Mortality Shocks and Survivors’ Consumption Growth*

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Abstract

In contrast to health shocks, mortality shocks do not only induce direct costs such as medical and funeral expenses and possibly income loss, but also reduce the number of consumption units in the household. Using data from Indonesia, it is shown that the economic costs related to the death of children and older persons seem to be fully compensated for by the decrease in consumption units. In contrast, when prime-age adults die, survivors face additional costs and, in consequence, use coping strategies. These strategies seem to be quite effective, although households may face higher long-term vulnerability.

I. Introduction

To what extent shocks such as droughts, natural disasters, illnesses, and mortality affect household income is an important topic in both developed and developing economies. However, in most low- and middle-income countries, only a small percentage of the population is formally insured against such shocks (and even if they are insured, insurance often covers only part of the risk). Hence, it is important to know how households in these countries manage such risks ex ante, and how they cope with them ex post. Some of the informal coping mechanisms utilized by individuals include depleting savings, selling assets, working more, reallocating expenditures, receiving financial support from relatives or other members

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of their social support network, and borrowing from local (mostly informal) credit markets.¹

Decreasing life expectancy in countries severely affected by the AIDS epidemic and rising health inequalities in transition countries raise the question of how illnesses, and in particular mortality, affect household income in both the short- and long-run. The illness of a household member generally involves two types of costs: first, the costs of diagnosing and treating the illness, and, second, possible income losses associated with the reduced labour supply and productivity of both the ill person and those providing care.

Empirical studies investigating illness shocks suggest, may be surprisingly, that, except in case of severe illnesses, households manage to cover these costs fairly well on average. Although, those studies often ignore the long-term costs of households’ risk mitigation and ignore the health effects of forgone treatment (mostly because of data constraints). For instance, Pitt and Rosenzweig (1986) found only small effects of illnesses on farm profits in Indonesian farming households. They observed that households made up for reductions in labour within the family by hiring outside help, enabling them to maintain previous consumption levels. For Thailand, Townsend (1995) even found that the percentage of the year that an adult man was sick had no impact at all on household consumption. For the case of South India, Kochar (1995) analysed the effect of illness in the household in more detail. She found that illnesses among men decreased wage income and increased informal borrowing during peak periods of the agricultural cycle, but that they had no effect during slack periods, and that illnesses among women had no effect at all. Lindelow and Wagstaff (2005) and Wagstaff (2007) emphasized, based on studies on China and Vietnam, that unearned income (including remittances, but not only) is one of the most important forms of (informal) insurance.

Gertler and Gruber (2002) used an original Indonesian panel dataset,² which combines very good measures of health status (a weakness of many other surveys) with consumption information, to consider the intensity of illness shocks as well. They found that while families were able to insure themselves fully against minor illnesses, they were unable to insure themselves adequately against severe illnesses limiting their ability to physically perform everyday activities, obtaining coverage of less than 40% of the income loss as a result of the illnesses. Dercon (2004) observed rural Ethiopian households over time and also found that serious illness shocks had a significant negative impact on food consumption.

Few studies have so far examined the effects of mortality on household income and consumption. The major difference between illness and mortality shocks is that the death of a household member not only induces direct costs such as funeral expenses and possibly losses in income, but also reduces the number of consumption units in the household. Therefore, whether the economic costs of household mortality are

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

²Indonesian Resource Mobilization Study, which was undertaken in two Indonesian provinces.
positive or negative depends on the balance between funeral and medical costs as well as income loss on the one hand, and the value of the basket of goods formerly consumed by the deceased household member on the other. Accordingly, the evidence in the literature is quite mixed.

For Vietnam, Wagstaff (2007) finds a significant negative effect on earned income with respect to the death of a working-age household member in urban areas and an ambiguous effect, depending on the adult equivalence scale used, in rural areas. If total income is used, the effect is negative in urban areas when using per capita income specification and insignificant in rural areas. Beegle (2005) found only small and insignificant changes in the labour supply of individuals in households having experienced a prime-age adult death, for the Kagera region in northwest Tanzania (a region strongly affected by the AIDS epidemic). While some farm activities were temporarily scaled back and wage employment fell after the death of a man, households neither shifted cultivation towards subsistence food farming nor reduced their diversification over income sources. In another paper, she also analysed the impact on survivors’ consumption related to prime-age adult mortality. She found a negative short-term and no long-term impact (Beegle, De Weerdt and Dercon, 2008). 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 found no significant effect of mortality. Mather et al. (2004) analysed the effect of prime-age adult mortality on rural household outcomes such as crop production and farm and non-farm profits using a set of household surveys for Kenya, Malawi, Mozambique, Rwanda and Zambia, but in most cases without a panel dimension in the data and hence without controlling for household fixed effects. They found that in almost all cases, although the households affected may well have suffered negative effects on household crop production and income, they showed similar average amounts of land cultivated, total land area, and total income ex post. In contrast, many studies found a negative impact of parental mortality on children’s schooling (see, e.g. Yamano and Jayne, 2005; Gertler, Levine and Ames, 2004; Yamauchi and Buthelezi, 2005) suggesting that some coping strategies might have severe negative intergenerational effects.

All these studies focus solely on adult mortality. I also consider the deaths of children and older persons, and investigate the differing economic consequences connected to each group. Most existing studies, except Wagstaff (2007), also do not pay much attention to the mortality-induced change in consumption units in the household. Hence, I analyse the robustness of the results with respect to the equivalence scale used. Moreover, I use panel data from the Indonesian Family Life Survey (IFLS). A special feature of this data is that it also contains information about the subjective perceptions of households regarding the economic impact of a household member’s death. Unsurprisingly, households see the death of a household member as a major economic shock and tend to report high financial costs related to that death (see section IV). I confront these information with fairly objective measures of

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household expenditure and analyse to what extent households rely on coping mechanisms and whether the utilized mechanisms are effective.

In the following, I proceed as follows. In section II, I briefly lay out the theoretical framework. In section III, I present the data. In section IV, I exploit the information on the consequences of economic shocks provided by households. In section V, I estimate a model of household consumption growth, controlling in each case for the occurrence of deaths by age, alternative shocks, household characteristics and household fixed and time-community effects. In section VI, I analyse the coping strategies implemented by households. In section VII, I conclude.

II. Theoretical framework

The theoretical framework underlying this paper is a standard intertemporal consumption model with income uncertainty (see, e.g. Deaton, 1992; Sadoulet and de Janvry, 1995) in which it is assumed that risk-averse households maximize intertemporal expected utility defined over consumption. With some additional assumptions (see, e.g. Deaton, 1992) it is straightforward to show that in such a framework, and if risk sharing or consumption smoothing is possible, transitory idiosyncratic shocks on income are smoothed out and, hence, consumption follows permanent income.

However, if risk sharing and consumption smoothing are imperfect, transitory shocks on income will alter consumption. For instance, the death of a household member could via a possible effect on earned income, high medical expenditure, and funeral costs reduce the resources available for consumption. Households could of course mitigate such a shock by adjusting the savings rate, depleting assets, increasing labour supply, increasing non-earned income, or taking a (informal) credit.

But, in the case of mortality shocks there is another aspect to consider. If a person disappears from a household the number of consumption units in the household is also decreasing, that is, the available income has to be shared among fewer persons. Thus, from a purely economic perspective, it is possible that in per person, or better in per adult equivalent terms, the household is better off after death than before. Obviously, what counts for the net effect is the balance between what the deceased person contributed to household income and how much the person used for consumption. Thus, even in the absence of perfect insurance, it is not obvious what happens to households affected by death events on average, and hence it is worth exploring that question empirically stratifying death events by age and gender. This will be done in section V.

III. Data

I use three waves of the IFLS conducted by RAND, the University of California Los Angeles, the University of Indonesia’s Demographic Institute and the Center for Population and Policy Studies of the University of Gadjah Mada. 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. This procedure added a total of 878 split-off households to the initial households. The third wave, IFLS3, was conducted in 2000. It covered 6,800 IFLS1 households and 3,774 split-off households, totalling 43,649 individuals. In IFLS3, the re-contact rate was 95.3% of the IFLS1 households. Nearly 91% of the IFLS1 households are complete panel households\(^3\) and only those are used in the following analysis, that is, split-off households are discarded from the sample. The confrontation of the observed baseline characteristics of the ‘attritors’ and the ‘non-attritors’ did not reveal a significant attrition bias.

The IFLS contains detailed information on the socio-demographic structure of households, their employment (except for 1997), their expenditures, their self-consumed production, transfers made and received, and financial and material assets, along with other data. To measure consumption, I aggregate expenditures for all food and non-food items including home-produced consumption but excluding expenditures for durable consumption goods (often goods with public goods character), which are considered as savings. I also exclude from expenditures aggregate expenditures for funeral ceremonies and burials and deal in different ways with medical expenditures. For each year, household consumption is expressed in the 1993 prices and adjusted by regional price deflators to the Jakarta price level.\(^4\)

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

\[
\text{Adult equivalent consumption} = \frac{\text{household consumption}}{(\text{adults} + 0.5 \times \text{children})^{0.9}},
\]

where children are defined as those in the age group 0–15. As discussed for instance by Woolard and Klasen (2005), this scale gives relatively little weight to children and assumes relatively low economies of scale. But in Indonesia, large households usually also have many children, and, hence, both parameters together imply considerable economies of scale. Given the fact that in developing countries and especially in poor households a large share of the budget goes towards food – for which economies of scale are typically low – this scale should result in an appropriate measure of household consumption. However, the exact form of such a scale is obviously always debatable (see, e.g. Deaton and Paxson, 1998a). Hence, the sensitivity of the results to alternative scales will be examined in detail.

It is possible to derive from the household roster births, immigration, emigration and deaths within the households, as well as the dates when these events occurred. Moreover, the survey contains a specific section in which households were asked if they had faced any economic shocks or hardships during the past five years, such as

\(^3\)For details see Strauss (2004).

\(^4\)Data on prices was obtained from BPS Statistics Indonesia.
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the death of a household member, a natural disaster, a price shock, or a drought. In 1993, the households were also asked to enumerate the measures they had taken to overcome these shocks and to provide estimates of the total costs involved.\(^5\) Whereas in 1997 the survey only registered the occurrence of shocks, in 2000 it asked households to state the measures undertaken in response to shocks, and also in the case of a death to declare any direct costs separately (funeral costs and losses of earnings if the deceased person was employed).

Without going into the details of Indonesia’s recent social and economic development, it is important to note that it was one of the hardest-hit countries during the Asian financial crisis. The crisis started to be felt in southeast Asia in April 1997 and began affecting Indonesia in December 1997, just after IFLS2 was conducted. Indonesia suffered a sustained crisis of over 1 year. By 2000, when IFLS3 was conducted, the population returned to roughly its pre-crisis standard of living (Strauss et al., 2002). Public health expenditures, however, fell significantly during the crisis. In addition, the 1997/98 drought, which was a consequence of El Niño, and several major forest fires caused serious health problems and a sharp drop in food production in some regions. While Rukummuaykit (2003) and Jayachandran (2008) showed that the drought and smoke pollution had significant adverse effects on infant mortality in rural areas, Strauss et al. (2002) found that adult body mass indices did not worsen and that the fraction of pre-school-aged children with very low heights for their age and gender even fell over the 1997–2000 period.

IV. Households’ perceptions of the impact of deaths

Table 1 describes how households perceived a death of a household member. It should be noted that in this section households were not asked who exactly died. Hence this information cannot be linked directly to a specific death recorded in the household roster, given that these deaths occurred within the past five years and not necessarily within the two periods covered by the three waves of the IFLS and given that it happens that households suffer multiple death events.

Roughly 10% of all households experienced one or more deaths during the 5 years preceding the survey. In 1993, the median costs reported by households resulting from the death of a household member during these 5 years was more than 260 thousand Rupiah (in 1993 prices), corresponding to roughly 36% of the median annual household consumption per adult equivalent. In 2000, the median household affected by death declared having spent 325 thousand Rupiahs on medical and funeral costs involved, corresponding to approximately 33% of the median annual household consumption per adult equivalent in that year. If for the year 2000 these costs are broken down by children, male and female adults and elderly, although that can only be done in those households where a single death event occurred, these costs are substantially

\(^5\)Note that in this section households had not provided the person identifier of the deceased person, that is, that in the case of multiple deaths it is not possible to link costs and coping strategies to specific death events (see also the next section).
TABLE 1

*Household’s perceptions of costs related to death events*

|                                      | 1993 | 1997 | 2000 |
|--------------------------------------|------|------|------|
| Share of households having experienced a death within the past 5 years | 0.10 | 0.10 | 0.09 |
| Median cost of overcoming the death within the past 5 years* † ‡ | 263.7 |      |      |
| In relation to yearly median consumption per adult equivalent | 0.36 |      |      |
| Median cost of medical and funeral* † ‡ § |      | 325.1 |      |
| In relation to yearly median consumption per adult equivalent |      | 0.33 |      |
| Median yearly income of the deceased (forgone earnings)* † ‡ § ¶ | 1,509.7 |      |      |
| Median yearly income of the deceased (forgone earnings, computed only over those persons who were occupied)* † ‡ § ¶ |      |      | 1.56 |
| In relation to yearly median consumption per adult equivalent |      |      |      |

*Notes: *Not available in 1997 (IFLS2).
† Not available in 2000 (IFLS3).
‡ In thousands of real Rupiah (1993, Jakarta).
§ Not available in 1993 (IFLS1).
¶ 45% of all declared deaths in this section of the survey concerned household members with an income.
IFLS, Indonesian Family Life Survey.
Sources: IFLS1, IFLS2 and IFLS3; computations by the author.

higher for male adults compared with female adults and elderly. They are the lowest for children. Roughly 55% of the deceased household members did not have any monthly income, but among the 45% who did, the median loss in earned income declared by the households was almost 1.5 million Rupiah, which is almost one-and-a-half times the median annual household consumption per adult equivalent. Again, this loss was on average the highest for male adults. 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 this shock, almost 40% of all households declared having received assistance or transfers from other households. In addition, almost a quarter of all households took loans, sold assets and used savings. Twelve per cent of all households in 1993 and 21% in 2000 declared having increased their labour supply. 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 that declared having 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 analysed in detail in the next section using household consumption growth regressions.

V. The impact of mortality on household consumption growth

The econometric model

To test whether mortality shocks have an impact on household consumption or whether such shocks are smoothed or compensated through the decline in consumption units, I use the following fixed-effects specification:
Figure 1. Measures taken to overcome a death (multiple answers possible)

Source: Indonesian Family Life Survey (IFLS)1, IFLS3 (data not available in IFLS2); computations by the author.

\[
\ln c_{h,c,t} = \alpha_{h,c} + \beta \ln c_{h,c,t-1} + \delta X_{h,c,t} + \kappa b_{h,c,t} + \sum_j \gamma_j j_{h,c,t} + \sum_j \mu_j d_{h,c,t} + \sum_j v_j e_{j,h,c,t} + \zeta S_{h,c,t} + \tau T_t + \phi(T_t \times v_t) + \epsilon_{h,c,t},
\]

where $\Delta \ln c_{h,c,t}$ is the average annual change in log consumption for household $h$, residing in location $c$ in period $t$.\(^6\) The fixed effect $\alpha_{h,c}$ captures all the household-specific time-invariant effects and thus avoids a bias which could stem from the fact that preferences and health endowments can be a determinant of both mortality and consumption. The demographic shocks are included using dummy variables for births ($b_{h,c,t}$), immigration ($i_{j,h,c,t}$), deaths ($d_{j,h,c,t}$), and emigration ($e_{j,h,c,t}$) of individuals of age-group $j$ occurring in household $h$ between $t-1$ and $t$. Note that these events are based on the household roster information and not on the questionnaire on economic shocks used in section IV. The vector $S_{h,c,t}$ 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 crop loss as a result of bad climatic conditions, by a natural disaster, by unemployment of a household member, or by a significant price decrease of goods that it produces and sells.\(^7\) The vector $X_{h,t}$ contains a set of

\(^6\)This specification is similar to that used by Gertler and Gruber (2002) which also focuses on the change in log outcome. Alternatively, the model can be estimated in levels [as done, for example, by Wagstaff (2007)]. I explored that specification. As discussed below, the results were almost identical in both specifications.

\(^7\)A potential problem with self-reported shocks is that they are only declared if income was indeed negatively affected and, thus, self-reported shocks might be endogenous.
additional potential control variables which will subsequentially be introduced, namely poverty status (defined over expenditures or wealth), insurance status, education of household head, and being a farm household. However, most of these variables do only hardly vary over time, and thus are only introduced in interaction with the death events (i.e. to see if the effect of death events varies with the level of these variables). Further household composition variables are not considered as all changes in household composition are already controlled for by the death, emigration and immigration variables. The dummy period $T_t$ takes the value zero for the period 1993–97 and one for the period 1997–2000. The term $v_c$ is a community fixed effect, which interacted with the time effect, controls for all community-specific shocks during the period, which might possibly be correlated with my variables of interest (e.g. weather shocks that affect both changes in permanent income and health). The term $e_{h,c,t}$ stands for the household-specific error term with mean zero.

In such a model it makes sense to condition on the level of consumption at the beginning of the period. The remaining regressors then measure only the effect of new information. 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 $\ln c_{h,c,t-1}$. In principle, the generalized method-of-moments estimator (GMM) should be used in this case (Arellano and Bond, 1991). However, GMM implies instrumenting initial consumption by lagged levels or differences. Given that only three waves of data, that is, two growth rates, are available, GMM cannot be used appropriately.8

By estimating equation (2) and finding that $\mu_j = 0$, the data suggests that the economic costs as a result of the death of a household member of age-group $j$, such as forgone earnings, medical expenditures, and funeral costs are exactly offset by the decrease of consumption units in the household or that households are perfectly insured by market or non-market institutions (or a combination of both). In contrast, if $\mu_j < 0$, the net impact is negative and households are imperfectly insured and, conversely, if $\mu_j > 0$, the net effect is positive or the insurance system of households overcompensates the negative net effect.

An econometric problem stems from the fact that household mortality might be endogenous with respect to household consumption.9 To solve this problem one could rely on IV techniques. But it is not obvious to find a variable which determines death events in a household and is not a direct determinant of household consumption. Presence or distance to health care centres, sea level (included in the village-level

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8 Although a Hausman test did not reject exogeneity of initial consumption in the growth regression, I tested the robustness of the results using the logarithm of mean household consumption per adult equivalent in the community, the gender and education level of the household head, and a dummy variable for urban residence of the household as an instrument for household consumption per adult equivalent. The instrumentation passed the usual overidentification test (theoretically aggregate community consumption would not be exogenous if insurance took place at the community level) and the $F$-test statistic was far above the critical level. The results turned out to be almost identical to the non-instrumented ones, and, hence, I report next only the latter.

9 Obviously, potential endogeneity also applies to the other demographic shocks included $e, b$ and $i$, but given the focus on household mortality, the issue discussed here is only for mortality.
data), or simply the crude death rate (computed over the sampled population) in the community turned out to be not relevant and suffered from insufficient variation in the instruments. This is also what other studies in the health shock literature found.10

As an alternative to the IV approach, I use survey information on self-assessed health to classify whether death events were caused by some exogenous event, that is, an accident, or whether they were because of illness. Illness might be determined by household consumption, because lower consumption might hinder a household from making adequate health investments. In the survey, adults had to declare whether they felt ‘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, first, the intervals between the surveys are relatively large and a person could still have become ill before the death occurred, and, second, some empirical studies suggest that self-assessed health itself may depend on income (see, e.g. Crossley and Kennedy, 2000). However, Deaton and Paxson (1998b) argue (at least for the United States) that such measures are very good at predicting 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 disasters, traffic accidents, or physical violence. But, again there is not much more to do in the absence of better data. The results of that approach are discussed next.

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

**Estimation results**

For estimation I distinguish four types of deaths: 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). I use alternatively growth of total expenditure [as specified in section III; columns (1) to (3)], growth of food expenditure [column (4)], growth of non-food expenditure [columns (5)], and growth of total expenditure excluding medical expenditure [columns (6)]. Table 3 shows the results. Column (1) is without time-location interactions, column (2) includes time-province interactions, and column (3) to (6) include time-community interactions.11 All specifications include household fixed effects.

When total household expenditure (per adult equivalent) is used [columns (1) to (3)], all specifications suggest that all types of death events, except those of adult women, have a significant positive effect on consumption. The coefficients change only marginally if time–location interactions are introduced. A child’s death increases

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10 See, for example, the short discussion regarding the instrumentation of health status in Lindelow and Wagstaff (2005).
11 The survey sampled in total 310 communities.
TABLE 2
Description of the sample used

|                              | 1993/97 |     | 1997/2000 |     |
|------------------------------|---------|-----|-----------|-----|
|                              | Mean    | SD  | Mean      | SD  |
| Household head, man          | 0.850   |     | 0.828     |     |
| Age of household head        | 45.7    | 14.0| 48.8      | 13.7|
| Household head no education  | 0.194   |     | 0.177     |     |
| Household head some primary  | 0.508   |     | 0.517     |     |
| Household head some secondary or more | 0.298 |     | 0.306     |     |
| Household size               | 4.7     | 2.1 | 4.6       | 2.0 |
| Share of household with one working adult | 0.394 |     | 0.345     |     |
| Share of household with 2–4 working adults | 0.509 |     | 0.574     |     |
| Share of household with more than 5 working adults | 0.022 |     | 0.044     |     |
| Urban residence              | 0.456   |     | 0.452     |     |
| Farm household               | 0.408   |     | 0.362     |     |
| Household owns land          | 0.334   |     | 0.326     |     |
| Any health/life insurance    | 0.196   |     | 0.221     |     |
| 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     |     |
| Emigration of a child        | 0.136   |     | 0.131     |     |
| Emigration of an adult man   | 0.214   |     | 0.200     |     |
| Emigration of an adult woman | 0.197   |     | 0.205     |     |
| Emigration of an older person| 0.008   |     | 0.017     |     |
| Birth                        | 0.276   |     | 0.193     |     |
| Immigration of a child       | 0.091   |     | 0.079     |     |
| Immigration of an adult man  | 0.112   |     | 0.142     |     |
| Immigration of an adult woman| 0.110   |     | 0.124     |     |
| Immigration of an older person| 0.022  |     | 0.020     |     |
| Crop loss (household level)  | 0.112   |     | 0.097     |     |
| Natural disaster (household level) | 0.018 |     | 0.012     |     |
| Unemployment (household level)| 0.036  |     | 0.035     |     |
| Price shock (household level)| 0.078   |     | 0.040     |     |
| Annual growth of real monthly household cons. p.a.e. | 0.090 | 0.197 | 0.031 | 0.230 |
| Yearly household cons. p.a.e. (in 1,000 rupiahs) | 1,254 | 3,793 | 1,398 | 1,499 |
| Annual growth of real household wealth | 0.111 | 0.325 | 0.021 | 0.342 |
| Real household wealth (in 1,000 rupiahs) | 31,500 | 155,000 | 27,900 | 84,200 |

n = 6,303

Notes: Except flows, variables are measured at the beginning of the period.
Sources: IFLS1, IFLS2 and IFLS3; computations by the author.

The annual growth rate of household consumption per capita by roughly four to five percentage points. The death of an elderly person is associated with an increase of roughly three percentage points. Even the death of an adult man increases the growth rate by about three percentage points. These effects may appear very large. But the following simple example shows that the order of magnitude is plausible and might
### TABLE 3

_Growth regressions of household consumption per adult equivalent_

|                          | Total expenditure | Food expenditure | Non-food expenditure | Non-medical expenditure |
|--------------------------|-------------------|------------------|----------------------|-------------------------|
|                          | (1)               | (2)              | (3)                  |                         |
| Death of a child         | 0.045***          | 0.022            | 0.044***             | 0.021                   |
| Death of an adult man    | 0.034***          | 0.013            | 0.033***             | 0.013                   |
| Death of an adult woman  | −0.011            | 0.016            | −0.007               | 0.016                   |
| Death of an older person | 0.030***          | 0.009            | 0.030***             | 0.008                   |
| Emigration of a child    | 0.012**           | 0.006            | 0.015**              | 0.006                   |
| Emigration of an adult man | 0.017***         | 0.005            | 0.017***             | 0.005                   |
| Emigration of an adult woman | 0.013**           | 0.005            | 0.015***             | 0.005                   |
| Emigration of an older person | 0.048***        | 0.017            | 0.045***             | 0.017                   |
| Birth                    | −0.017***         | 0.005            | −0.018***            | 0.005                   |
| Immigration of a child   | −0.015**          | 0.007            | −0.017**             | 0.007                   |
| Immigration of an adult man | −0.019***        | 0.006            | −0.020***            | 0.006                   |
| Immigration of an adult woman | −0.006           | 0.007            | −0.009               | 0.007                   |
| Immigration of an older person | −0.024*          | 0.014            | −0.025*              | 0.013                   |
| Crop loss (household level) | −0.004           | 0.007            | 0.002                | 0.007                   |
| Natural disaster (household level) | 0.018          | 0.016            | 0.018                | 0.016                   |
| Unemployment (household level) | −0.002          | 0.011            | −0.001               | 0.011                   |
| Price shock (household level) | 0.009            | 0.009            | 0.010                | 0.009                   |
| 1997–2000 dummy          | 0.048***          | 0.003            | 0.054***             | 0.004                   |
| Time–province interaction | Yes              |                  |                      |                         |
| Time–community interaction | Yes             |                  |                      |                         |
| Adj. $R^2$               | 0.251             | 0.254            | 0.269                |                         |
| $n$                      | 12,606            | 12,606           | 12,606               |                         |
|                          | Food expenditure  | Non-food expenditure | Non-medical expenditure |
|                          | (4)               | (5)              | (6)                  |                         |
| Death of a child         | −0.005            | 0.027            | 0.098***             | 0.032                   |
| Death of an adult man    | 0.013             | 0.017            | 0.054***             | 0.020                   |
| Death of an adult woman  | 0.010             | 0.020            | −0.027               | 0.024                   |
| Death of an older person | 0.009             | 0.011            | 0.050***             | 0.013                   |
| Emigration of a child    | 0.003             | 0.008            | 0.015*               | 0.009                   |
| Emigration of an adult man | 0.009             | 0.007            | 0.014**              | 0.008                   |
| Emigration of an adult woman | 0.009            | 0.007            | 0.007                | 0.008                   |
| Emigration of an older person | 0.043**          | 0.022            | 0.048*               | 0.026                   |
| Birth                    | −0.008            | 0.006            | −0.023***            | 0.007                   |
| Immigration of a child   | −0.024***         | 0.009            | −0.007               | 0.011                   |
| Immigration of an adult man | −0.003            | 0.008            | −0.036***            | −0.009                  |
| Immigration of an adult woman | −0.006           | 0.008            | 0.000                | −0.010                  |
| Immigration of an older person | −0.024           | 0.017            | −0.045**             | −0.020                  |
| Crop loss (household level) | 0.015            | 0.009            | 0.027***             | 0.011                   |
| Natural disaster (household level) | 0.006          | 0.021            | 0.029                | 0.025                   |
| Unemployment (household level) | −0.007            | 0.014            | 0.008                | −0.004                  |
| Price shock (household level) | −0.001           | 0.011            | 0.029**              | 0.013                   |
even be higher. For instance, if an inactive adult dies in a four-person household with two adults and two children, the direct effect of that death would be an increase in consumption per adult equivalent of 44%, which is about seven times the median growth rate in the sample. Hence, compared with that example the measured effects are rather small.

Emigration of household members has a similar but slightly smaller effect on household consumption. All coefficients are significantly positive and different from zero. The highest effect seems to be related to the emigration of an older household member and the lowest to the emigration of a child. Births and immigration, that is, the increase in the number of household members, have a negative effect. The birth of a child reduces on average the annual growth rate of household consumption per capita by a bit less than two percentage points. The effects associated with the immigration of an older person or an adult man seem to be slightly higher.

Next I test the sensitivity of the results with respect to the equivalence scale used. Again, this is an important issue given that the balance between earned income and absorbed consumption should be an important factor in how a death affects the survivors’ consumption. Alternative estimations show that all results presented before are robust with respect to a wide range of equivalence scales [cf. equation (1)]. Figure 2 illustrates this for the case of mortality of an adult man. In Figure 2a, I vary the economies of scale parameter. The coefficient remains significantly higher than zero for all scale parameters between 0.6 and 1. A scale parameter lower than 0.6 is, however, not plausible. In Figure 2b, I vary the weight given to children. Here the regression coefficient of the mortality of an adult man stays positive for the whole range of weighting factors between 0 and 1.

Another question is whether the results differ for alternative consumption aggregates. Column (4) in Table 3 considers food expenditure per adult equivalent only. The results show that the coefficients related to death events stay positive (except

|                  | Food expenditure (4) | Non-food expenditure (5) | Non-medical expenditure (6) |
|------------------|----------------------|--------------------------|-----------------------------|
| 1997–2000 dummy  | 0.042                | 0.069                    | −0.043                      |
| Time–province interaction | Yes                 | Yes                      | Yes                         |
| Time–community interaction | Yes                 | Yes                      | Yes                         |
| Adj. $R^2$       | 0.546                | 0.218                    | 0.288                       |
| $n$              | 12,606               | 12,606                   | 12,606                      |

Notes: *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level. The regressions also include the initial level of consumption and an intercept. Instrumentation of initial consumption did not change the results (see section V). Standard errors reported behind coefficients.

IFLS, Indonesian Family Life Survey.

Source: IFLS1, IFLS2 and IFLS3; estimations by the author.
Figure 2. Robustness of results with respect to the equivalence scale used [cf. equation (1)]

Notes: The dotted lines show the 95% confidence intervals of the regression coefficient. The test is based on regression (3) in Table 3.

Source: Indonesian Family Life Survey (IFLS), IFLS2 and IFLS3; computations by the author.
for a child’s death) but are not significant anymore. This suggests that adjustments, positive and negative, are made through non-food expenditures. Indeed, column (5) shows that for non-food expenditures the positive effects associated with mortality persist, they are even, as one can expect, a bit higher as if the total expenditure is used. Finally, if total expenditure excluding medical expenditure is used, again the effects associated with mortality are positive, but only hardly significant ($P \approx 0.15$), except for the older person’s death. That could mean that health expenditure causes positive impact on expenditure growth and that mortality has no significant impact on the remaining part of the total expenditure. If true this is of course still a very interesting result, because it suggests that households are able to raise the money for health-related out-of-pocket expenditure without contracting food and non-food expenditures.

However, given the sequencing of the panel data, it is almost surprising that the regressions suggest such a strong relationship between death events and medical expenditure. Although there is a clear positive and significant relationship between illness and medical expenditure in the data, this effect should, in principle, only show up for those death events which occurred in the expenditure reporting period which is the 12-month period preceding the survey. Only then it is plausible that current health expenditures are still affected by a past death event. Put differently, a death event which occurred in the year 1998 should not affect medical expenditure in the year 2000. Of course it could be that households suffering death events have persistently higher medical expenditure than households without such shocks, but that should in principle be captured by the household fixed effect.

That households on average seem to cope (economically) quite well with death events seems plausible for a newborn, a child, or an older retired person, but may be surprising for an adult of working age, although some of the individuals of working age who died may have gone through a period of illness and thus inactivity before death, and hence their departure may imply a degree of economic relief for the households concerned. Given the data structure, it is not possible to identify the exact activity status in the month preceding death. But it is possible to compare the activity status of deceased and survivors for various female and male age groups at the beginning of the observation period. Table 4 shows that for all groups, except for young men in the first period, the activity rates are higher for survivors than they were for the deceased, but only slightly. However, they were much higher for women between 45 and 59 years old, and persons older than 60 years. The lower activity rates of the deceased might be caused by illness preceding the death. This would suggest that for the household, the true economic shock is illness because it reduces labour market participation and causes medical expenditures, but that later mortality actually brings economic relief. However, if adult deaths are

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12I regressed the logarithm of health expenditures per capita on alternative indicators of serious illness of at least one adult household member [(i) Having had serious illness during the last 12 months, (ii) having had serious illness for more than 12 months, and (iii) having reported low health status, that is, ‘somewhat unhealthy’ or ‘unhealthy’) controlling for total expenditures.
TABLE 4

Activity rates in t−1 of those who died between t−1 and t and those who survived to t

|                | 1993–97* Survivors | 1993–97* Deceased | 1997–2000† Survivors | 1997–2000† 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: *‘What was your primary activity during the past week? – working/trying to work/helping to earn income.
†‘Did you work in the last 12 months?’ – yes.
IFLS, Indonesian Family Life Survey.
Source: IFLS1, IFLS2 and IFLS3; computations by the author.

classified according to their activity status at the beginning of the observation period and the same regressions as in Table 3 are performed, the related coefficients do not change much and are not significantly different for both active and inactive adults.

Obviously, the effects shown in Table 3 are average effects and, an interesting question is whether the effect of mortality varies if it is interacted with relevant observed household characteristics. Table 5 shows such interaction effects. All other explanatory variables used in the regressions correspond exactly to those used in Table 3 [column (3)]. First it is tested whether the effect of mortality of adult man varies with poverty status. All households belonging to the poorest 40% in the 1993 expenditure distribution are coded as poor. As can be seen in Table 5, the growth rate of expenditure does not seem to depend on poverty status. Next, I tested whether health and life insurance status plays a role. About 20% of all households had at least such an insurance for some household members. Again, I do not find any effect. However, I find that secondary education of the household head in 1993 compared with primary or no education has a significant negative effect, suggesting that for households with a well-educated household head the effect associated with a death of an adult man involves higher costs (or forgone earnings) than for households with a less-educated household head. Farm households, which may often be characterized by surplus labour, are not differently affected by the death events of an adult man rather than other households. Households which belong to the poorest 40% in the wealth distribution (how wealth is computed is explained next) are more negatively affected by adult male death events than wealth-richer households. This could indicate that the depletion of assets is one important coping strategy, but alternative explanations are possible. Other variables, such as the size of the social network (as measured by the total number of siblings belonging to any household member and living outside the household), the number of working adults, or land ownership did turn out as insignificant.
TABLE 5

Growth regressions of household consumption per adult equivalent interaction effects

| (1)    | (2)         | (3)         | (4)         | (5)         |
|--------|-------------|-------------|-------------|-------------|
| Death of an adult man | 0.016 | 0.037 | 0.078 | 0.038 | 0.054 |
|         | 0.017 | 0.015** | 0.035** | 0.017** | 0.017*** |
| Death × consumption poor in 1993 | 0.037 | 0.028 | | | |
| Any health/life insurance in t | 0.000 | | | | |
| Death × any insurance | −0.022 | 0.032 | | | |
| Death × no education (1993) | (Ref.) | | | | |
| Death × some primary (1993) | −0.034 | 0.040 | | | |
| Death × some secondary (1993) | −0.093 | 0.042** | | | |
| Death × farm household in 1993 | | −0.022 | 0.027 | | |
| Death × wealth poor in 1993 | | −0.058 | 0.027** | | |

Notes: **Significant at the 5% level. ***Significant at the 1% level. Standard errors are reported below the respective coefficients. The regressions include the same explanatory variables than the regressions in Table 3, including household fixed-effects and time–community interaction terms.

IFLS, Indonesian Family Life Survey.

Sources: IFLS1, IFLS and IFLS3; estimations by the author.

Obviously, now it is important to examine exactly how households respond to demographic shocks. It is possible that the direct impact of adult mortality on consumption is negative, because of medical expenditures, funeral costs, forgone earnings, etc. – although only between 5% (1993) and 13% (2000) of all affected households declared to have reduced expenditure after a death event (see section IV) – but that households then implement appropriate coping strategies and that these are, on average, quite effective. Hence, what is captured in the consumption growth regressions is, for most households, the effect after consumption was smoothed. Coping strategies are examined in the next section, but it is first worthwhile to discuss the coefficients of some of the other control variables presented in Table 3 and to discuss the implications of possible endogeneity problems.

The effects associated with emigration and immigration seem plausible, but still, an obvious question is of course what are the motivating factors of these movements and are those consistent with the effects found. Klasen and Woolard (2009) 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 parental household necessitates having a job. Conversely, schooling and unemployment forces people, in the absence of
any social security benefits, to stay or to return to a household where at least some members are active. The IFLS data contains some information about the motivations of household members who are joining and leaving. Emigration by male adults is motivated mainly by having found work or looking for work (table not presented). For women, marriage and following the spouse or parents is more important, but work still plays a significant role. Immigration, however, is motivated for both men and women mainly by other and especially familial considerations.13 Hence, these findings are in line with those of Klasen and Woolard (2009) and are consistent with the estimated coefficients related to emigration and immigration in Table 3.

The effects of other shocks by which households were possibly affected are generally not significantly different from zero. Crop loss, a natural disaster and price shocks, are likely to be covariate shocks and hence the associated effects should be captured by the time–community interactions although they are self-reported in the survey and hence there could be within-community heterogeneity. Anyway, they are also insignificant in column (1) in Table 3, where such interactions are not used. Hence, again the results might suggest that households are relatively effective in coping with shocks, at least on average.

As discussed before, household mortality might be endogenous with respect to the growth of household consumption. I also laid out that instrumentation strategies failed in the lack of relevant instruments, which show enough variation across households and can reasonably satisfy the exclusion restriction. An alternative to the IV strategy is, as mentioned before, to compare death events that can be assumed to be exogenous to household consumption, like those resulting from accidents, with other death events. Thus, one may differentiate death events of adults who declared themselves to be ‘healthy’ or ‘somewhat healthy’ at the beginning of each period from those who declared themselves as ‘somewhat unhealthy’ or ‘unhealthy’. When I run the same regressions as in Table 3 and distinguish in addition these both types of death events I do not find a systematic difference between the impact of ‘accidental’ deaths and other deaths. Hence, the endogeneity issue has to be left for future work, which hopefully can rely on better data sets which allow for an appropriate instrumentation strategy or offer the possibility to rely on some ‘natural experiment’.14 However, if simultaneity would be a problem in this study, the coefficient associated with mortality would probably be downward-biased and thus be consistent with the result that mortality has no substantial negative effect on household expenditure. If expenditure feeded back on health and mortality, one would expect that the effects are significantly different for insured and uninsured households, which is, as seen before, not the case.

13Note that the motivating factors of emigration and immigration do not necessarily have to be the same, among other reasons, because emigrating household members who form a new household are, given that I use a balanced panel, not covered by the sample.

14However, randomized experiments should, despite their present popularity, not be performed in this context.
VI. Death events and coping strategies

In this section, I investigate how and to what extent survivors react to the death events within their households. Two types of reactions are considered in detail: the depletion of assets (or dissaving) and increased labour supply.

Whether households insure themselves against the death of a breadwinner by building up their assets in good years and depleting them in bad years is investigated by regressing the growth of household wealth on the mortality dummies and the same control variables as those used in the consumption growth regressions. Wealth is evaluated at its current value using the households’ self-evaluations and deflated to 1993 (Jakarta) Rupiahs. It includes farm and non-farm lands (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 equipments, household appliances, jewellery, financial savings and receivables. Table 6 shows that whereas a death of a child, an adult woman and an older person, have no significant impact on growth of wealth over time, a death of an adult man has a significant negative impact. This suggests that survivors try to cope with the death of an adult male household member by depleting assets to finance current consumption and death-related costs like medical expenditure and funeral costs. The estimations imply a reduction of the annual growth rate of household wealth by approximately four percentage points. If this effect is compared with that of mortality of an adult man on consumption growth – both evaluated for the median household – the regression results suggest that the wealth effect is about $-95 USD PPP per adult equivalent and year and the consumption effect about +32 USD PPP per adult equivalent and year. Hence, households do indeed seem to deplete assets to cover the economic costs related to a death event, but in doing so, may tend, on average, to overcompensate for the total loss. However, note that the consumption aggregate used before does not include funeral costs. It is interesting that this wealth effect is not observed for the death of children, adult women, or older persons. For them, the direct medical and funeral costs seem to be completely compensated for by the decrease in consumer units in the household. Wealth effects exist, as Table 6 shows, for unemployment shocks as well.

However, an aspect which might introduce a bias in that analysis is that some of the wealth losses associated with the death of an adult man may reflect the disinheritance of widows after their husband died. Unfortunately, with the data at hand, it is not possible to analyse this issue reasonably well. The data contains only information on wealth stocks but not on wealth flows and their direction. Inheritance rules vary widely across Indonesia and are in constant change. In Sumatra matrilineal land inheritance systems are still widespread. In some regions, it is common in Muslims that the widow keeps 25–50% of the wealth holdings, and the remaining share is given to the children irrespective of their gender. However, such division rules may not apply to rather immobile assets such as housing and land. Moreover, as long as children live with their mother inheritance should not have any impact on declared household wealth. Finally, Quisumbing and Otsuka (2001) report that in Indonesia traditional
TABLE 6
Growth regressions of household wealth

|                          | (1)     | (2)     | (3)     | (4)     | (5)     |
|--------------------------|---------|---------|---------|---------|---------|
| Death of a child         | 0.051   | 0.036   | 0.064*  | 0.035   | 0.054   | 0.036   |
| Death of an adult man    | −0.046**| 0.023   | −0.045* | 0.023   | −0.039* | 0.024   |
| Death of an adult woman  | −0.029  | 0.027   | −0.027  | 0.027   | −0.036  | 0.028   |
| Death of an older person | −0.019  | 0.016   | −0.020  | 0.015   | −0.020  | 0.016   |
| Emigration of a child    | −0.016  | 0.011   | −0.010  | 0.011   | −0.002  | 0.012   |
| Emigration of an adult man| −0.013 | 0.010   | −0.014  | 0.010   | −0.016  | 0.010   |
| Emigration of an adult woman| −0.021** | 0.010  | −0.024***| 0.010   | −0.025**| 0.010   |
| Emigration of an older person| −0.121***| 0.030  | −0.119***| 0.029   | −0.110***| 0.030   |
| Birth                    | −0.010  | 0.009   | −0.012  | 0.009   | −0.012  | 0.009   |
| Immigration of a child   | 0.021   | 0.013   | 0.020   | 0.013   | 0.019   | 0.013   |
| Immigration of an adult man| 0.041***| 0.011  | 0.039***| 0.011   | 0.042***| 0.011   |
| Immigration of an adult woman| 0.041***| 0.012  | 0.043***| 0.012   | 0.048***| 0.012   |
| Immigration of an older person| 0.020 | 0.025   | 0.020   | 0.025   | 0.008   | 0.025   |
| Crop loss (household level)| −0.011 | 0.012   | −0.008  | 0.012   | −0.006  | 0.012   |
| Natural disaster (household level)| 0.008 | 0.029   | 0.023   | 0.028   | 0.023   | 0.029   |
| Unemployment (household level)| −0.053***| 0.019 | −0.044** | 0.019   | −0.038* | 0.019   |
| Price shock (household level)| 0.010 | 0.014   | 0.016   | 0.014   | 0.022   | 0.015   |
| 1997–2000 dummy          | 0.012** | 0.005   | 0.062***| 0.023   | −0.054  | 0.092   |
| Time–province interaction| Yes     |         |         |         |         |         |
| Time–community interaction| Yes    |         |         |         |         |         |

Adj. $R^2$ 0.160 0.163 0.176

$n$ 11,394 11,394 11,394

Notes: *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level. Standard errors reported behind coefficients. The regressions also include the initial level of wealth, being a farm household, whether the household has any health or life insurance and an intercept; 606 households were not used for the regressions because their growth rate exceeded 100%. While such growth rates can of course be real, especially for very low initial levels of wealth, they strongly influence the results.

IFLS, Indonesian Family Life Survey.

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

inheritance systems are becoming weaker and that economic considerations play an important role today.

Figure 3a,b illustrates how the wealth effect varies with household expenditure. Figure 3a shows that for households having known of the death of an adult man, the depletion of assets in relative terms is higher the poorer is the household. Households above the 60th percentile of the expenditure distribution even seem not to rely on this coping strategy. As a benchmark, Figure 3a also shows the relative change in wealth for households without the death of an adult man. Figure 3b confronts the relative change in expenditure per adult equivalent with the relative change in household wealth across the expenditure distribution. It can be seen that negative changes in wealth fit positive changes in expenditure, although expenditure growth might be exaggerated by measurement error.

The second coping strategy considered is labour supply. Table 7 shows the estimated parameters of two probit models that describe the association between mortality
Figure 3. Exploring the wealth effect of the death of an adult man
Source: Indonesian Family Life Survey (IFLS)1, IFLS2 and IFLS3; computations by the author.

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and the propensity of individuals (older than 15 years) to work and earn income in 2000, controlling for other shocks as well as household and individual characteristics such as gender, age, age-squared, education, household size, the position in the household, urban/rural residence, being in a farm household, and any health or life insurance in the household. The first model is estimated on those individuals active in 1993 and the second on those individuals inactive in 1993. An analysis for the sub-periods 1993–97 and 1997–2000 cannot be conducted because the detailed employment information of the IFLS2 is not available, and therefore no consistent variable for labour market status in 1993, 1997 and 2000, can be constructed. Both models show that the death of an adult man increases the remaining household members’ propensity to work, but not the deaths of others (except older persons in the second model). The corresponding marginal effects (evaluated at the sample mean) are 3.5% and 6.3%. These orders of magnitude are obviously rather low, but they might have been higher if it had been possible to estimate the probit models by sub-periods as well, and, hence, to capture the labour supply effect directly after the event of death. Interestingly, crop loss and price shocks are also associated with higher labour supply.

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### TABLE 7

**Employment probit model**

| Dependent variable | Being employed in 2000 | Employed in 1993 | Not employed in 1993 |
|--------------------|------------------------|------------------|----------------------|
| Death of a child   | −0.123                 | 0.152            | −0.014               | 0.192 |
| Death of an adult man | 0.192**               | 0.091            | 0.162**              | 0.081 |
| Death of an adult woman | −0.011               | 0.133            | 0.220               | 0.200 |
| Death of an older person | 0.096               | 0.072            | 0.148*              | 0.086 |
| Emigration of a child | 0.031               | 0.049            | 0.116**             | 0.061 |
| Emigration of an adult man | 0.010               | 0.047            | 0.081               | 0.055 |
| Emigration of an adult woman | −0.045              | 0.046            | 0.031               | 0.057 |
| Emigration of an older person | 0.039               | 0.149            | 0.207               | 0.172 |
| Birth              | −0.080*               | 0.043            | −0.321***           | 0.049 |
| Immigration of a child | −0.121**            | 0.055            | −0.024              | 0.069 |
| Immigration of an adult man | −0.107**           | 0.050            | −0.077              | 0.060 |
| Immigration of an adult woman | 0.028             | 0.054            | 0.080               | 0.065 |
| Immigration of an older person | 0.044             | 0.101            | −0.020              | 0.132 |
| Crop loss (household level) | 0.028             | 0.052            | 0.202***            | 0.067 |
| Natural disaster (household level) | 0.200           | 0.123            | −0.180              | 0.147 |
| Price shock (household level) | 0.138**            | 0.063            | 0.021               | 0.078 |

| Pseudo $R^2$       | 0.145                 | 0.103            |
|--------------------|------------------------|------------------|
| $n$                | 7,218                  | 3,515            |

**Notes:** *Significant at the 10% level. **Significant at the 5% level. ***Significant at the 1% level. Standard errors reported behind coefficients. The regressions also control for gender, age, age-squared, education, relationship to household head, household size, urban location, being a farm household, whether the household has any health or life insurance and an intercept.*

IFLS, Indonesian Family Life Survey.

**Source:** IFLS1, IFLS2 and IFLS3; estimations by the author.
A third possible way for the survivors to cope with household mortality is by relying on transfers from other households. Unfortunately, the three surveys did not ask the same questions about transfers, and they seem strongly affected by the measurement error. Even when concentrating only on those transfers received by the household head and his or her spouse from their parents, siblings and children outside the household, it was not possible to identify any significant effect of household mortality, either when considering the amount of transfers or when simply considering the fact that transfers were received. In general, it was very difficult to explain any variation in transfers. The only variables that had any real explanatory power were regional dummies.

Finally, I tested whether mortality has any significant impact on children’s school enrolment. 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 have been enrolled in $t$. In contrast to Gertler et al. (2004), I did not find any significant impact of mortality on school enrolment.15

VII. Conclusion

The results show that the effect of mortality on survivors’ consumption is either insignificant or even slightly positive, depending on the age and gender of the person who died and depending on the consumption aggregate which is used. However, the analysis of different coping strategies suggest, that on impact it matters for the household whether it was a child, an older person, or a prime-age adult person who died. In other words, what seems to be important is what happens to the households’ dependency ratio. The economic costs related to the death of a child or older person – medical expenses preceding the death and funeral costs thereafter – seem to be fully compensated for by the decrease of consumption units in the household. In contrast, when prime-age adults die, survivors face additional costs because of the loss of income earned by the deceased household member and therefore have to implement appropriate coping strategies. Two of these strategies have been analysed in detail here: depleting assets and increasing labour supply. Both are shown to respond positively to adult mortality and are obviously quite effective. This is an important result given the relatively high costs of mortality as perceived by survivors, a finding documented in section IV. The results also show that shocks affecting household size and structure are very different from direct income shocks or health shocks, because these demographic shocks imply changes in consumption and income and therefore have an ambiguous effect on the well-being of households. The net effect obviously depends

15Note that Gertler et al. (2004) use the SUSENAS household survey, which does not have a panel dimension (thus the enrolment status prior to the death event is not observed), and hence the authors use matching techniques to infer the impact of parental deaths on schooling. The sample size of the IFLS is too small to apply this estimator. However, in principle the panel estimator should be preferred to a matching estimator.

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on age, gender and activity status of the deceased. Put differently, only if the medical expenses preceding the death, funeral costs, and the formerly earned income exceed the former consumption of the deceased will the households experience a death event as a negative economic shock. In contrast, for severe illness shocks, not only does the number of adult equivalent units remain constant but in addition, medical expenditure remain durably high. Other household members might also be forced to supply care instead of going to work.

The finding that Indonesian households are quite effective in coping with economic shocks has also been shown by other studies. For instance, Thomas et al. (2002) found that following the financial crisis of 1997/98, Indonesian households adopted strategies for mitigating the effects of the crisis that appear to have been extremely successful, at least for those at the top of the income distribution. Franken-berg, Smith and Duncan (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 successfully compensated for income losses owing to crop loss by increasing their labour supply, thus avoiding reductions in consumption. They also showed that household members did not need to increase their total hours of work as the crop losses appear to have reduced the value of their time in household farming, allowing them to take on extra jobs.

However, in the case analysed here, the depletion of assets to smooth consumption may involve lower consumption and higher deprivation and vulnerability in the longer term. Selling productive assets might make it difficult for a household to generate a constant stream of income in the future. Selling durable consumption goods like a radio may help in maintaining constant consumption of non-durable goods, but it may also lower utility through deprivation in other domains. It may also lower the ability to face future shocks. In the theoretical model underlying this paper, assets did not enter the utility function directly and hence this possibility was excluded. Moreover, ex-ante income diversification across household members and individuals may be less efficient than full specialization. Long-term panel data would be necessary to analyse this issue appropriately. Soon, the fourth round of the IFLS becomes available and will allow making a first step in this direction.

From a policy perspective, the finding that households cope rather well with mortality shocks suggests that countries introducing general formal safety nets should first focus on insuring citizens against other types of risks such as unemployment, illness and natural disasters. Indonesia, for instance, recently introduced a range of formal safety nets, such as school scholarships, health cards and in 2005 a public health insurance targeted to the poor (Askeskin). However, a more detailed analysis,
possibly backed by an impact evaluation, which looks simultaneously at the different
types of shocks is necessary to draw a final conclusion regarding such a prioritization.

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