Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

# Coping Strategy of Disaster Effect: Intra-Household Labor Substitutionin Indonesia

**Ariska Nurfajar Rini[1], Lienggar Rahadiantino[2], Mayanggita Kirana[3]**

[1]Fakultas Ekonomika dan Bisnis Universitas Diponegoro
Jl. Prof. Soedarto, Tembalang, Kota Semarang, Jawa Tengah 50275, Indonesia
ariskanurfajarrini@lecturer.undip.ac.id

[2]Fakultas Desain Kreatif dan Bisnis Digital, Institut Teknologi Sepuluh Nopember
Jl. Raya ITS, Keputih, Sukolilo, Surabaya, Jawa Timur 60111, Indonesia
lienggardian@gmail.com

[3]Fakultas Ekonomika dan Bisnis Universitas Diponegoro
Jl. Prof. Soedarto, Tembalang, Kota Semarang, Jawa Tengah 50275, Indonesia
kiranamayanggita@gmail.com

**Abstract.** Household with health shocks experience difficulties from the economic burden of morbidity, especially in developing countries. Morbidity will trap time limits for healthy household members, and medical costs increase during illness. Using two waves of 2007 and 2014 household survey data provided by the Indonesian Family Life Survey, this paper provides a comprehensive analysis of intra-household dynamics during periods of health shocks through the mechanisms and effectiveness of household labor substitution to address morbidity shocks. Using the Fixed-Effect household model, we find that natural disasters can affect working hours and household health expenditures. Household can overcome male chronic disease problems through changing labor in the household. Meanwhile, husband have a faster response to health when they are chronically ill for less than 1 year. They would reduce their hours of work and use medical expenditure, but there was no evidence that women would cut back on hours when they were sick. This is because women have multiple responsibilities in the family.

**Keywords:** Disaster, Health Shock, Economic, Labor Hours

## 1. Introduction

One of the idiosyncratic shocks is morbidity shock. An event of sickness may influence a person through two channels (Gertler and Gruber, 2002). First, there would be increased health care expenditure to cover the health care cost over the duration of the illness. Second, if the sick is the breadwinner of the household, the sickness would limit his or her ability to work and tend to lower the income of the household. Decreasing in health condition affects household labor supplies, labor force participation and earnings. However, the magnitudes of the effects vary across studies (Abegunde and Stanciole, 2008; Alam and Mahal, 2014; Bales, 2013; Bridges and Lawson, 2008; Khan, 2010; Mete and Schultz, 2006; Murphy et al., 2013; Rocco et al., 2011).

In the complete and competitive market, households will be able smoothing consumption when confront health shocks (Chetty and Looney, 2006). However, previous studies have shown that not all of the households can smoothing consumption. Due to incapable risk-sharing mechanism that can protect households.

Households may use various coping strategies and the mechanism that might be costly. The strategies related to assets through borrowing and loans by financial institution (Asfaw and Braun, 2004; Gertler, Levine, and Moretti, 2009; Lim, 2015; Lindelow and Wagstaff, 2005; Islam and Maitra, 2012; Mohanan, 2013; Russell, 2004; Sparrow et al., 2014), transfers and gifts (Genoni, 2012; Nguyet and Mangyo, 2010; Wagstaff, 2007), or trading livestock (Islam and Maitra, 2012). Another costly strategy, by dropping children out of school and using their labor supply (Guarcello, Mealli, and Rosati, 2010; Jacoby and Skoufias, 1997; Liu, 2016).

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

Among possible strategies, intra-household labor substitution may will be an alternative way for household, especially for poor households suffer from sickness and have limited access to other coping strategies (Beegle, 2005; Ilahi, 2001; Nur, 1993; Sauerborn, Adams, and Hien, 1996; Galiano and Hernandez, 2008; McGeary, 2009). To overcome shocks household will tend to reallocation of labor from household members, attempts to compensate for any financial shortfalls and maintain consumption (Zhang, 2014; Berloffa and Modena, 2013; Yamauchi, Buthelezi, and Velia, 2008; Fallon and Lucas, 2002). Intra-household labor substitution may feasible with household members, with the potentially higher earners in the labor market can increase replace incomes.

This study attempts to investigate the mechanism and worth of intra-household labor substitution in rural households to overcome the morbidity shocks. Using rich household survey data provided by the Indonesia Family Life Survey in 2007 and 2014, this studyexplainsthe impact of the intra-household dynamics over two period to health shocks.The bigger effect of health shocks and the unexpected morbidity impacts might be more difficult to insure. Focus on agricultural households, this study also considering farm's profit every month to see the impact of health and morbidity shocks.

This study also explains on gender roles within coping because man and women may respond in some alternative ways to household health shocks. This paper uses 'Added Worker Effect' (AWE) concept. AWEdefines as a temporary increase in the labor supply of one household member as the consequence of the unemployment of another member (Lim, 2017). AWE is mostly focus on unemployment of the primary worker whose earnings are the main source of income for the household and the implications for labor supply of the secondary worker, for instance the effect of the husband's unemployment and his wife's labor supply (Xiadong and Soest, 2002; Awudu and Prasad, 2000; Bardhan, 1984; Gluck and Sahn, 2001; Lundberg, 1985; Maloney, 1991; Serneels, 1998; Tano, 1993).

## 2. Conceptual Framework

The neoclassical model of the household by taking into account the opportunity price of time of every household member is used to observe the determinants of intra-household time allocation. The agricultural household models are explained in the studies of the general intra-household time allocation across agricultural and other activities related to morbidity shocks (Khandker, 1988; Mueller, 1984; Pitt and Rosenzweig, 1986; Pitt, Rosenzweig and Hassan, 1990; Skoufias, 1993).

The most commonly used model to explain household behavior is Unitary Model (Chiappori and Mazzocco, 2017). Suppose, a household consists of only a husband $(h)$ and a wife $(w)$. The household's utility is assumed to depend on health stocks of household members $(H_i)$, their leisure time $(T_i^L)$, a goods for consumption $(C)$, a vector of all observable and unobserved households' characteristics$(Z)$:

$$U = U\left(T_i^L, C, H_i; Z\right), \frac{\partial U}{\partial T_i^L} > 0, \frac{\partial^2 U}{\partial {T_i^L}^2} \langle 0, \frac{\partial U}{\partial C} \rangle 0, \frac{\partial^2 U}{\partial C^2} < 0, i = h, w \quad (1)$$

A combination of inputs $(X)$, the time inputs of household members $(T_i)$, health status of household members $(H_i)$, hired labor $(L)$, and household-spesific physical characteristics such as soil quality $(\sigma)$ are expected to produce household goods $(Q^F)$.

$$Q^F = Q^F\left(X^F, T_h^F, T_w^F, L; H_h, H_w, \sigma\right), \quad (2)$$
$$\frac{\partial Q^F}{\partial X^F} > 0, \frac{\partial^2 Q^F}{\partial {X^F}^2} \langle 0, \frac{\partial Q^F}{\partial T^F} \rangle 0, \frac{\partial^2 Q^F}{\partial {T^F}^2} \langle 0, \frac{\partial Q^F}{\partial L} \rangle 0, \frac{\partial^2 Q^F}{\partial L^2} \langle 0, \frac{\partial Q^F}{\partial H} \rangle 0, \frac{\partial^2 Q^F}{\partial H^2} < 0$$

The main assumption of complete labor markets is the work of a sick household member in the production of household goods is perfectly substitutable using hired labor at the same wage rate.

This study treats health as a function of consumption $(C)$, household good $(Q^H)$, and an acute health shock $(S_i)$. Morbidity terms as a decline of health stocks due to an acute health shock. Health can affect household resource allocations in three alternative systems: (1) health has a direct effect on household utility; (2) health reduces the sick member's time endowment; and (3) health affects production of household goods.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

$$H_i = h(C, Q^H, S_i) \frac{\partial H_i}{\partial C} > 0, \frac{\partial^2 H_i}{\partial C^2} \langle 0, \frac{\partial H_i}{\partial Q^H} \rangle 0, \frac{\partial^2 H_i}{\partial Q^H} < 0, \frac{\partial H_i}{\partial S_i} < 0 \quad (3)$$

Household goods ($Q^H$) are expected to be produced by a combination of inputs ($X$), the time inputs of household members ($T_i$), and household-spesificunobserved characteristics ($\rho$).

$$Q^H = Q^H(X^H, T_h^H, T_w^H; \rho) \quad (4)$$

Endowment stock of household time consist of time for household work ($T^F$), time for market work ($T^M$), time for home good production ($T^H$), and time for leisure ($T^L$).

$$\overline{T_i}(H_i) = T_i^H + T_i^F + T_i^M + T_i^L, i = h, w, \frac{\partial \overline{T_i}}{\partial H} > 0, \frac{\partial^2 \overline{T_i}}{\partial H^2} < 0 \quad (5)$$

Household maximizes its utility function subject to the household full income constraint by combining its profits and total value of time.$F$ denotes full income, $\pi$ represents profits, and $W$ denotes market wage rates, $P^{XH}$ denotes input prices for home good production, and $P^C$ denotes prices for consumption goods. Then, the optimum conditions and the household Marshallian time demand are provided for household good production as a reduced form.

$$\sum_i W_i \left(T_i^H + T_i^L + T_i^M\right) + P^{XH} X^H + P^C C \leq \pi + \sum_i W_i \overline{T_i}(H_i) + Y = F(H) \quad (6)$$

$$T_i^H = \emptyset^H(F, W_h, W_w, P^{XH}, P^C, H_h, H_w; Z, \rho) \quad (7)$$

It has unobserved characteristic $(Z, \rho)$, which sophisticate theoretical of morbidity effect on intrahousehold resource allocation. The effects of morbidity can be estimated by taking the derivative with respect to $H_{-i}$ (the health condition of a sick member):

$$\frac{\partial {T_i}^H}{\partial H_{-i}} = \frac{\partial {\varphi_i}^H}{\partial H_{-i}} + \frac{\partial {\varphi_i}^H}{\partial F} \frac{\partial F}{\partial \overline{T}_{-i}} \frac{\partial \overline{T}_{-i}}{\partial H_{-i}}; \frac{\partial {\varphi_i}^H}{\partial H_{-i}} < 0; \frac{\partial {\varphi_i}^H}{\partial F} \frac{\partial F}{\partial \overline{T}_{-i}} \frac{\partial \overline{T}_{-i}}{\partial H_{-i}} > 0 \quad (8)$$

The first term in the right-hand side is negative because of an increasing need to help the sick member. The second term is positive because a health shock reduces full income via decline in total available hours and wage rates. The overall effect of a health shock on house good production providing ambiguity results. A loss of adult labor over the duration of sickness decreases homegood productionvia income effect.Otherwise, duration of sickness increases the time via a substitution effect. Decreasing in home good production if income effect is higher than substitution effect.

The demand for agriculture labor also has alternative ways for coping the health shock. The sick member may be replaced completely by hired labor, it can also be substituted by other healthy household members. Under the assumption of perfect substitute of hired labor, total labor hours in household's production will not be affected although a sick member reduces his or her own labor hours (Benjamin, 1992; Pitt & Rosenzweig, 1986). On the other hand, households with sick adults arelikely more affected by the negative health shocks due tothe decreasing of total labor used in households. The level of labor substitution is depends on household-spesificunobserved characteristics.

This study, two hypotheses are going to be tested. First, we explore whether Indonesian agricultural households adjust labor hours of healthy members in the face of morbidity shocks. Second, we test whether household profits are affected by morbidity of breadwinner of the household.

## 3. Data

This study focuses on agricultural households in Indonesia, involving adult household members who are vulnerable to symptoms of morbidity. The data used consisted of two data waves (2007 and 2014) Indonesian Family Life Survey (IFLS). IFLS represents around 83 per cent of the population living in 13 of 26 provinces in Indonesia. This survey consisted of 16,204 households in Indonesia

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

that provided information on demographic, socio-economic and public health conditions. By considering various characteristics, we focus on individuals in a household, namely the household head and their partners, so that the sample is 5,643.

One of the essential parts of this data is providing detailed information about the individual working hours of each household member over 15 years old, including main work and additional work. The estimation of the number of working hours of household members is associated with income generating efforts during the past week. The data also involves the value of agricultural income and expenditure over the past 12 months. For respondents who were unsure about the answers, this survey provided a choice of ranges of nominal value in rupiah. Data on agricultural income and expenditure areused to calculate the number of farming profits. This research involved data on farm products because researchers is taking into the types of work of most Indonesian people. Estimates of income received by households can later be used to estimate the amount of family medical expenses in one month. Consideration of medical expenses arises due to health shocks in the household, so this is important to know whether the income received can cover various expenses, especially unexpected expenses such as health costs.

Another essential part is the data on natural disaster events in the last 5 years. 'Does the impact of natural disasters affect the physical health of individuals in the household?' Although some regions in Indonesia do not feel the significant impact of natural disasters, this study tries to control the measurement of self-reported general health status, morbidity conditions, and physical health assessments carried out by health workers. Whether respondents had been diagnosed with chronic illness by medical personnel (hypertension, diabetes, cancer, chronic lung disease, stroke, etc.), and when the diagnosis was first made. Furthermore, respondents were asked the question of whether chronic diseases limit their work. The longer the respondent suffers from chronic diseases, the more limited he is in doing work.

Furthermore, efforts should be made to avoid endogenous problems due to the measurement of self-reported individual health status that causes biased results (Meyer & Mok, 2019). Individuals will likely underestimate or overestimate information about their health status. A person who is wealthier and more educated will be more concerned about his health status, so it is likely to recognize that the disease limits activity. It is different from poor households who continue to work even though their physical condition decreases. The nature and severity of the disease have a different impact on the household, so the coping mechanism is different (Lim, 2017). Self-reported information also remains essential to consider the perception of the behavior of sick people (Wilson, 2001).

To collect more objective health information, it is necessary to involve the health status of individuals recorded through self-reporting with measures of physical ability to carry out daily activities (ADL). ADL reports a person's disability resulting from interference/health conditions and environmental factors (physical and social environment) interactions. In survey data in Indonesia, household members at least 15 years of age and above were asked some daily activities. Questions ranging from light activities are carried out, such as taking medicine to challenge activities such as walking 1 km. ADL measurement is calculated on three levels based on the respondent's answer, namely whether the activity is easy, difficult, or cannot do it. This test is done to minimize measurement errors.

In this section, we count the number of answers to ADL questions, then calculate the overall health score of all respondents. This is done because each activity requires different abilities. The questions of ADL are included in appendix of this study. This score then converted to the ADL health index with an algorithm using standard formulas (Stewert et al., 1989) to easier interpretation.

$$ADL\ Index = (Score - Min\ Score\ Data)/(Max\ Score\ Data - Min\ Score\ Data)$$

The ADL index is worth 1 if the individual can do all activities without difficulty, while 0 if the individual cannot do the activity. Furthermore, ADLs are divided into two categories, namely basic ADL and intermediate ADL. The ability to do some basic activities, such as bathing, eating, dressing, standing from the bed, going to the toilet will going to called by the basic ADL index. The intermediate ADL index is measured by the ability to do work that requires strength, such as lifting heavy objects, drawing water, walking 1 km, and sweeping the floor.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

**Table 1.** Descriptive Statistics
Sources: Authors' calculations based on IFLS data (2007 and 2014)

| Dependent variable | Mean | | Std. Dev | | Change | |
|---|---|---|---|---|---|---|
| | 2007 | 2014 | 2007 | 2014 | Mean | Std. Dev |
| Total weekly hours labor | 35.907 | 32.045 | 24.252 | 24.099 | -1.738 | 18.593 |
| Total weekly hours labor: husband | 37.660 | 33.712 | 24.414 | 22.648 | -1.717 | 18.964 |
| Total weekly hours labor: wife | 33.578 | 31.733 | 24.113 | 26.006 | -0.846 | 16.197 |
| Medical expenditure (ln) | 0.039 | 0.080 | 0.131 | 0.220 | 0.021 | 0.175 |
| Farm profit (ln) | 2.252 | 2.944 | 5.917 | 8.587 | 0.346 | 6.471 |
| Farm size ($m^2$) | 0.761 | 0.287 | 15.531 | 1.740 | -0.237 | 10.838 |
| Household size | 4.208 | 3.915 | 1.842 | 1.951 | -0.148 | 1.298 |
| Age | 52.916 | 59.778 | 9.530 | 9.581 | | |
| Household head: male (male=1) | 0.866 | 0.883 | 0.341 | 0.321 | | |
| Education (year) | 5.331 | 5.218 | 4.386 | 4.506 | | |
| Household head education (year) | 5.811 | 7.732 | 4.450 | 4.995 | -0.056 | 1.201 |
| Disaster caused by illness (yes=1) | 0.077 | 0.025 | 0.266 | 0.158 | 0.928 | 2.764 |
| Disaster last 5 years (yes=1) | 0.241 | 0.200 | 0.428 | 0.400 | | |
| Number of household members < 15 years old | 1.183 | 0.951 | 1.164 | 1.068 | -0.116 | 0.777 |
| Number of household members > 60 years old | 0.555 | 0.829 | 0.738 | 0.806 | 0.136 | 0.508 |
| Chronic illness < 1 year: wife (yes=1) | 0.125 | 0.190 | 0.330 | 0.392 | 0.032 | 0.324 |
| Chronic illness < 1 year: husband (yes=1) | 0.077 | 0.133 | 0.267 | 0.340 | 0.028 | 0.265 |
| Chronic illness > 1 year: wife (yes=1) | 0.125 | 0.106 | 0.330 | 0.308 | -0.006 | 0.291 |
| Chronic illness > 1 year: husband (yes=1) | 0.077 | 0.087 | 0.267 | 0.282 | 0.008 | 0.226 |
| ADL index: wife | 0.955 | 0.783 | 0.082 | 0.181 | -0.079 | 0.156 |
| ADL index: husband | 0.972 | 0.729 | 0.075 | 0.198 | -0.108 | 0.185 |
| Basic ADL index: wife | 0.991 | 0.786 | 0.049 | 0.316 | -0.093 | 0.236 |
| Basic ADL index: husband | 0.993 | 0.655 | 0.048 | 0.360 | -0.148 | 0.293 |
| Intermediate ADL index: wife | 0.897 | 0.785 | 0.163 | 0.229 | -0.056 | 0.164 |
| Intermediate ADL index: husband | 0.939 | 0.849 | 0.142 | 0.218 | -0.043 | 0.144 |
| Observation | 5,643 | | 5,643 | | | |

In the first period of 2007, it was found that the average number of hours worked for the husbands was 38 hours per week, while the wives were 34 hours. However, in the 2014 period both experienced a decline, namely the average working hours of husbands to 34 hours and working hours ofwives was 32 hours. In general, reduced working hours can be caused by a decrease in physical function caused by a decrease in individual abilities. Table 1 shows that in the two survey periods there was an increase in symptoms of chronic diseases betweenhusbands andwives, this was also accompanied by a decrease in the ability to carry out activity daily living (ADL). The condition of the decline in the level of individual health leads to increased health costs.

## 4. Method

Morbidity shocks may be endogenous factors because health status can be affected by the time allocated to produce public goods such as sanitation. Meanwhile, some confounding factors, such as natural disasters, can affect household members' income and health status. Natural disasters occur in all villages, causing different losses between households. For instance, the emergence of crop failure due to a flood and damaged crops caused by pests have different results. Another more significant

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

impact is the high cases of morbidity, which causes a decrease in household productivity and income in the long run.

In this case, the level of labor substitution and the households' ability to cope with health shocks tend to be influenced by factors that cannot be observed by households, such as preferences, use of production technology, and allow the replacement of various types of work in the households members.Therefore, this study uses a fixed-effect specification on household level to estimate the effect of morbidity on household welfare through coping with labor substitution strategies in meeting labor supply ($L$) based on individuals ($i$) in households ($h$) and years ($y$):

$$L_{iht} = \alpha_h + \beta_0 d_t + \beta_1 H_{mht} + \beta_2 H_{fht} + \beta_3 D_h + \beta_4 K_h + \varepsilon_{ih} \quad \text{(Model 1)}$$

Where, L is the labor supply analyzed using the number of working hours of household members in one week, $\alpha_h$ is control for specificunobserved household, $d_t$is the dummy of time in the 2007 and 2014 observations. $H_{mht}$ and $H_{fht}$ are dummies for indicator variables of male and female adult status in productive age. D is a dummy of natural disasters measured at the household level. IFLS provides information on natural disasters that have occurred over the past five years, such as floods, landslides, volcanic eruptions, and so on, as well as their impact on income and household health. $K$ is a series of householdspesificcontrol variables, including ages, educational backgrounds, number of household members, and agricultural characteristics?

We used consumption expenditure to measure of economic welfare. For this reason, it is important to examine the impact of morbidity on health expenditure (M) to consider changes in household welfare due to the influence of health shock.To control the primary source of spurious correlation, which influences changes in time and health allocation. This estimation is needed to test whether there is a differential influence of morbidity on duration and severitybecause it takes into account the length illness by the individual and the impact of natural disasters (Beegle, 2005).The estimated effect of morbidity on household farm profits ($h$):

$$\pi_{iht} = \alpha_h + \beta_0 d_t + \beta_1 H_{mht} + \beta_2 H_{fht} + \beta_3 D_h + \beta_4 K_h + \varepsilon_{ih} \quad \text{(Model 2)}$$
$$\Delta L_{ih} = \alpha_h + \beta_1 \Delta H_{mht} + \beta_2 \Delta H_{fht} + \beta_3 D_h + \beta_4 K_h + \varepsilon_h \quad \text{(Model 3)}$$

Similar toEquation (model 2), the model still considers the impact of dummy disaster ($D$) at the household level by controlling for confounding factors that affect the level of household health and agricultural output. Assuming a total labor market and the separation between consumption and production, the coefficient of household heads ($H_{mh}$)and their spouses ($H_{fh}$) is zero. That is, there is no morbidity effect on household agricultural productions. The emergence of alternative models allows one to think more strongly to predicting resource allocation decisions that affect changes in income and other household members' health status. However, Gertler and Gruber (2002), in their research, they assume that consumption insurance has minimal effect on cases of the disease in Indonesia.

## 5. Results

### a. Effects of Chronic Disease and Morbidity on Husband-and-Wife Labor Supply

The influence of chronic diseases and morbidity will affect changes in the number of working hours of husbands and wives. In table 2 presents the results of regression estimation using the household fixed-effect (HFE) and village fixed-effect (VFE) models. HFE results show that chronic husband's disease less than one year is associated with a reduction of 6 working hours per week. Similar with the previous results, the VFE model of ahusbands suffering from a chronic illness will also reduce the number of working hours.

**Table 2.** Effects of Chronic Illness and Morbidity on Husband-and-WifeLabor Supply

| Dependent variable | Husband labors | | Wife labors | |
|---|---|---|---|---|
| | HFE | VFE | HFE | VFE |

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

| | | | | |
|---|---|---|---|---|
| Chronic illness < 1 year: husband | -5.914*** | -6.087*** | -1.771 | -1.683 |
| | (1.858) | (1.863) | (1.797) | 1.794 |
| Chronic illness > 1 year: husband | 1.516 | 1.515 | -2.323 | -1.859 |
| | (2.170) | (2.174) | (2.101) | 2.101 |
| Chronic illness < 1 year: wife | 0.659 | 0.595 | 0.437 | 0.146 |
| | (1.461) | (1.462) | (1.623) | 1.627 |
| Chronic illness > 1 year: wife | 1.147 | 1.221 | -0.746 | -0.730 |
| | (1.679) | (1.680) | (1.804) | 1.801 |
| Age | -0.584*** | -0.725*** | -0.342*** | -0.210* |
| | (0.088) | (0.109) | (0.106) | (0.117) |
| Household head education | | 0.243 | 0.188 | 0.239 |
| | | (0.161) | (0.167) | (0.168) |
| Number of household members < 15 years old | | -1.116** | | -0.750 |
| | | (0.646) | | (0.686) |
| Number of household members > 60 years old | | 0.840 | | -2.875*** |
| | | (0.864) | | (0.891) |
| Household head: male | | 1.111 | -0.084 | 0.030 |
| | | (5.330) | (4.618) | (4.611) |
| Change of household size | 0.651** | 0.967 | 0.646* | 0.949** |
| | (0.325) | (0.388) | (0.352) | (0.422) |
| Change of farm size | -0.072* | -0.067 | | -0.063 |
| | (0.042) | (0.042) | | (0.161) |
| Disaster last 5 years | -2.937*** | -0.071** | -3.144** | -3.174** |
| | (1.096) | (2.109) | (1.134) | (1.243) |
| Illness caused by disaster | | -2.963 | | 0.780 |
| | | (1.191) | | (2.129) |

Source: Authors' calculations using IFLS data (2007 and 2014)
* p < 0.10, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses. All standard errors were adjusted within cluster. Dependent variables of HHFE and VFE models are define by changes in labor hours. N= 5,643 individual for total of husband and wife

The results are not consistent with previous studies, Lim (2017) found evidence that husbands would reduce their working hours if they had a chronic illness for more than one year. This is because long-term sufferers of chronic diseases will limit their productivity. Gertler et al. (2009) also did not find a significant effect of chronic illness on working hours of the household head. Meanwhile, similar with Lim (2017), this study does not prove that husbands reduce working hours when their wives have symptoms of morbidity.

In the symptoms of chronic disease, the household will increase the working hours of other household members as part of the substitution of 'AddedWorkers Effect'(AWE). This section finds evidence thathusbands will reduce their 1-hour work if in the household there is (at least one) member is under 15 years of age. Children in a household will increase their time to work as AWE due to a decrease in their parents' health. We found no evidence that wives would reduce their working hours because of the chronic symptoms they had; they would reduce working hours because they had household members over 60 years old. Reduction of wife's working hours is used to treat other sick household members. We involved change of household size to control the number of household members in 2007 and 2014 and to see how labor substitution would be if other household members had an illness. The change of household size affect wife and husband to increase their working hours.

Besides, this model also controls the influence of confounding factors that occur at the household and village level. Variables of natural disasters in the last five years have been indicators of changes

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

in household and village conditions. The HFE and VFE estimation results show that natural disasters have a negative and significant effect on the supply of household labor. Wife labors have bigger significant effect if they experienced natural disasters on the last five years. They will reduce their working hours. Natural disasters do not always cause a person's physical changes, but they also affect the mental condition due to the trauma they feel.

**b. Effects of Chronic Disease and Morbidity on Labor Supply and Medical Expenditures**

The difference in changes inhusbands and wives working hours is likely due to the role specification in the household. If the husband experiences symptoms of morbidity, in general, it will affect the condition of household welfare. This is because the husband's working hours are more significant or work full time.

**Table 3.** Effects of Chronic Disease and Morbidity on Medical Expenditures and Labor Supply

| Dependent variable | Labor hours | | Medical expenditure | |
|---|---|---|---|---|
| | HFE | VFE | HFE | VFE |
| Chronic illness < 1 year: husband | -5.147** | -4.638** | 0.087*** | 0.081*** |
| | (1.835) | (1.839) | (0.012) | (0.012) |
| Chronic illness > 1 year: husband | -0.510 | -0.270 | 0.002 | 0.000 |
| | (2.145) | (2.145) | (0.015) | (0.015) |
| Chronic illness < 1 year: wife | -1.536 | -1.156 | 0.013 | 0.007 |
| | (1.522) | (1.530) | (0.011) | (0.011) |
| Chronic illness > 1 year: wife | 1.468 | 1.056 | 0.020* | 0.024** |
| | (1.728) | (1.730) | (0.012) | (0.012) |
| Household head education | | -0.174 | | 0.003*** |
| | | (0.153) | | (0.001) |
| Number of household members < 15 years old | | -0.329 | | 0.007 |
| | | (0.658) | | (0.005) |
| Number of household members > 60 years old | | -2.391*** | | 0.024*** |
| | | (0.815) | | (0.006) |
| Household head: male | | -1.171 | | 0.016 |
| | | (4.956) | | (0.040) |
| Change of household size | 0.601* | 0.679* | 0.007*** | 0.005* |
| | (0.336) | (0.406) | (0.002) | (0.003) |
| Change of farm size | -0.060 | -0.066 | 0.000 | 0.000 |
| | (0.056) | (0.056) | (0.000) | (0.000) |
| Disaster last 5 years | -2.931** | -2.835** | -0.005 | -0.005 |
| | (1.217) | (1.217) | (0.009) | (0.009) |
| Illness caused by disaster | 2.133 | 1.676 | -0.035** | -0.030* |
| | (2.119) | (2.120) | (0.015) | (0.015) |

Source: Authors' calculations using IFLS data (2007 and 2014)
* p < 0.10, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses. All standard errors were adjusted within cluster. Dependent variables of HHFE and VFE models are define by changes in labor hours. N= 5,643 individual for total of husband and wife

Table 3 estimation results, the HFE and VFE model decreases 5 working hours per week when the husband suffers from a chronic illness of less than one year, but there is no significant change in workload in responding to wife's illness. This condition may be due to the substitution of other labor supplies that can replace the husband's role in the household. For example, the amount of wife's

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

working hours is lower than the husband's working hours, so it is more likely to be replaced by other household members. The presence of gender roles also influences the difference in working hours; women spend more time caring for sick adults, while men have dependents to increase their time to earn more income.

In this case, changes in household working hours affect income and the level of household welfare. The decline in the level of well-being is generally caused by the increase in household expenditure rather than the income received. The high potential of chronic diseases causes a decrease in household products, so it is crucial to test whether the morbidity level has a significant effect on household health expenditure. The regression estimation results show that there are no significant differences between the HFE and VFE models in columns 3 and 4; health costs increase when husbands and wives suffer from chronic diseases. Increased health costs occur when a husband suffers from a chronic illness of less than one year and his wife for more than one year. Although there are differences in the VFE model, that is, an increase in health costs occurs when households have members over 60 years old. This result supports the research of Simeu & Mitra (2019), Mitra, et al., (2016) disability increases health spending, especially in developing countries.

Although the IFLS data does not make it possible to separate long-term and short-term impacts appropriately, the increase in health costs due to disability in 2007 that occurred may be due to a rise in short-term health costs. Both of these dependent variables prove high public health awareness in Indonesia. Those who are diagnosed with a chronic illness will automatically reduce their 5 hours of work per week to do their own health care. Interestingly, in this section, the impact of natural disasters has a significant negative effect on both models. This further strengthens that natural disasters in Indonesia are detrimental to households which are characterized by a reduction in the number of working hours and an increase in medical costs due to the level of pain they suffer. According to *Data Informasi Bencana Indonesia* (DIBI)-BNPB, the number of disasters caused by geological factors does not have much effect compared to hydrometeorologists, such as floods, weather changes, forest fires, and droughts. Hydrometeorological disasters have a huge impact, especially in the economic and environmental sectors (Amri et al., 2016). Furthermore, these findings also prove evidence of AWE's contribution to the substitution of labor supply depending on age. Families with 60-year-old household members will significantly reduce the proportion of working hours and medical expenses.

**c. Effects of Adult Morbidity on the Profit of Household Farming**

To identify differences in the physical abilities of each based on the ADL index, health shocks cannot only be observed in one type of test. Therefore, this section presents fixed-effect information about the effect of adult morbidity on the supply of householdlabor. Each model requires different ADL category specifications to observe the difference in impact. We involve models for ADL indices, basic ADL indices, and intermediate ADL indices. Basic ADL indices are used to measure a person's ability to carry out lighter basic activities, while an intermediate ADL index measures a more cumbersome activity. The list questions of ADL are included in appendix section of this paper.

In the previous section discussed how to overcome the disease through substitution of labor supply, this section needs to be addressed about the comparison of adults to family farm yields. Agrarian costs collect agricultural income obtained through agricultural income. Next, transform the value of farming profits by counting 1000,000 Rupiah. This assumes there are many negative values. Table 5 shows the estimation of health regression with changes in the ADL index score.

**Table 4.** Effect of Health Shocks on Household Farm Profit

| Dependent variable | Farm profit | | | |
|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 |
| Chronic illness < 1 year: husband | -0.75 | | | |
| | 0.475 | | | |
| Chronic illness > 1 year: husband | 0.01 | | | |
| | 0.555 | | | |

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

| | | | | |
|---|---|---|---|---|
| Chronic illness < 1 year: wife | -0.259 | | | |
| | 0.408 | | | |
| Chronic illness > 1 year: wife | | 1.179*** | | |
| | | 0.446 | | |
| ADL index: husband | | 0.0267 | | |
| | | 0.80074 | | |
| ADL index: wife | | -0.5245 | | |
| | | 0.8903 | | |
| Basic ADL index: husband | | | -0.086 | |
| | | | 0.464 | |
| Basic ADL index: wife | | | -0.571 | |
| | | | 0.53 | |
| Intermediate ADL index: husband | | | | 0.53 |
| | | | | 0.814 |
| Intermediate ADL index: wife | | | | 0.865 |
| | | | | 0.774 |
| Year (2014=1) | 0.992*** | 0.82606 | 0.765*** | 1.071*** |
| | 0.174 | 0.29336 | 0.246 | 0.205 |
| Change of household size | 0.074 | 0.07191 | 0.074 | 0.07 |
| | 0.091 | 0.09137 | 0.091 | 0.091 |
| Change of farm size | 0.007 | 0.00712 | 0.007 | 0.008 |
| | 0.014 | 0.01353 | 0.014 | 0.014 |
| Disaster last 5 years | -0.125 | -0.0963 | -0.088 | -0.072 |
| | 0.311 | 0.31169 | 0.312 | 0.312 |

Source: Authors' calculations using IFLS data (2007 and 2014)
* p < 0.10, ** p < 0.05, *** p < 0.01. Standard errors are in parentheses. All standard errors were adjusted within cluster. Dependent variables of HHFE and VFE models are define by changes in labor hours. N= 5,643 individual for total of husband and wife.

The results of the study prove to further research on increasing agricultural income.Interestingly, husbands opposed will reduce the congestion caused by their wives being sick for a long duration. Changes in the ADL index score do not affect changes in household farm profits. An increase in agricultural profit by 2 per cent may be due to reduced traffic hours and transferred to the farming sector, which can be maintained by husbands who suffer from chronic diseases.

## 6. Conclusion

This study aims to test whether Indonesian agricultural households adjust labor hours of healthy members in the face of morbidity shocks. Second, we tested whether household profits are affected by morbidity of breadwinner of the household.Regarding household problems due to health shocks, only a few studies have analyzed household coping strategies. The success of the substitution of household labor supply may be an important coping strategy in meeting household productivity levels. Natural disasters affect the level of morbidity which causes a reduction in working hours for husbands and wives in the household, thereby reducing household income. The results show that the duration of illness from the head of the household not only increases the working hours of other household members but also shocks health expenditures. The head of the household who is chronically ill for less than 1 year, will significantly reduce his working hours and there will be a substitution of labor

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

from other household members. Unlike their wives, they will reduce their working hours when another member of the household is sick.

Although health awareness in Indonesia is quite high, husband and wife have different responses. The results show that husbands will access medical expenses when they have complaints of illness, while wives will access medical expenses when they have had chronic pain for more than 1 year. The wife generally will prioritize the interests of other household members who are sick. The study also found significant evidence that women would reduce the number of hours they worked caring for a sick adult household member. On the other hand, the agricultural sector will be an alternative to health shocks. Result show that profit increase during the compilation reduced the number of hours to treatwives suffering from chronic diseases.

The implication of this study is the policy of reforming the healthcare system especially for the near-poor in the informal sector. Near poor recipient households do have low health preference, thus their consumption is not affected by medical cost incurred by health shocks. This mean that their inability to secure income might arise from constrained ability to work. Here, government could assist using formal safety nets that ensure households' ability to ensure their income such as policy that promotes paid sick leave. The substantial welfare benefit from disability insurance for rural households may be occur here. While the National Health Insurance Program (*Jaminan Kesehatan Nasional*) may relieve direct costs of health shocks, labors in the informal sector will be suffer from indirect costs of health shocks.

## 7. Research Limitation

This study only discusses changes in working hours and levels of household head pain due to natural disasters, particularly in the agricultural sector. We do not discuss the impact of natural disasters extensively, because it is necessary to control the changes in income and loss levels that occur after a disaster. Meanwhile, at the farm level, labor substitution for family members is easy to find, because they can work part time to help manage the family farm. Their children will participate in cultivating the agricultural land after they return from school. This will be different for other types of work that force people to work full time. In addition, we also do not control how much health assistance from the government can support household medical expenses each period.

## APPENDIX

**ADL list questions**

| **questions** | **Answers** | | | |
|---|---|---|---|---|
| To dress without help | easily | With difficulty | Can do with help | Unable to do it |
| To bathe | easily | With difficulty | Can do with help | Unable to do it |
| To get out of bed | easily | With difficulty | Can do with help | Unable to do it |
| To eat (eating food by oneself when it is ready) | easily | With difficulty | Can do with help | Unable to do it |
| To control urination or defecation | easily | With difficulty | Can do with help | Unable to do it |
| To carry a heavy load | easily | With difficulty | Unable to do it | |
| To draw a pail of water from a well | easily | With difficulty | Unable to do it | |
| To walk for 1 kilometer | easily | With difficulty | Unable to do it | |
| To walk 5 for kilometer | easily | With difficulty | Unable to do it | |
| To sweep the house floor yard | easily | With difficulty | Unable to do it | |
| To bow, squat kneel | easily | With difficulty | Unable to do it | |
| To walk across the room | easily | With difficulty | Unable to do it | |

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

| | | | |
|---|---|---|---|
| To stand up from sitting on the floor without help | easily | With difficulty | Unable to do it |
| To stand up from sitting position in a chair without help | easily | With difficulty | Unable to do it |
| To reach or extend your arms above shoulder level | easily | With difficulty | Unable to do it |
| To pick up a small coin from a table | easily | With difficulty | Unable to do it |

Source: Indonesia Family Life Survey, 2014

**References**

1. Abegunde, Dele Olawale, and Stanciole, Anderson E. 2008. The Economic Impact of Chronic Diseases: How do Households Respond to Shocks? Evidence from Russia'. Social Science and Medicine 66 (11): 2296-2307.
2. Alam, Khurshid and Mahal, Ajay. 2014. 'The Economic Burden of Angina on Households in South Asia'. BMC Public Health 14:179-190.
3. Amri, M. R. et al., 2016. Resiko Bencana Indonesia, Jakarta: Badan Nasional Penanggulangan Bencana.
4. Asfaw, Abay, and Joachim von Braun. 2004. 'Is Consumption Insured against Illness? Evidenceon Vulnerability of Households to Health'. Economic Development and Cultural Change 53 (1): 115-129.
5. Awudu, Abdulai, and Regmi Punya, Prasad. 2000. 'Estimating Labor Supply of Farm Households Under Non-Separability: Empirical Evidence from Nepal'. Agricultural Economics 22(3): 309-329.
6. Bales, Sarah. 2013. 'Impact of Health Stocks on Household Welfare in Vietnam-Estimates Using Fixed Effects Estimation'. HEFPA Working Paper. Rotterdam: Erasmus Universiteit.Bardhan. 1984. Land, Labor and Rural Poverty: Essays in Development Economics. New York, Columbia: University Press.
7. Beegle, Kathleen. 2005. 'Labor Effects of Adult Mortality in Tanzanian Households'. Economic Development and Cultural Change 53 (3):655–683.
8. Berloffa, Gabriella, and Modena, Francesca. 2013. 'Income Shocks, Coping Strategies, and Consumption Smoothing: An Application to Indonesian Data'. Journal of Asian Economics 24:158-171.
9. Bridges, Sarah and Lawson, David. 2008. 'Health and Labor Market Participation in Uganda'.
10. Helsinki, Finland: WIDER Discussion Papers: United Nations University.
11. Cesarini, D., Lindqvist, E., Notowidigdo, M., & Östling, R. 2017. The Effect of Wealth on Individual nd Household Labor Supply: Evidence from Swedish Lotteries. The American Economic Review, 07(12), 3917-3946. doi:10.2307/26527900
12. Chiappori, P., & Mazzocco, M. 2017. Static and Intertemporal Household Decisions. Journal of conomic Literature, 55(3), 985-1045. Retrieved July 7, 2020, from www.jstor.org/stable/26303309Chetty, Raj, and Adam Looney. 2006. 'Consumption Smoothing and The Welfare Consequences of Social Insurance in Developing Economies'. Journal of Public Economics 2351-2356.
13. Galiano, Aida, and Marcos Vera-Hernandez. 2008. 'Health Shocks, Household Consumption, and Child Nutrition'. IVIE Working Paper. no. 14. Edited by S.A. Instituto Valenciano de Investigaciones Economicas. December.
14. Gertler, Paul, and Jonathan Gruber. 2002. 'Insuring Consumption against Illness'. The American Economic Review 92 (1):51-70.
15. Gertler, Paul, David I. Levine, and Enrico Moretti. 2003. 'Do Microfinance Programs Help Families Insure Consumption Against Illness?'. Center for International and Development

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

Economics Research Working Paper No. C03-129. Berkeley, California: Center for International and Development Economics Research UC Berkeley, May.
16. Gertler, P., Levine, D. I. & Moretti, E., 2009. 'Do Microfinance Programs Help Families Insure
17. Consumption Against Illness?'. Health Economics, 18(3): 257–273.
18. Guarcello, Lorenzo, Fabrizia Mealli, and Furio Camillo Rosati. 2010. 'Household Vulnerability
19. And Child Labor: The Effect of Shocks, Credit Rationing, and Insurance'. Journal of
20. Population Economics (Springer) 23 (1): 169-198.
21. Fallon, P., & Robert E. B. Lucas. 2002. The Impact of Financial Crises on Labor Markets, Household Incomes, and Poverty: A Review of Evidence. The World Bank Research Observer, 17(1), 21-45. Retrieved July 7, 2020, from www.jstor.org/stable/3986398
22. Ilahi, Nadeem. 2001. 'Gender and The Allocation of Adult Time: Evidence from The Peru LSMS Panel Data. The Policy Research Report on Gender'. Washington, DC: World Bank Working Paper. November.
23. Islam, Asadul, and Pushkar Maitra. 2012. 'Health Shocks and Consumption Smoothing In Rural Households: Does Microcredit Have a Role To Play?'. Journal of Development Economics 97: 232-243.
24. Jacoby, H., and Skoufias, E. 1997. 'Risk, Financial Markets, And Human Capital in a Developing Country'. The Review of Economic Studies, 64(3): 311–335.
25. Janvry, A. D. & Sadoulet, E., 2016. Development Economics Theory and Practice, 1st Edition. New York: Routledge.
26. Khan, Farid U, Bedi, Arjun S, and Sparrow, Robert. 2010. 'Sickness and Death: Economic Consequences and Coping Strategies of the Urban Poor in Bangladesh'. The Hague:
27. Erasmus University.Khandker, Shahidur Rahman. 1988. 'Determinants of Women's Time Allocation in Rural Bangladesh. Economic'. Development and Cultural Change 37:111–126.
28. Lim, Sung So. 2015. 'Consumption Vulnerability to Prolonged Illness'. Journal of International Development 29(3):351-369.
29. Lim, S. S., 2017. 'In Times of Sickness: Intra-household Labor Substitution in Rural Indonesian Households'. The Journal of Development Studies, 53(6): 788–804.
30. Lindelow, Magnus, and Adam Wagstaff. 2005. 'Health Shocks in China: Are the Poor and Uninsured Less Protected?'. World Bank Policy Research Working Paper 3740. Washington DC, October.
31. Liu, Kai. 2016. 'Insuring Against Health Shocks: Health Insurance and Household Choices'. Journal of Health Economics 46: 16-32.
32. Lundberg, Shelly. 1985. 'The Added Worker Effect'. Journal of Labor Economics 3(1):11-37.Maloney, Tim. 1991. 'Unobserved Variables and the Elusive Added Worker Effect'. Economica 58(230): 173-187.
33. Mete, Cem, and, Schultz, Paul T. 2006. 'Health and Labor Force Participation of The Elderly in Taiwan'. International Studies in Population 3:163-200.
34. Meyer, B. D. & Mok, W. K., 2019. "Disability, Earnings, Income and Consumption". Journal of Public Economics 171: 51-69.
35. Mitra, S., Palmer, M., Mont, D. & Groce, N., 2016. 'Can Households Cope with Health Shocks in Vietnam?'. Health Economics, 25(7): 888–907.
36. Mohanan, M. 2013. 'Causal Effects of Health Shocks on Consumption and Debt: Quasi-Experimental Evidence from Bus Accident Injuries'. The Review of Economics and Statistics 95(2):673–681.
37. Murphy, Adrianna, Mahal Ajay, Richardson Erica, and Moran Andrew E. 2013. 'The Economic Burden of Chronic Disease Care Faced by Households in Ukraine: A Cross-sectional Matching Study of Angina Patients'. International Journal for Equity in Health 12:38-45.
38. Nguyet, Nguyen Thi Nhu, and Eiji Mangyo. 2010. 'Vulnerability of Households to Health Shocks: An Indonesian Study'. Bulletin of Indonesian Economic Studies 46 (2): 213-235.
39. Nur, El Tahir Mohamed. 1993. 'The Impact of Malaria on Labor Use and Efficiency in the Sudan'. Social Science & Medicine 37(9):1115–1119.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 3, 2021, Pages. 5383 - 5396
Received 16 February 2021; Accepted 08 March 2021.

40. Rocco, Lorenzo, Tanabe, Kimie, Suhrcke, Marc, and Fumagalli, Elena. 2011. 'Chronic Diseases and Labor Market Outcomes in Egypt'. Washington, DC: World Bank Working Paper. November.
41. Russell, S. 2004. 'The Economic Burden of Illness for Households in Developing Countries: A Review of Studies Focusing on Malaria, Tuberculosis, and Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome'. American Journal Tropical Medical Hygiene, 71(2), 147–155.
42. Sauerborn, Rainer, Adams, Alayne, and Hien, M. 1996. 'Household Strategies to Cope with The Economic Costs of Illness'. Social Science and Medicine 43(3):291–301.
43. Serneels, Pieter M. 1998. Young Female Labor Supply in Urban Ethiopia. University of Warwick.Simeu, N. & Mitra, S., 2019. 'Disability and Household Economic Wellbeing: Evidence from Indonesian Longitudinal Data'. Oxford Development Studies.
44. Sparrow, R., De Poel, E. V., Hadiwidjaja, G., Yumna, A., Warda, N., & Suryahadi, A. 2014.
45. 'Coping with the Economic Consequences of Ill Health in Indonesia'. Health Economics, 23, 719–728.
46. Subramaniam, R. (1996). Gender-Bias in India: The Importance of Household Fixed-Effects. Oxford conomic Papers, 48(2), new series, 280-299. Retrieved July 9, 2020, from www.jstor.org/stable/2663728
47. Stewert, A. L. et al., 1989. 'Functional Status and Well-being of Patients with Chronical Conditions: Results from the Medical Outcomes Study'. Santa Monica: Rand Corporation.
48. Tano, Doki. K. 1993. 'The Added Worker Effect: A Causality Test'. Economics Letters 43(1): 111-117.
49. Wagstaff, Adam. 2007. 'The Economic Consequences of Health Shocks: Evidence from Vietnam'. Journal of Health Economics 26: 82-100.
50. Wilson, S. E., 2001. Work and the Accommodation of Chronic Illness: A Re-examination of the Health-Labor Supply Relationship. Applied Economics, 33: 1139-1156.
51. Xiaodong, Gong, and Soest, Arthur V. 1997. 'Family Structure and Female Labor Supply in Mexico City'. Tilburg Center Working Paper. Tilburg.
52. Yamauchi, Futoshi, Buthelezi, Thabani, and Velia, Myriam. 2008. 'Impacts of Prime-Age Adult Mortality on Labor Supply: Evidence from Adolescents and Women in South Africa'. Oxford Bulletin Economic Statistics 70:375-398.
53. Zhang, S. 2014. Wage shocks, household labor supply, and income instability. Journal of Population Economics, 27(3), 767-796. Retrieved July 7, 2020, from www.jstor.org/stable/44289683