependent variable	Panel FE reg			Panel FE reg		
Growth rate	Coeff.		S.E.	Coeff.		S.E.
Death in the household	0.041	***	0.010			
Survival time x Death in the hh	0.000		0.000			
Death of a child				0.032		0.033
Death of an adult man				0.052	*	0.024
Death of an adult woman				0.040		0.028
Death of an older person				0.043	***	0.014
Survival time x Death child				0.002		0.002
Survival time x Death adult man				0.000		0.001
Survival time x Death older person				-0.001		0.001
Survival time x Death adult woman				0.001		0.001
ρ (fraction of var due to α_h)	0.725			0.725		
H0: all α_h=0 (P > F)	0			0		
H0: all inter. effects = 0 (P > F)				0.372		
Adj. R^2	0.254			0.254		
n	12606			12606		

Notes: $*$ significant at the ten percent level. $**$ significant at the five percent level. $***$ significant at the one percent level. The 'survival time' corresponds to the number of months which have elapsed between the beginning of the period and the most recent death event within the household in that period. Both regressions include all control variables noted in Table 3 (FE), including the dummies for emigration, birth and immigration.

Source: IFLS1, IFLS2 and IFLS3; estimations by the author.

Table 8
Growth regressions of household wealth

Dependent variable	Panel FE reg		
Growth rate	Coeff.		S.E.
ln Wealth	-0.327	***	0.004
Death of a child	0.052		0.036
Death of an adult man	-0.050	**	0.023
Death of an adult woman	-0.031		0.027
Death of an older person	-0.015		0.016
Emigr. of a child	-0.015		0.011
Emigr. of an adult man	-0.013		0.010
Emigr. of an adult woman	-0.019	**	0.010
Emigr. of an older person	-0.119	***	0.030
Birth	-0.010		0.009
Immigr. of a child	0.022	*	0.013
Immigr. of an adult man	0.040	***	0.011
Immigr. of an adult woman	0.039	***	0.012
Immigr. of an older person	0.022		0.025
Crop loss (hh level)	-0.011		0.012
Natural disaster (hh level)	0.009		0.028
Unemployment (hh level)	-0.052	***	0.019
Price shock (hh level)	0.009		0.014
1997-2000 dummy	0.007		0.006
Constant	4.852		0.096
ρ (fraction of var due to α_h, u_h)	0.806		
H0: all α_h=0 (P > F)	0		
Adj. R^2	0.160		
n	11394		

Notes: $*$ significant at the ten percent level. $**$ significant at the five percent level. $***$ significant at the one percent level. Additional included control variables are the age and age squared of the household head, household size and the share of young (0-15 years old) and older persons (60 years and older) in the household. 606 households were not used for the regressions, because their growth rate exceeded 100 percent. While that can of course be real, especially for very low initial levels of wealth, they influence enormously the results. Here again, initial wealth could be endogenous, but given that only two periods are covered by the data the GMM estimator cannot be applied, hence, the regressions are estimated without any instrumentation.

Source: IFLS1, IFLS2 and IFLS3; estimations by the author.

Table 9
Employment probit model

Dependent variable	Employed in 1993			Not empl. in 1993		
Being employed in 2000	Coeff.		S.E.	Coeff.		S.E.
Death in the household	0.094	*	0.056	0.158	**	0.066
Emigration of at least one person	0.019		0.045	0.132	**	0.052
Immigration of at least one person	-0.143	***	0.040	-0.229	***	0.047
Crop loss (hh level)	0.025		0.052	0.204	***	0.067
Natural disaster (hh level)	0.199		0.123	-0.189		0.147
Price shock (hh level)	0.137	**	0.063	0.015		0.077
Male	0.636	***	0.068	0.565	***	0.098
Age	0.047	***	0.010	0.032	***	0.010
(Age squared)/100	-0.086	***	0.010	-0.066	***	0.011
Primary education	-0.099	*	0.052	-0.120	**	0.060
Secondary education and more	-0.140	**	0.063	-0.276	***	0.075
Spouse of household head	-0.204	***	0.070	-0.047		0.086
Child of household head	-0.128		0.192	-0.057		0.145
Other household member	-0.337	***	0.124	-0.322	***	0.121
Household size	-0.018		0.011	-0.024	*	0.013
Urban	-0.194	***	0.043	-0.303	***	0.050
Constant	0.789	***	0.228	0.101		0.225
Pseudo R^2	0.143			0.097		
n	7218			3515		

Notes: $*$ significant at the ten percent level. $**$ significant at the five percent level. $***$ significant at the one percent level.

Source: IFLS1, IFLS2 and IFLS3; estimations by the author.