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AND HEALTH INDICATORS OF WOMEN
AND CHILDREN IN WIDOWED-MOTHER
HOUSEHOLDS:
A TURKISH CASE STUDY

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Abstract

Survivors' benefits are cash payments made by government to family members when a worker dies. His or her spouse and unmarried children are entitled to receive these cash benefits. The payments are intended to help ease the financial strain caused by the loss of the worker's income. Survivors can receive benefits if the deceased partner was employed and contributed to Social Security long enough to be considered insured. Although these benefits aim to help single-head households who are in financial difficulties due to the loss of an additional household income, the remaining parents have generally serious challenges to do work both at labor market and home such as childrearing and house chores. Widows across the world therefore share two common experiences: a loss of social status and reduced economic circumstances. Prior research suggests that widowhood is much more common experience among women than men. Moreover, it is more likely to cause financial difficulties for women than for men, and financial strain reducing well-being of women. Using Cross-Sectional Income and Living Conditions Survey of Turkey (2006-2012), the first aim of this paper is to empirically analyze the effect of survivors' benefits on poverty indicators of widowed-mother households and secondly to investigate whether survivors' benefits promote health status of women and children in these families.

JEL Classifications: J1, J2

Keywords: Cash Benefits; Worker's Income; Social Security

ملخص

فوائد الورثة هي مدفوعات نقدية امن قبل الحكومة لأفراد الأسرة عند وفاة عامل. يحق للزوج أو الزوجة والأبناء غير المتزوجين في الحصول على هذه الفوائد النقدية. والغرض من هذه المدفوعات للمساعدة في تخفيف الضغوط المالية الناجمة عن فقدان الدخل للعامل. يمكن للورثة الحصول على مزايا إذا كان الشريك المتوفى عامل ومساهم في الضمان الاجتماعي منذ فترة طويلة بما يكفي لاعتباره مؤمن عليه. وعلى الرغم من هذه الفوائد والتي تهدف إلى مساعدة الأسر الذين يواجهون صعوبات مالية بسبب فقدان العائل الرئيسي لدخل الأسرة، الا أن الآباء المتبقين على قيد الحياة لديهم تحديات خطيرة عموما للقيام بالعمل سواء في سوق العمل أو المنزل مثل تربية الأطفال. لذا فان الأرامل في جميع أنحاء العالم لديهم اثنين من التجارب المشتركة: فقدان المركز الاجتماعي وانخفاض الظروف الاقتصادية. يشير بحث سابق أن الترمل هو أكثر شيوعا بين النساء أكثر من الرجال. وعلاوة على ذلك، فإنه من المحتمل أن يسبب صعوبات مالية للنساء أكثر من الرجال، والضغط المالي الذى يحد من رفاه النساء. باستخدام مسح الظروف المستعرضة للدخل والمعيشة تركيا (2006-2012)، الهدف الأول من هذه الورقة هو اجراء تحليل تجريبي لتأثير فوائد الورثة على مؤشرات الفقر للأسر الأرامل وخاصة النساء منهم وثانيا للتحقيق في ما إذا كانت فوائد الورثة تعزز الحالة الصحية للنساء والأطفال في هذه الأسر.

1. Introduction

Particular types of single parents can be counted as unmarried mothers and fathers; divorced parents; widowed parents; single adoptive parents; and parents who have been separated from their spouses because of a job, illness, etc. Several studies concur that single parenthood following a marital termination such as separation; widowhood and divorce have harmful economic and health consequences for women more than men do. Regarding poverty effects of marital termination, many of these studies typically employ one of the measures such as poverty rates, family income, per capita income to show the economic consequences of marital termination. It is commonly documented that poverty rates among women in the year following marital termination are uniformly higher than during marriage (Morgan, 1989; Holden and Smock, 1991; Smock et al., 1999). Furthermore, the reduction in economic sources following a divorce tends to be long lasting, unless women do not get remarried (Bedard and Deschenes, 2005). For instance, using Canadian Longitudinal Survey of Labor and Income Dynamics, Gadalla (2008) has found that about one quarter of women remained in low income for at least 1 year compared with 9.8% of men and women less than 40 years old were at higher risk of persistent poverty.

Considering the health effects of marital termination, Waldron et al. (1996) have found that married women have better health trends than their unmarried counterparts. Previous studies consider widowhood as one of the most stressful periods in an individual's life with physical effects such as new illnesses, lower perceived health status, increase in hospitalization and the usage of medicines followed by psychological effects such as increased risk of depression and mental illness (Avis et al., 1991). Due to the fact that the most common type of single parenting across the world is widowhood, our project focuses on the survivor benefits and their effects on women's and children's health outcomes and our main target is therefore female widows and their children. The classic definition of widowhood is the phase of marriage following the death of one of the partners. The public payment called ''Survivor benefits'' is made to a beneficiary from an annuity or policy when the policyholder dies.

This is the first study that the effects of survivor benefits on health status of widows and children in Turkey are examined, as well as, the effects of survivor benefits on poverty are explored. Previous researches have generally neglected these effects in the world, with the exception of USA, especially for the Middle East and North African (MENA) region. Thus, examining these effects in Turkey, other countries in the MENA region can follow Turkey as an example in order to improve the health status and decrease poverty of their countries' population and specifically for the sensitive group of widows. This study uses a detailed micro-level data that is the Income and Living Conditions Survey (ILCS) of Turkey during the period 2006-2012. The purpose of this study is to estimate and compare Ordered Logit and Probit with Bayesian Network model, while a structural equation model (SEM), is applied only for the robustness check. Overall, the results suggest that the poverty rate is reduced by 17 per cent owned to survivor benefits. The poverty gap between the households that receive the survivor benefits and those that do not, is 23 per cent. Those who receive the survivor benefits report higher health status level by 0.11 units (in a scale from 1 to 5) than widow mothers that do not receive the benefits, while children who are beneficiaries of survivor benefits report 0.16 unit higher levels of health status than their counterparts who do not get benefits.

The structure of the paper is as follows: In the next section, a brief literature review on the previous empirical researches on poverty and health effects of survivor benefits is discussed. In section 3, the followed methodology is described and the data is presented in section 4. In section 5, the empirical results are reported and the concluding remarks are finally discussed in the last section.

2. Literature Review

2.1 Survivor benefits and poverty outcomes

The literature on 'survivor benefits and poverty outcomes' are mainly based on US case studies. Myers et. al., (1987) is one of the novel studies on the survivor benefits and poverty outcomes. Using data from Ten-Year Longitudinal Retirement History Study, they analyzed the effect of joint-and-survivor benefits on poverty outcomes of women. Married retirees in traditional benefit plan of US, have two options to choose between *single life annuities* and *joint-and-survivor annuity*. In joint-and-survivor annuity option, retirees generally do monthly pension contribution due to the risk that they can die before their spouses and leave them with insufficient income. Relevant research shows that if all married men chose the joint-and-survivor annuity option, the mean income and the poverty rates of widows would be improved. However, although joint-and-survivor annuity have more advantages compared to the single life annuities for the widow women, studies show that survivor benefits in US apparently are not as effective in preventing poverty, especially among elderly women, after the death of a spouse or divorce (Burkhauser, et al., 1994). For instance, Myers et. al., (1987) have found that, on average women have higher levels of poverty as widows than when they were married. Moreover, using the 1990 Survey of Income and Program Participation (SIPP) matched to the Social Security Administration's benefit records, they found that widows are much more likely to be living in poverty than older married women. Besides US case studies, a study, which analyses the German Social Security system as well, similarly shows that German Social Security system is also less successful in maintaining the living standards of widowed women compare to married counterparts (Hungerford, 2001).

Although widows are consisted of the poorest part of the population even in most of the western countries, the social and economic situation of widows in eastern countries are much worse compared to Western countries. Widows are much more vulnerable people in a Middle Eastern society compare to the west. For instance, scholars show that more than a third of Egypt's women-headed households are living below the poverty line (Assaad and Rouchdy, 1999; Datt et.al, 1998). Moreover, customs and religions still play role in how widows are treated. Widows, especially the illiterate widows living in rural areas, are mostly ignorant of the legal rights that they have. For instance in India, many laws to protect women have been passed since independence. But it is the personal laws of each religious community that govern property rights and widowhood practices. Where patrilineal kinship systems are valid, inheritance still devolves onto the males, through the widow's brother and his sons (Owen, 2002).

On the other hand, Loewe, (2000) points out one of the reasons behind this situation as the low level of survivor benefits in the country. He indicates that many widows have no pension, although, in theory, they are entitled to one. Tajvar et. al. (2008) similarly argue that most of the Iranian elderly women are poor and do not adequately cover their living expenses to have better life standards. Not only in Iran but also in many other middle-eastern countries, there are not enough policies to protect and handle the widows who are not elderly as well. Globally, one-quarter to one-third of all families are headed by single mothers. In developing countries, divorce is not as common, but desertion, death, and imprisonment produce single-parent families which are primarily headed by women (Kinnear 1999).

2.2 Survivor benefits and health outcomes

According to Lee (2001) it is more likely for women to be widowed than men for two main reasons. Firstly, women in the majority live longer than men and secondly they tend to marry older men, although this age gap has been narrowing during the last years. Thus, because of these facts, the odds for women to become widowed are much greater than men's odds. On the other hand, relevant literature suggests that the widows and their children are generally in

poorer health, have less opportunity used physician services and spend more on health care compared with the general population (Springer, 1984). Moreover the loss of the spouse, and especially for the women, is one of the most intensive, negative and dramatic events that a person can live, next to the loss of a child (Bennett *et al.,* 2005). Therefore widowhood is also associated with various psychological, mental and physical problems (Chen *et al.,* 1999; Abdallah and Ogbeide, 2002; Amoran *et al.,* 2005). The main cause of these problems is the economic hardship and burden, especially for the women whose husband is generally considered as the principal breadwinner. In the case of widowhood, the death of husband leads to a deprivation of the widow and collapse of the nucleus and pillar of the family (Fasoranti and Aruna*,* 2007). Thus, this economic deprivation can have further effects on the health status of women and children.

As a financial contribution and a part of personal income, it is expected from survivor benefits to be effective on health outcomes. Among studies on the determinants of health, several researches found a strong relationship between income and health status. On average, individuals, who are in the most advantaged social groups in terms of high-income level, are healthier. Previous studies have also demonstrated that household income is associated with the development of children and youth (Huston et al., 1994; Brooks-Gunn and Duncan, 1997). Similarly, employed people are found to have better health, since they have an earning to sustain their life, while the unemployed people might be under-stress on searching for a job and may harm their mental and physical health. In other words, financial strain and vulnerability to the life events may affect health. However, some types of social security benefits delivered to the people can buffer the adverse effects on health (Rodriguez, 2001). This is actually the main concern of our study focusing on one of the social security benefits that is survivors' benefits.

3. Data Description and Variables

The main data used in this study have been derived from the Income and Living Conditions Survey (ILCS). ILCS is a cross-sectional survey which took place during the period 2006-2012 covering the respondents who are 15 years and older. The annual sampling size is around 13,000 households. ILCS also includes regions, which are coded according to the Nomenclature of Territorial Units for Statistics (NUTS) at level 1 classification and these regions are: TR1-Istanbul, TR2-West Marmara, TR3-Aegean, TR4- East Marmara, TR5-West Anatolia, TR6- Mediterranean, TR7-Central Anatolia, TR8-West Black Sea, TR9-East Black Sea, TRA-North-east Anatolia, TRB-Central east Anatolia, TRC- Southeast Anatolia (Turkish Statistical Institute, 2013). Considering our dataset based on variety of variables (TUIK, Income and Living Conditions Survey of Turkey (2006-2012), the number of women who are the beneficiaries of survivor benefits are 6721 out of 11,390 women. Namely, 59.01 per cent of the whole sample receives survivor benefits. For children, the number of beneficiary of survivor benefits is only 619 out of 2254 children. Table (1) and Table (2) present a number of descriptive statistics of our datasets for widowed women and children respectively.

To have a unique dataset for girls and boys together, children who are not married and aged under 25 years old are included in the dataset considering the conditions of being eligible for survivor benefits. The principal health outcome is self-assessed health (SAH) defined by a response to the question "What is your general health status; very good/good/fair/bad/very bad?" In order to give meaningful interpretations in the coefficients, the health status variable is reordered from 1 (very bad health status) to (very good health status). Figure (1) presents the percentage of each health status levels for widowed women who are receipting and not receipting survivor benefits respectively. The number of survivor benefits beneficiaries who report 'very good health status' is higher than the number of widowed women, who do not receipt any benefits but also report very good health status. Furthermore, a factor analysis,

which is presented in the empirical results section, is followed in order to construct a wealth index (poverty-deprivation index) based on the household belongings.

The wealth index can take negative values, which indicates low wealth levels, and positive values that are equivalent to higher wealth level. Figure (2) depicts a positive relationship between wealth index and the survivor benefits. However these explanations do not particularly enough to make predictions for a positive relationship without controlling the possible determinants of wealth. To examine the relationship in a more robust fashion, we proceed issues econometrically in the methodology section. Based on the literature, the control variables of interest are household income, age, job status, house tenure, education level, type of the fuel that is mostly used in the dwelling for heating, house size, whether or not the individual reports that is exposed to air pollution, area type (urban or rural) and NUTS 1 regions.

4. Methodology

4.1 Bayesian networks

The first part of this study examines the relationship between the health status and the treatment group of survivor benefits, where in this case the treatment variable is dummy indicating whether the household receives the survivor benefits or not. Then the levels of survivor benefits, instead of the dummy variable mentioned above, are included into the analysis. In this way the association between the survivor benefits and health status, is examined limiting our interest only to the sample of the current social benefits claimants.

This section discusses the directed acyclic graphs (DAGs) and describes the Bayesian Network (BN) used in this study. More specifically, the framework presented involves two mathematical pieces which are the DAGs and the probability theory focused on conditional independence. DAGs were primarily developed in computer science by Judea Pearl (1988; 2000; 2009) and Spirtes et al. (2000). Thus, DAGs are characterized by two distinct functions; DAGs represent the probability distributions in the first and they represent the causal paths and structures in the second. The representation of the probability distributions is given by the Markov condition, which in DAGs is equivalent to a more useful graphical relation; the d-separation (Pearl 1988). DAGs consist of three elements: variables (nodes, vertices), arrows (edges), and missing arrows. *Arrows* represent possible *direct causal effects* between pairs of variables and order the variables in time. An example of a DAG is presented in Figure (3).

The arrow between *T* and *F* in Figure (3) means that *T* may have a direct causal effect on *F*. Similarly, same holds for the arrow between *B* and *T*, *A* and *C* or *B* and *C*. In the case where there are *missing arrows*, it is implied that the strong assumption of no direct causal effect between two variables is rejected, which is so-called "strong null" hypothesis of no effect.

All variables directly or indirectly caused by a given variable are called its *descendants*. The descendants of *T* are *F* and *Y*, while the *descendants* of *B* are *C*, *D*, *T* (B's children), *E* (D's and T's child), *F* (T's child) and *Y* (child of *A*, *C*, *D*, *E*, *F*). On the other hand, *parents* are the variables that direct cause another variable. Coming back to Figure (3), the only parent of *F* is *T*, while the only parent of *T* is *B*. A similar definition to *descendants*, working on the opposite way, is the variables that are directly and indirectly cause of another variable and are called *ancestors*. For example the *ancestors* of *F* are *T* and *B*, while the *ancestors* of *E* are *B*, *D*, and *T*. *Paths* are sequences of adjacent arrows that traverse any given variable at most once. The arrows along a path may point in any direction. For example if *B* is the treatment and *F* is the outcome *then B→T→F* is the only causal path. By incorporating Figure (3), DAG into a general framework, let $V=(X_1, X_2,......,X_m)$, where *m* is the number of variables and X_i denotes the variable and its matching node. Denoting the parents as par_i and given the structure in *G*, the joint probability for *V* is defined as:

Definition 1. (Markovian parents) (Pearl, 2000): *Let V = {X_1, X_2, . . . X_v} be set of variables, and let P(v) be the joint probability distribution on these variables. A set of variables PA_j is said to be Markovian parents of X_j if PA_j is a minimal set of predecessors of X_j that renders X_j independent of all its other predecessors.*

$$p(x) = \prod_{i=1}^{m} p(x_i \mid par_i) \tag{1}$$

Applying the chain rule of probability, we have:

$$p(x) = \prod_{i=1}^{m} p(x_i \mid x_1, ..., x_{i-1}) \tag{2}$$

The causal Markov assumption is the central assumption that defines BN. According to this assumption, each node is independent of its non-descendants in the graph, conditional on its parents in the graph. In other words, given a node's immediate cause, we can disregard the causes of its ancestors. Thus, we have definition 2.

Definition 2. (Conditional Independence Graph): *The conditional independence graph of X is the undirected graph G = (V,E) where V = {X_1, X_2, . . . X_v} and (i, j) is not in the edge set E iff $X_i \perp X_j \mid X_{v \setminus \{I,j\}}$.*

Coming back to Figure (3), the Markov condition entails the following conditional independence relation for *F* to *B* and similar for the other relations.

$$F \perp B \mid T \tag{3}$$

F is independent of *B* given *T*, where $\perp$ stands for the statistical independence. This definition allows us to start with the complete graph, where each node is connected to all other nodes. Then remove the edges between X_i and X_j iff $X_i \perp X_j \mid rest$, where *rest* denotes the rest of the variables.

Definition 3. (Partial Correlation): *For $i \neq j \in 1, . . . , p$, $k \in rest$, let $\rho_{i,j \mid k}$ be the partial correlation between X_i and X_j given X_r ;$r \in k$.*

Based on the above definition we have that $X_i \perp\!\!\!\perp X_j \mid X_r \Leftrightarrow \rho_{i,j \mid k}$. A test for conditional independence is therefore a test for the partial correlation between the variables and the partial correlations can be estimated via regression analysis. Then, a test for the conditional independence is presented.

$$Z(i.j \mid k) = \frac{1}{2} \frac{(1 + \hat{\rho}_{i,j \mid k})}{(1 - \hat{\rho}_{i,j \mid k})} \tag{4}$$

Then it will be:

$$\sqrt{n - |k| - 3} \mid Z(i.j \mid k) \mid N(0,1) \tag{5}$$

The test for the independence is based at significance level *α*. Kalisch and Buhlmann (2007) have shown that the choice of *α* is not too important. However, a significance level *α*=0.01 is used. The DAG is estimated with PC algorithm and a pseudo-code is reported in Figure (4) (Spirtes et al., 2000).

Definition 5. (d-separation) (Pearl, 1988; Spirtes et al., 2000; Neapolitan, 2003): *Let G= (V,E) be a DAG, A $\subseteq$ V, X and Y be distinct nodes in V—A, and h be a chain between X and Y. Then h is blocked if one of the following cases holds:*

There is a node S $\in$A on the chain h and the edges incident to S on h meet head-to-tail at S.

There is a node S ∈A on the chain h and the edges incident to S on h meet tail-to-tail at S.

There is a node S such that S and all of S's descendants are not in A on the chain h and the edges incident to A on h met head-to-head at S.

The *d*-separation condition is especially important and useful in constructing a BN because it controls possible confounds as in the form of *S* described here. Graphically, d-separation usually exhibits two main cases: firstly $X{\rightarrow}S{\rightarrow}Y$ and secondly $X{\leftarrow}S{\rightarrow}Y$. The intuition behind this graphical representation is that *X* and *Y* are independent from each other conditioned on *S*. In the first case *X* causes *Y* through *S*, while in the second case *X* and *Y* have a common cause *S*. In addition, given the edge $X{\rightarrow}S$, it is said that the tail of the edge is at *X*, while the head of the edge is at *S*.

In addition, chains $X{\rightarrow}S{\rightarrow}Y$ (and its contraction $X{\rightarrow}S$), forks $X{\leftarrow}S{\rightarrow}Y$ and inverted forks $X{\rightarrow}S{\leftarrow}Y$ correspond respectively to causation, confounding, and endogenous selection. Thus, *X* and *Y* are associated by causation only because *X* is an indirect cause of *Y*. However, if *S* is a control variable conditioning on that, then the causal effect between *X* and *Y* is not identified and results to *over-control* bias. In other words, by including the control variable *S* would block, or control away the association from *X* to *Y*. Secondly, the variables *X* and *Y* can be associated if they share a common cause which is the case of the fork $X{\leftarrow}S{\rightarrow}Y$, which is known as *confounding* bias. The marginal association between *X* and *Y*, is biased because it does not identify a causal effect from *X* to *Y* and this association would be spurious. However, the conditional association between *X* and *Y*, given *S* would identify the causal effect of *X* on *Y* in DAG which would be zero. Lastly, in the case of the inverted forks $X{\rightarrow}S{\leftarrow}Y$, *X* and *Y* are marginally independent because they do not cause each other and do not share a common cause as in the previous situation. In that case, conditioning on the common outcome *S* of the two variables *X* and *Y*, the causal effect of *X* on *Y* is not identified and this phenomenon is called *endogenous bias* or by others is called selection bias (Hernan et al., 2004). In this study the PC algorithm is applied which takes as input raw data for a set of random variables assumed to be discrete or multivariate normal. The degree of a vertex is the number of vertices adjacent to it. In the large sample, the number of conditional independence tests required by the algorithm is bounded above by n^{k+2} where *k* is the maximum degree of any vertex in the true DAG (for more details on PC algorithm see also Spirtes et al., 2000).

Concluding relation (2) and definition (1) use the back-door criterion. More specifically, estimating the effect of a factor of interest *X* on the outcome of interest *Y,* a back-door path is an undirected path between *X* and *Y* with an arrow into *X* and these paths create confounding, by providing an indirect non causal channel along which information can flow. Thus, a set of conditioning variables or controls *Z* satisfies the backdoor-criterion when *Z* blocks every back-door between *X* and *Y* and also no node in *Z* is a descendant of *X* or both descendent of *X* and ancestor of *Y* because it will block the causal path between *X* and *Y*. Thus, if set *Z* satisfies the back-door criterion then it will be:

$$\Pr(Y \mid do(X = x)) = \sum_z \Pr(Y \mid X = x, Z = z)\Pr(Z = z) \qquad (6)$$

All the items on the right hand of (6) are observational conditional probabilities and not counterfactuals. Based on (2) and the back-door criterion, for example the causal effect of *F* to *Y* in the Figure (3) will be a regression of *F* and its parent (only one parent in this case the *T*) on *Y*. In this case the back-door criterion is met since *T* blocks every back-door between *F* and *Y* conditioning on its parent *B* and it is not descendant of *F*. However, Figure (2) is a very simple case, where DAG derived in the empirical results section is more complicated. In the case where a variable or set of variables *S* are descendants of *F* and block every path from *F* to *Y*, then the causal effect may be totally blocked off. In this case it is said that there is a over-

control bias, since the descendants of *F* are effects and not confounders or causes of *C*. In that case, the front-door criterion (see for more details Pearl, 2000; Spirtes et al., 2000) is applied. The results will confirm this assumption, as it is shown in more details in the empirical results section.

4.2 Ordered logit and probit models

In this section the ordered Logit and Probit regression are briefly presented. The following model of health status is estimated:

$$HS_{i,h,j,t} = \beta_0 + \beta_1 dben_{h,t} + \beta_2 \log(y_{h,t}) + \gamma' z_{i,h,j,t} + l_j + \theta_t + l_j T + \varepsilon_{i,j,t} \qquad (7)$$

$HS_{i,h,j,t}$ is the health status for individual *i* in household *h*, located in the region-area *j* and in time *t*. $dben_{h,t}$ is the dummy indicating whether the household receives the survivor benefits or not, $log(y_{i,t})$ denotes the logarithm of household income and *z* is a vector of household and demographic factors, discussed in the next section. Set l_j is controls for region, 12 regions particularly in Turkey, and θ_t is a time-specific vector of indicators for the year, while $l_j T$ is a set of area-specific time trends. Finally, $\varepsilon_{i,j,t}$ expresses the error term which we assume to be *iid* and robust standard errors are employed. The same equation (7) takes place also, with the difference that $dben_{h,t}$ is replaced by the variable $log(ben)_{h,t}$, which denotes the logarithm of the survivor benefits. In this case, regression (7) controls for the household income minus the amount of the survivor benefits. As the dependent variable is an ordered variable indicating the general health status with values from 1 (very bad health status) to 5 (very good health status), ordered Probit and Logit models for cross-sectional data are the most appropriate techniques.

Based on the data, this study examines the poverty using deprivation indicators. Deprivation indicators that measure relative poverty have been introduced by Townsend (1979). Townsend (1979) made a list of items and activities that every household should have them. He counted as poor those lacking three or more items, without considering which of those items are missing. Moreover, his work has been criticized because he did not distinguish whether respondents could not afford to have these items or simply they did not want them. In this study a poverty-deprivation index (wealth index) is built based on the indicators proposed by Townsend (1979) and Guio (2009). More detailed information for the poverty indicators and the construction of the index will be provided in the next section. Furthermore, for the possible selection bias and heterogeneity problems in the sample chosen, a propensity score by Rosenbaum and Rubin (1983) is applied. In all cases, the matching before and after confirms that the sample chosen is not biased.

4.3 Structural equation modelling (SEM)

Structural equation models (SEMs) with latent variables provide a very general framework for modelling of relationships in multivariate data (Bollen, 1989). SEM is most commonly applied in studies involving latent variables, such as life satisfaction, happiness and health status and they provide a parsimonious framework for covariance structure modelling. SEM includes both endogenous and exogenous variables. The endogenous variables are dependent variables in at least one of the SEM equations. There are two types of variables in SEM: latent and observed variables. Latent variables are variables that are not directly observed or measured, such as hypothetical constructs or factors, including the health status and the wealth index used in this study.

In Figure (5), the SEM theoretical model is presented. The items chosen for the construction of the poverty-deprivation or wealth index are based on a factor analysis, which is presented in the section of the empirical results. More specifically, in Figure (5) the household belongings *bath, toilet, pipe_water* and *hot_water,* indicate whether there is bathroom, indoor toilet, piped water system and hot water system in the dwelling or not. The next belongings are *phone* and *wash_m* indicating whether there is telephone and washing machine in the dwelling or not.

Variables, *fridge* and *car* indicates whether there is refrigerator and car in the household or not. The variable *leak_prob* indicates whether there are leaking and roof problems in the dwelling, *holiday* and *meat* show respectively if the household can afford to go for holiday and whether they can afford to have a meal with meat or fish. Variable *warm_home* shows whether the household is able to keep the house warm and *fin_hardship* indicates whether the household has the capacity to face unexpected financial expenses. Variables *diffc_house*, *diffc_bills* and *install* indicate respectively arrears on mortgage, utility bills and hiring purchase instalments. The variables *dark_room* and *no_space* indicate respectively if there is darkness in the rooms and shortage in the space of the dwelling. The variable *fuel_heat* indicates the fuel type for the main heating of the dwelling, while *ratio_hou* indicates whether the household spends more than 40 per cent of the net income on housing.

The wealth index can take negative values, indicating low levels of wealth or high levels of poverty and it can take positive values, where higher values are equivalent to higher levels of wealth or equivalently lower levels of poverty. Variables *age* and *edu* denote respectively the age and education level. Variables *tenure_st*, *emp* and *num_member* denote respectively the house tenure status, the employment status and the number of family members in the household. *unmet_doctor* is a dummy variable indicating whether the individuals cannot the needs for medical examination or treatment, while *dw_size* and *expense* denote respectively the dwelling-house size and the average monthly expenses. Variables *heat_prob* and *air_p* are dummies indicating whether there are heating problems because of the insulation in the dwelling and whether there are air pollution and other environmental problems in the neighborhood. Finally, *log_inc* is the natural logarithm of the household income and *urban* is a dummy indicating whether the location of the household is an urban area or not. Health status is a measurement equation of two factors, *illness* and *limit_act*. The former indicates whether the individual suffers from chronic or long-standing illnesses i.e. diabetes, hypertension, asthma, renal failure, rheumatic diseases and others. The latter variable indicates whether the individual suffers from limitation in daily activities of any physical or psychological-mental health problems for at least the last 6 months. This is important because health status is a latent variable with measurement error; thus using these two variables both physical and mental health problems can be captured at some point. However, it would be even more precise if there were in the survey questions about activities of daily living (ADL) and instrumental activities of daily living (IADL) including capabilities on walking, bathing, dressing, eating, cooking, driving, using the phone, managing medication, shopping and managing finances.

The last step is to examine and determine the fit of the model and this is based on three goodness-of-fit indices; comparative fit index (CFI) developed by Bentler (1990), the Tucker-Lewis index (TLI) proposed by Tucker and Lewis (1973) and the root mean square error of approximation (RMSEA). The CFI and TLI indices ranges between 0 and 1 and the large they are the better the fit is. According to Bentler (1990) and Hu and Bentler (1999), a CFI and TLI value of greater than 0.90 can be expected for a very good fit to the data. RMSEA measures the degree of model adequacy based on population discrepancy in relation to degrees of freedom. If value of RMSEA is lower than 0.05 indicates a good fit, values between 0.05-0.08 suggest acceptable fit, while values higher than 0.10 imply poor model fit (Hancock and Mueller, 2006). The last index is the root mean square residual (RMSR), which is a measure of the mean absolute value of the covariance residuals and values less than 0.1 indicate favorable estimates.

However, it should be noticed that the causal path analysis and SEM do not imply causality, which is a main misunderstanding in social sciences (Pearl, 2009). In the case of failure to fit the data well implies doubt on the strong causal assumptions of zero coefficients. On the other hand, fitting the data well - based on the tests described below- does not "prove" the causal assumption. (Goldberger, 1973; Pearl, 2009).

5. Empirical Results

In Table (2), the ordered Probit and Logit estimates for widowed women are reported. It is observed that the dummy of survivor benefits is not significant based on columns (1)-(2). In columns (3)-(4), the results when the level of survivor benefits, instead of the survivor benefits dummy, is included into the analysis, are reported. It should be noticed that only the widows who receive survivor benefits are included into the regression analysis. The results remain the same when the level of survivor benefits, instead of the survivor benefits dummy, is included into the analysis.

A strong relationship between socio-economic status (SES) and health status has been found in previous researches, which is important to health not only for those in poverty, but at all levels of SES. Thus, based on the results of Table (2), individuals with higher education level and higher income are more likely to report higher levels of health status than the less educated and those with low income level. Employment status is another important determinant of health status. The reference category in our analysis is the full time workers. Based on the results those who work part time, the retired, the disabled people and those who fulfil domestic tasks and they are housekeepers, present significant lower levels of health status. Those who reported that can meet the needs for medication and treatment present, that there is no leaking roof, damp walls, rot in window frames and heating problems in the dwelling and that they are not exposed to pollution, grime or other environmental problems are more likely to present significant higher levels of health status. An insignificant association between house size, monthly expenses, tenure status and health is observed. Regarding the fuel type of the heating system used in the house, there is no difference between the various types, such as fuel-oil, electricity and natural gas with the reference category, wood.

The exception is the coal, as well as, dried cow dung which shows that the relationship between these types of heating and health is significant and negative. Finally, those who are located in urban areas are more likely to report lower health levels. Even though it could be expected that urban areas provide more opportunities on labor market, higher income and better and more centralized health services, these benefits can be partially offset from other factors, such as higher unemployment, air and noise pollution in the neighborhood coming especially from traffic, higher criminal rates, depression and stress among others. For instance the 30 per cent of the sample which is located in urban areas reported that it is exposed in air and other environmental problems, while the respective percentage in rural areas is 10 per cent.

Finally, as the sample selection bias and heterogeneity can be an issue due to the sample of treatment and controls have been derived in this study, a Propensity Score Matching has been applied. The results remain identical and robust independently of which matching algorithm is considered and are reported in Column (5) estimated by applying the ordered Probit model. The estimated coefficients are almost identical or very close with those found in Column (1), while ordered Logit gives the same results, but the estimates are not presented. In addition, the results of the propensity score test before and after the matching for the control variables and the treated and control groups are presented in Table 3, showing that the sample selection was efficient even before the matching takes place with the exception of the house size and unmet doctor, where the difference between the treated and untreated group remains significant. Nevertheless, the estimates are similar employing also propensity score matching. Moreover, the matching took place without considering the survivor benefits in order to be used as baseline and then to examine the additional effects of benefits on health and wealth. The results in Table (3) confirm that the sample selection is efficient. In (Table 4), the test shows that the original sample chosen is rather reliable, while there is significant difference in the treated and control group before the matching in the case of the household size, income and unmet doctor, as well as, self-reported air pollution at 10 per cent level. However, this does not change the effects, since as it will be shown below in the BN estimates, house size is not related to the

factor of interest which is the survivor benefits, as well as, the unmet doctor creates over-control bias in the regression analysis. More importantly, while the difference in household income levels between treated and control groups was positive before the matching, it becomes negative after, but the differences are insignificant. For instance the average household income in the treated and control groups is respectively 19,411 and 18,898 TL, showing that the income may not be the only significant factor of taking the survivor benefits. This may also indicate that these households are rich and do not need any health insurance coverage, which wealth cannot be covered or captured only by the household income. It should be also noticed that the t-tests after the matching process have been subject of criticism, especially when the variables are categorical, while the distribution of the continuous variables is not normal. Nevertheless, the results show that even after the propensity score matching, the estimates remain almost identical. Moreover, a BN framework and a DAG is presented, which account for all the common issues in identification strategy and traditional econometric modelling.

In Table (4), the ordered Probit and Logit estimates for the treatment of survivor benefits and health status of children are reported. The results show that the children in the households that receive the survivor benefits report no difference in the health status in comparison with the children in the households which have not claimed the benefits. The socio-economic status (SES) plays a significant role in the health status of the child. More specifically, the education level of the child and mother are important determinants of heath, where children whose mothers have completed a high school or higher university degree are more likely to report higher levels of health status. In addition, the relationship between the health status and education level of children is monotonic and positive indicating that children with higher education report higher levels of health status than illiterate children. Based on the results of Table (4), age is negatively associated with the child's health status. However, age groups of 30-34 years old have no difference on the child's health status, in comparison with the reference age group category which is 25-29 years old. Only the age group of older than 65 years has a negative and significant effect on child's health status.

Next the relationship between wealth and survivor benefits is examined. In this case a factor analysis for the wealth or poverty indicators has taken place. Based on the criterion of the eigenvalue it is decided that the first two factors are enough to explain the total variance. More specifically, the eigenvalue is higher than one for the first two factors and the total variance explained is 85.94 per cent based on Table (5).

In Table (6), a detailed factor analysis are done following the procedure by Filmer and Pritchett (1998), for all the items described previously. It is observed that all the items in factor 1 have a positive loading except colour TV, kitchen, computer, dishwater and air conditioner. Also the items with a factor loading larger than 0.2 are considered for the construction of the proposed poverty-deprivation index. This criterion it might sound arbitrary; however the reliability and validity of the index is examined below. Moreover, the results remain similar when the computer and internet connection are included. Thus, this study suggests that the indices proposed by Townsend (1979) and Guio (2009) can be updated. In Table (6), the results (when the dependent variable is the tradition) and the proposed poverty deprivation index are reported respectively in Columns (1)-(2) using the logarithm of the survivor benefits. Higher and negative values indicate higher poverty levels, while increasing positive values suggest wealthier households. It is observed that a positive relationship between survivor benefits and wealth is observed, while the positive relationship remains also between the rest of the household income-excluding survivor benefits- and the wealth index. In both columns (1)-(2) age and education level are positively associated with wealth, indicating that older widows are wealthier, coming from long term savings, plausible investments on i.e. properties, while more educated people are more likely to be wealthier, associated with better labor opportunities and earning higher wage.

Overall, the results in columns (3)-(4) show that those who receive the survivor benefits increase their wealth or decrease poverty by 0.22 and 0.18 units more than those who do not claim the benefits, based on the old and the proposed index respectively. Based on the data sample used this corresponds to a poverty gap of the order of 23 per cent. Similarly, the effect of the survivor benefits on wealth is 0.22 and 0.18 according to the old and proposed poverty-wealth index in Columns (1)-(2) of Table (7). For instance a 1 per cent increase in survivor benefits will increase wealth or reduce poverty by 0.006 units corresponding for a reduction of poverty-deprivation index at 3 per cent.

It should be noticed that one of the first approaches of causality is the propensity score, proposed by Rosenbaum and Rubin (1983), which has been developed in order to assess the causal effects of interventions. This approach summarizes all the possible covariates into a single propensity score, by regressing, usually through Probit or Logit regression the treatment on the set of the covariates. However, this method allows only for one treatment and one effect. It should be noticed that the results do not change when the propensity score matching with various algorithms have been considered however, the results and conclusion do not change, confirming that both groups share similar characteristics. For instance the average household income in the treatment and control groups is 20,500 and 21,000 Turkish Liras respectively. Moreover, in the case examined here the relationships between survivor benefits, health status, wealth and other determinants are explored. Thus, Bayesian Network which in some part is based on propensity score is applied and the results are followed. More specifically Pearl (2000) showed and proved using the back-door criterion that estimating the effect of the treatment the parents or background variables of the treatment variable should block all the back door paths in the DAG, which can be done either by adding a confounding variable as a control into the regression or by matching on this variable (for more details see the methodology section and Pearl, 2000).

The DAG output is presented in Figure (6), while the relationship between survivor benefits, health status and wealth are reported in Table (8). The results show a positive relationship between wealth and survivor benefits, while a significant association between health status and benefits have been found too.

A direct relationship between the treatment of survivor benefit and wealth is presented, while an indirect effect on health status through unmet doctor is presented. Thus, the BN shows that the survivor benefit is actually a cause for unmet doctor need and health status is independent from survivor benefits dummy conditional on unmet doctor need, since there is no direct arrow from benefits to health status. BN shows that health status is independent of survivor benefits conditional on unmet doctor blocking in this way the relationship between survivor benefits and health status, which is known as *over-control* bias. For these reasons, when controlling for unmet doctor and medical treatment needs in the ordered Logit and Probit regressions, the effect of the survivor benefits dummy was found insignificant because the path from survivor benefits to health status was blocked as we controlled additional for unmet doctor need variable which is actually an effect of survivor benefits. Ordered Logit regression shows that ignoring unmet doctor need the coefficient of the survivor benefits dummy variable becomes significant and equal at 0.1085 very close that found by BN; however are not reported as the effects of the remained variables remain almost the same.

 Based on Table (8) and regarding health status, the coefficient of the survivor benefits dummy is equal at 0.1181, indicating that the household which receive the survivor benefits report higher levels of health status by average 0.118 in the scale 1-5. Similarly, the effect on wealth is 0.1370 indicating that those who receive the survivor benefits increase wealth or equivalently reduce poverty more than those who do not receive the current benefits by 0.14. As it has been discussed in the methodology part of the BN the forks $X \leftarrow S \rightarrow Y$ shows that the variables X and

Y can be associated if they share a common cause which is the case of the fork *X←S→Y*, and it is known as *confounding* bias. In this case the fork can be as: *wealth ← survivor benefits →unmet doctor*. In other words, the confounding bias or omitted variable bias takes place when a variable which cause both independent and the dependent variable is omitted. In this case if the *unmet doctor* was a cause of survivor benefits and health, its omission would have led to omitted bias. However, in this case *unmet doctor* is an effect and rather a cause of survivor benefits.

In Figure (7) the estimated DAG Bayesian Networks, when the logarithm of the survivor benefits is considered, are presented. The situation is the same with those found in Figure (6). The coefficient of the survivor benefits on health status is 0.1190, while the respective coefficient on wealth is equal at 0.49. More specifically, as the survivor benefits are expressed in natural logarithms the effect on health is 6.21 per cent, indicating that survivor benefits improve the health status by 6.21 per cent. Similarly, regarding wealth, a 1 per cent increase in survivor benefits increase wealth or decrease poverty by 2.2 per cent. The rest of the coefficients are no reported, as the conclusions ae the same with those derived by the ordered Probit and Logit regression, regarding health status and the OLS estimates in Table (7) for the poverty indicator.

The estimated Bayesian Networks and DAG with the PC algorithm and whether the survivor benefits affect child's health or not, are presented in Table (9) and Figure (8). The situation is again very similar with the one found when the widowed mothers are examined. In this case the effect of the dummy of survivor benefits is 0.1941, reported in Table (9), indicating that the children that belong in widowed households which receive the benefits, are more likely to report higher levels of health status by average 0.195 than the children in widowed households with no survivor benefits. In addition, as it can be seen from the Figure (8), as well as, from Table (9) the effect on the household wealth or poverty level, survivor benefits claimants presents significant difference with the poverty level of households that do not claim these benefits.

Regarding the level of survivor benefits, the DAG Bayesian Network is not presented as it is exactly the same with Figure 8, with the difference that the effect of the survivor benefits level on child's health status is examined, replacing the dummy of whether the benefits are claimed and limiting the analysis only to the households receiving the current benefits. The coefficient of survivor benefits on health status and wealth are again significant and equal at 0.1750 and 0.4374 respectively reported in Table (9).

Next the SEM estimates of the theoretical model described in the SEM methodology section are reported as robustness check. More precisely, the direct, indirect and total effects of the SEM are presented respectively in columns (1)-(3) in Table (10). It should be noticed that only the coefficient of the factor of interest (survivor benefits) is presented, while the remained factors present similar results. The dummy of survivor benefits is positive and significant in all cases. More specifically, the direct effect of survivor benefit is 0.027, while the indirect effects, through wealth index, on health status is 0.0836. This, indicates that the widowed mothers who receive the survivor benefits has low and positive direct effects on health status, such as covering the needs for medical examination and treatment and others. However, the indirect effects is significantly higher, through the wealth index. This is explained by the fact that these households that they receive the survivor benefits, might improve the wealth index, such as the ability to afford unexpected expenses, appears on utility bills, to afford a meal with meat or fish, resulting on improvement of both physical and mental health represented by the general health status. It should be noticed that the total effects of the survivor benefits dummy on wealth is 0.17 close to the one found with the OLS in the previous section which was found around 0.18.

Based on the CFI and TLI criteria the model fits the data well, while RMSEA is lower than the proposed 0.05 value and SRMR is lower than the proposed threshold of 0.1. Thus, overall the diagnostic tests suggest that the SEM fits the data well. The rest of the factors present the similar effects found in the previous estimates from the previous models; thus are not reported.

6. Conclusions

This study examined and tried to answer in two main questions; whether the widowed mothers and their children who are eligible for survivor benefits present better health status and are less likely to be at risk of poverty than the respective widowed mothers and their children who do not claim the benefits. Overall, households that receive the survivor benefits decrease the poverty level by 0.20 units more than those who do not get them leading to a reduction of poverty of the order of 23 per cent. Regarding, only those who receive the current benefits, a 1 per cent increase on the specific benefits can improve the wealth situation of the widowed households by 2 per cent. This is a useful tool which allows the policy makers to implement policies that can reduce poverty and improve the well-being of the people.

As a conclusion, the study initially examined and compared the health status between single-mothers (widows) who claim the survivor benefits and those who do not. The Propensity Score Matching showed that the treated group (survivor benefits claimants) share very similar characteristics with the untreated –control group (those who do not claim the benefits). In both cases the death of a spouse leads to a decrease in the budget line of the household for both groups. However, in the case of the treated group an increase on the budget line can be drawn implying an increase on household's wealth and improvement on health status. Therefore, the findings of this study are important in order to understand the effects of the survivor benefits on the relative well-being (health status and poverty in this study) of widows especially those who are in old age, low educated and not employed full time. Concluding, the survivor benefits is a very useful social assistance which improves the health status and reduces the probability and risk of poverty of households. More specifically, in order for someone to be eligible for survivor benefits he/she should be insured to social security.

To summarize various policy measures can be taken in order to protect the widows and their households that are uninsured and not eligible for survivor benefits. One option is to widen the health coverage to the uninsured individuals by either covering the financial contributions for the poor, or providing services for them. Another policy could be the extension of the tax-based systems and the improvement of the tax collection efficiency resulting to additional funds which can be used more effectively and efficiently for the non-eligible widowed mothers. In addition, voluntary insurance can be expanded among the middle-high income groups, so that these public resources can be allocated among the poor population of the uninsured widowed women. According to the Law Number 5510, Article 81 the survivors insurance is 20 per cent, where 11 per cent is paid by the employer and 9 per cent by the employee. Self-employed people pay all of the premiums. In 2009 based on the Law Number 5510, the National Treasury has compensated 11 per cent of the employer's share on tax premiums in October 2008. This compensation took place in order to protect the sensitive and poor group from the financial crisis of 2008 (Karadeniz, 2010). Another, policy could be a social assistance, such a lump sum payment for a period of time, like 1-2 years, helping the family and the widow women to find an employment through training services. Also in order for a family to be eligible for survivor benefits, a minimum of 900 contributory days and 5 qualifying years is required, while for the for civil servants and self-employed people, the required period is 1,800 days. Therefore, another policy option could be the reduction of the period of contributory days. Thus, the above-mentioned policies have a two-fold target. Firstly, decreasing the probability of being at poverty by allocating funds, and secondly reducing the risk of poverty and increasing the households' wealth by improving the health status indirectly.

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Figure 1: Health Status Levels for Widowed Beneficiaries and Non-Beneficiaries of Survivor Benefits
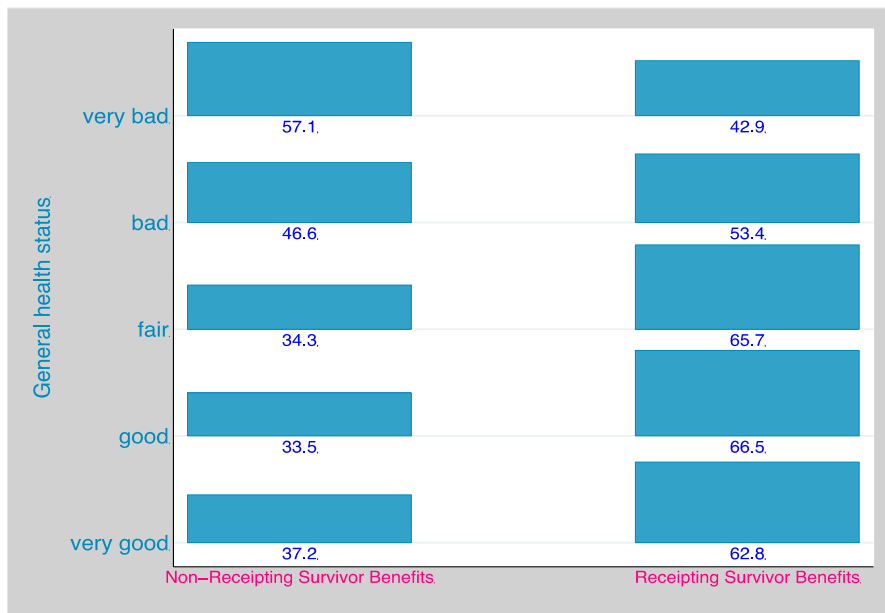
Figure 2: Relationship between Survivor Benefits and Wealth[1]

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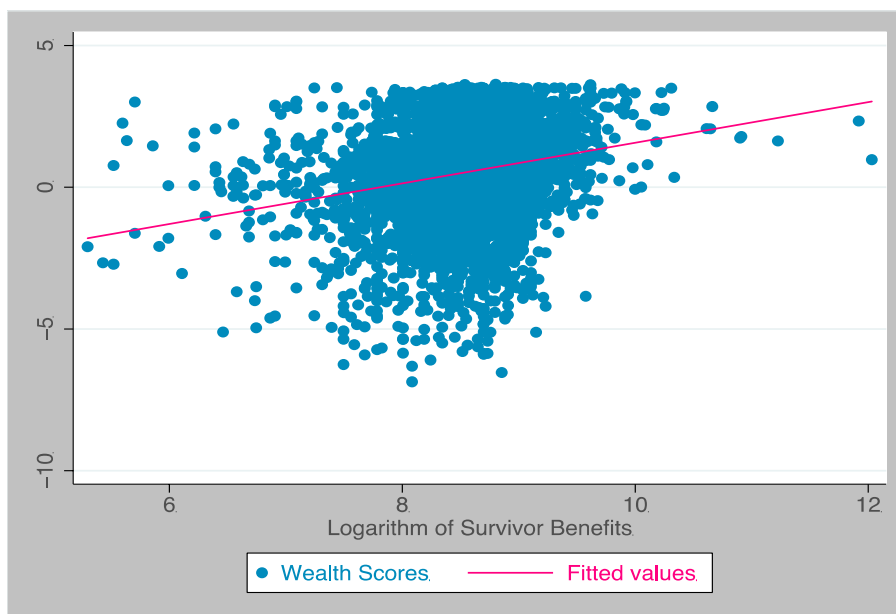
[1] Due to the nature of the wealth index, which is created using household related variables rather than personal variables, a similar graph is obtained for children beneficiaries as well.

Figure 3: An Example of a Directed Acyclic Graph (DAG)
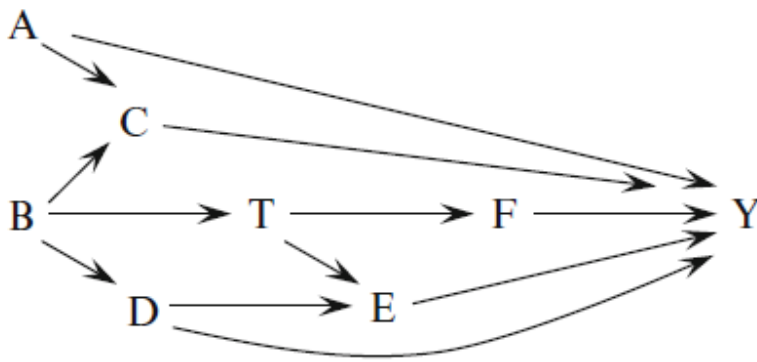
Figure 4: PC Algorithm for the Estimated DAG

Step 1:
Start with the complete undirected graph, $C^\sim$ with vertices $V = X_1, \ldots, X_p$. Then:
Step 2:
Set $l = -1$ and $C = C^\sim$
Step 3:
Increase l by one. For all pairs of adjacent nodes:
    • Check for conditional independence
    • Remove edge (X_i, X_j) if $X_i \perp\!\!\!\perp X_j\|rest$
Step 4:
Repeat step 2 until $l = m$ or until each node has fewer than $l - 1$ neighbors and let mr each $\in$ max l, m denote the stopping level of the algorithm and q be the maximum number of neighbors.

Figure 5: SEM Theoretical Model for Health Status, Survivor Benefits Treatment Group and Wealth-Poverty
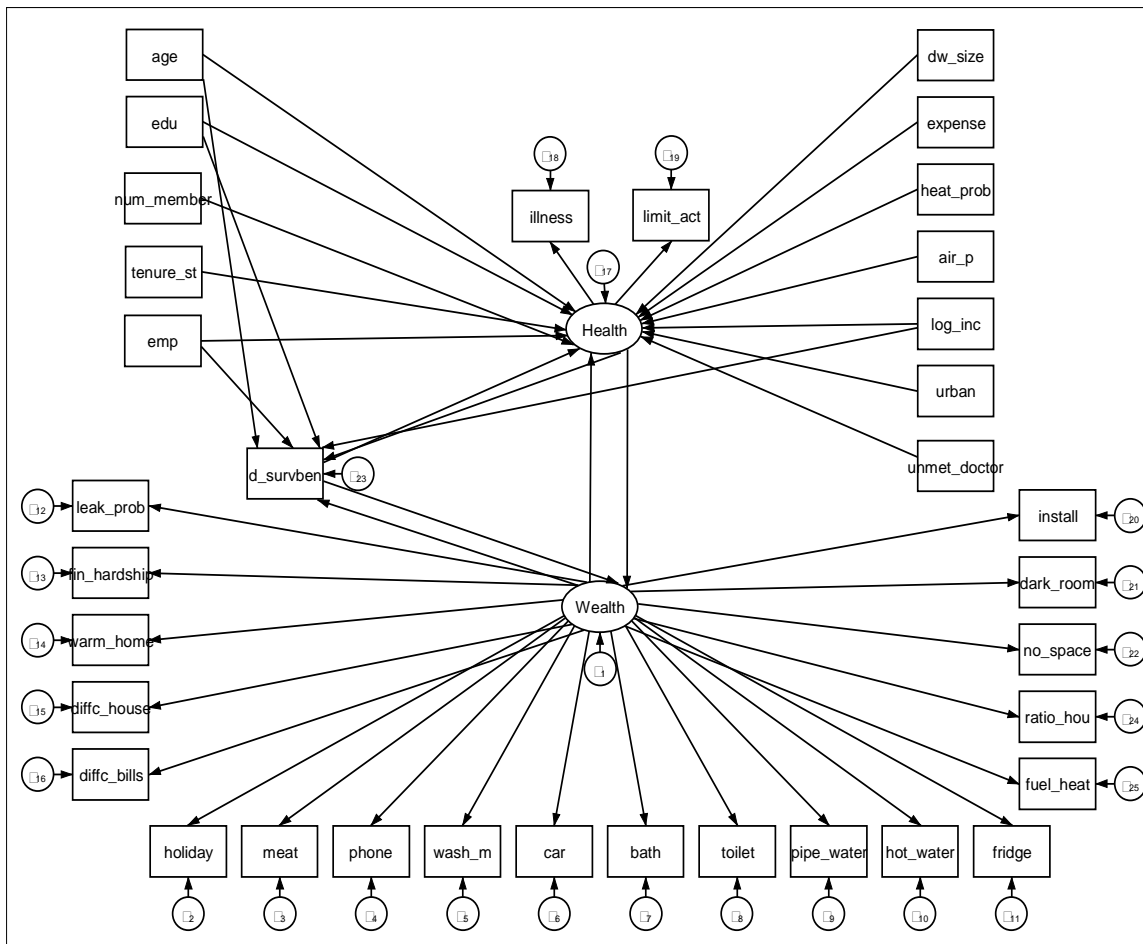
Figure 6: Estimated DAG with PC Algorithm for the Treatment Group of Survivor Benefits
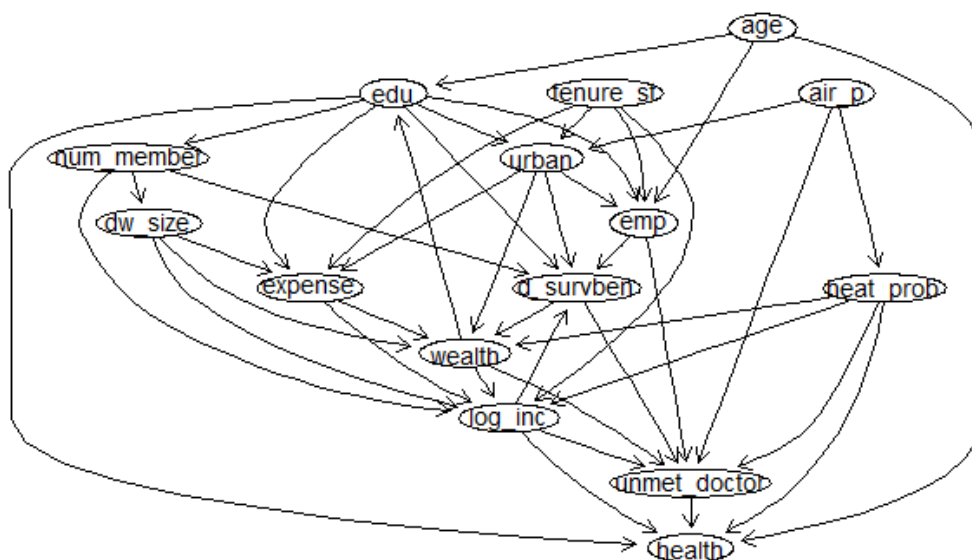
Figure 7: Estimated DAG with PC Algorithm for the Level of Survivor Benefits
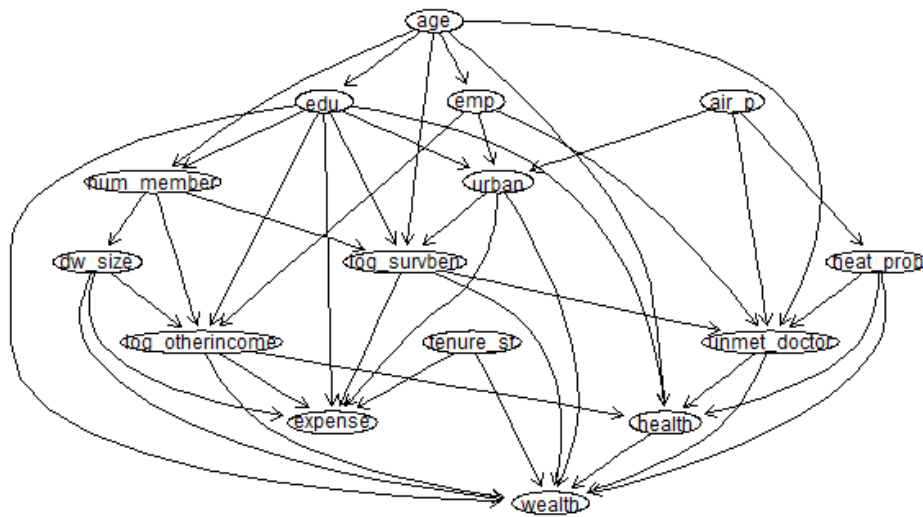
Figure 8: Estimated DAG with PC Algorithm for the Treatment Group of Survivor Benefits and Child Health Status
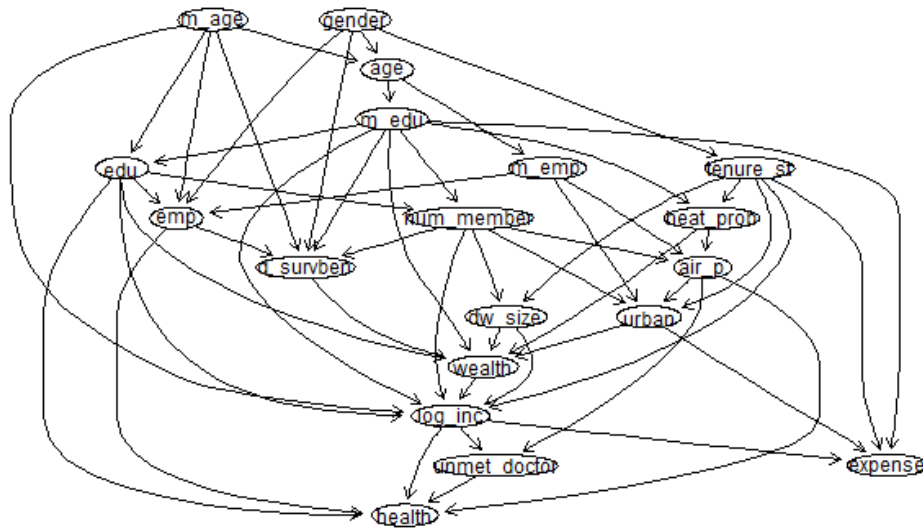
Table 1: Summary Statistics of the Dataset for Widowed Women

Continuous Variables	(1) N	(2) mean	(3) sd	(4) min	(5) max
Monthly expenses	11,389	164.7	152.0	0	2,208
Dwelling Size	11,389	96.02	32.02	25	400
Number of members in Household	11,389	2.696	1.559	1	16
Log (Income)	11,389	9.492	0.729	5.938	13.20
Log (Survivor Benefits)	6,721	8.582	0.475	5.298	12.03
Log (Other Income)	6,621	9.041	1.062	2.463	13.19

Categorical Var.	Percentage	Categorical var.	Percentage	Categorical Var.	Percentage
Health (very bad)	8.60	Fuel type (wood)	20.75	Tenure status (owner)	75.26
Health (bad)	39.04	Fuel type (coal)	50.18	Tenure status (tenant)	11.03
Health (fair)	35.48	Fuel type (natural gas)	17.65	Tenure status (lodging)	0.30
Health (good)	16.05	Fuel type (fuel-oil)	0.60	Tenure status (rent-free)	13.42
Health (very good)	0.83	Fuel type (diesel oil-gasoil)	0.25	Employment St. (Full-Time)	6.57
Gender (Female)	100.0	Fuel type (electricity)	4.43	Emp.St.(Part-Time)	10.51
Age (20-24)	0.09	Fuel type (dried cow dung)	5.53	Emp.St.(Looking for a job)	10.70
Age (25-29)	0.40	Fuel type (other)	0.61	Emp.St.(Student or unpaid work experience)	10.72
Age (30-34)	0.81				
Age (35-39)	1.67	Education (Illiterate)	57.05	Emp.St.(Retirement/giving up business)	5.66
Age (40-44)	2.90	Education (Literate but not a graduate)	12.86	Emp.St.(Seasonal)	0.11
Age (45-49)	4.98	Education (Primary Sch.)	24.56	Emp.St.(old, permanently disabled)	42.22
Age (50-54)	7.84	Education (Secondary Sch.)	2.20	Emp.St.(Fulfilling domestic tasks)	40.29
Age (55-59)	9.60	Education (High Sch.)	1.39	Emp. St.(Other inactive person)	1.00
Age (60-64)	11.45	Education (Vocational high Sch.)	1.10	Unmet need for medical examination or treatment (No)	75.31
Age (65 +)	60.28	Education (Higher edu)	0.85	Pollution, grime or other environmental problems (No)	78.40
Urban Area	56.71				
Leaking roof, damp walls or rot in window frames problems (No)	51.72	Heating problems because of insulation (no)	53.46	Capacity to afford a meal with meat, fish or vegetarian equivalent (No)	65.43
Receipting Survivor Benefits	59.01				

Table 2: Ordered Probit and Ordered Logit Estimates for the Relationship between Survivor Benefits and Health Outcomes of Widowed Women

Variables	(1) Ordered Probit	(2) Ordered Logit	(3) Ordered Probit	(4) Ordered Logit	(5) Ordered Probit Propensity Score	(6) Ordered Logit Propensity Score
Log(Income)	0.0920***	0.1494***			0.1063***	
	(0.0236)	(0.0419)			(0.0229)	
Receipting survivor benefits	0.0257	0.0607			0.0272	
	(0.0249)	(0.0441)			(0.0249)	
Log (Other Income)			0.0541***	0.0927***		0.0541***
			(0.0195)	(0.0344)		(0.0195)
Log (Survivor Benefits)			-0.0171	-0.0313		-0.0171
			(0.0322)	(0.0559)		(0.0322)
Age (25-29)	-0.1818	-0.3364	-0.1809	-0.4074	-0.1639	-0.1809
	(0.2292)	(0.4639)	(0.2940)	(0.5441)	(0.2298)	(0.2940)
Age (30-34)	-0.8342***	-1.6257***	-0.7286***	-1.4407***	-0.8333***	-0.7286***
	(0.2305)	(0.4601)	(0.2772)	(0.4971)	(0.2309)	(0.2772)
Age (35-39)	-0.7556***	-1.5028***	-0.6546***	-1.3877***	-0.7483***	-0.6546***
	(0.2118)	(0.4290)	(0.2447)	(0.4395)	(0.2118)	(0.2447)
Age (40-44)	-1.0276***	-2.0338***	-0.9424***	-1.9052***	- 1.0155***	-0.9424***
	(0.2047)	(0.4187)	(0.2286)	(0.4135)	(0.2046)	(0.2286)
Age (45-49)	-1.2606***	-2.4156***	-1.1642***	-2.2749***	1.2495***	-1.1642***
	(0.2015)	(0.4123)	(0.2209)	(0.3973)	(0.2014)	(0.2209)
Age (50-54)	-1.3655***	-2.6447***	-1.2790***	-2.5070***	- 1.3497***	-1.2790***
	(0.2003)	(0.4104)	(0.2200)	(0.3956)	(0.2001)	(0.2200)
Age (55-59)	-1.4739***	-2.8293***	-1.4446***	-2.8026***	-1.4518***	-1.4446***
	(0.1993)	(0.4088)	(0.2186)	(0.3930)	(0.1992)	(0.2186)
Age (60-64)	-1.5538***	-2.9559***	-1.5112***	-2.9006***	-1.5331***	-1.5112***
	(0.1992)	(0.4084)	(0.2184)	(0.3921)	(0.1990)	(0.2184)
Age (65+)	-1.7557***	-3.2863***	-1.7108***	-3.2226***	-1.7265***	-1.7108***
	(0.1982)	(0.4069)	(0.2172)	(0.3900)	(0.1980)	(0.2172)
Education (Illiterate)	0.0151	0.0267	-0.0117	0.0003	0.0175	-0.0117
	(0.0333)	(0.0584)	(0.0411)	(0.0722)	(0.0332)	(0.0411)
Education (Literate but not a graduate)	0.1194***	0.2067***	0.1208***	0.2238***	0.12687***	0.1208***
	(0.0295)	(0.0517)	(0.0369)	(0.0648)	(0.0294)	(0.0369)
Education (Primary Sch.)	0.0929	0.1467	0.0709	0.1360	0.1100	0.0709
	(0.0715)	(0.1227)	(0.0835)	(0.1446)	(0.0717)	(0.0835)
Education (Secondary Sch.)	0.2612***	0.4914***	0.2050**	0.4029**	0.2844***	0.2050**
	(0.0880)	(0.1553)	(0.0835)	(0.1787)	(0.0880)	(0.1006)
Education (High Sch.)	0.3974***	0.6807***	0.5135***	0.9021***	0.4193***	0.5135***
	(0.1022)	(0.1777)	(0.1183)	(0.1985)	(0.1022)	(0.1183)
Education (Vocational High Sch.)	0.1966	0.3247	0.3166**	0.5356**	0.2012	0.3166**
	(0.1206)	(0.2110)	(0.1489)	(0.2635)	(0.1204)	(0.1489)
Leaking roof, damp walls or rot in window frames problems (No)	0.1021***	0.1835***	0.1133***	0.2038***	0.1150***	0.1133***
	(0.0253)	(0.0446)	(0.0333)	(0.0588)	(0.0364)	(0.0333)
Fuel type (coal)	-0.0582*	-0.0981*	-0.0603	-0.1199	-0.0558*	-0.0603
	(0.0299)	(0.0524)	(0.0426)	(0.0744)	(0.0298)	(0.0426)
Fuel type (natural gas)	0.0487	0.0890	0.0454	0.0537	0.0576	0.0454
	(0.0490)	(0.0859)	(0.0627)	(0.1099)	(0.0488)	(0.0627)
Fuel type (fuel-oil)	-0.0549	-0.0744	-0.1986	-0.4126	-0.0416	-0.1986
	(0.1380)	(0.2368)	(0.1521)	(0.2579)	(0.0888)	(0.1521)
Fuel type (diesel oil), gasoil	0.1646	0.2925	0.3168	0.5340	0.1601	0.3168
	(0.2143)	(0.3906)	(0.2609)	(0.4932)	(0.2173)	(0.2609)
Fuel type (electricity)	-0.0769	-0.1239	-0.0504	-0.1097	-0.0702	-0.0504
	(0.0608)	(0.1052)	(0.0757)	(0.1317)	(0.0607)	(0.0757)
Fuel type (dried cow dung)	-0.1123**	-0.2328**	-0.1270	-0.2722	-0.1107**	-0.1270
	(0.0548)	(0.0956)	(0.0989)	(0.1806)	(0.0546)	(0.0989)
Fuel type (other)	0.0394	0.0309	-0.0889	-0.2378	0.0358	-0.0889
	(0.1438)	(0.2479)	(0.1952)	(0.3354)	(0.1444)	(0.1952)
Tenure status (tenant)	0.0040	0.0170	0.0215	0.0481	0.0046	0.0215
	(0.0471)	(0.0836)	(0.0629)	(0.1105)	(0.0470)	(0.0629)

Table 2 (Cont.): Ordered Probit and Ordered Logit Estimates for the Relationship Between Survivor Benefits and Health Outcomes of Widowed Women

Variables	(1) Ordered Probit	(2) Ordered Logit	(3) Ordered Probit	(4) Ordered Logit	(3) Ordered Probit Propensity Score	(4) Ordered Probit Propensity Score
Tenure status (lodging)	-0.1538	-0.3957	-0.1569	-0.4447	-0.1663	-0.4447
	(0.2154)	(0.3285)	(0.2453)	(0.3704)	(0.2466)	(0.3704)
Tenure status (rent-free)	-0.0497	-0.0668	-0.0318	-0.02 76	-0.0556*	-0.0276
	(0.0305)	(0.0531)	(0.0408)	(0.0707)	(0.0304)	(0.0707)
Emp.St.(part-Time)	-0.1336**	-0.2350**	-0.1811**	-0.3206**	-0.1376**	-0.3206**
	(0.0647)	(0.1130)	(0.0871)	(0.1498)	(0.0646)	(0.1498)
Emp.St.(looking for a job)	0.1132	0.1756	-0.0993	-0.2625	0.1093	-0.2625
	(0.2331)	(0.4402)	(0.3029)	(0.5620)	(0.2348)	(0.5620)
Emp.St.(Student or unpaid work experience)	-1.1862***	-2.2240***	-0.9424***	-1.8142***	-1.1753***	-1.8142***
	(0.3732)	(0.7763)	(0.3085)	(0.6080)	(0.3728)	(0.6080)
Emp.St.(retirement/giving up business)	-0.2766***	-0.4605***	-0.2105***	-0.3455**	-0.2792***	-0.3455**
	(0.0620)	(0.1091)	(0.0787)	(0.1387)	(0.0602)	(0.1387)
Emp.St.(seasonal)	0.3365	0.6208	-0.0847	-0.7946	0.3497	-0.7946
	(0.3712)	(0.7359)	(0.7824)	(1.7235)	(0.3728)	(1.7235)
Emp.St.(old, permanently disabled)	-0.7373***	-1.2968***	-0.7006***	-1.2526***	-0.7339***	-1.2526***
	(0.0473)	(0.0837)	(0.0623)	(0.1103)	(0.0440)	(0.1103)
Emp.St.(fulfilling domestic tasks)	-0.1835***	-0.3303***	-0.1312**	-0.2496**	-0.1835***	-0.2496**
	(0.0441)	(0.0781)	(0.0571)	(0.1011)	(0.0441)	(0.1011)
Emp.St.(other inactive person)	-0.4814***	-0.8068***	-0.3642***	-0.6442***	-0.4787***	-0.6442***
	(0.1180)	(0.2060)	(0.1393)	(0.2425)	(0.1186)	(0.2425)
Number of member in Household	0.0130	0.0248	0.0163	0.0286	0.0130	0.0286
	(0.0092)	(0.0160)	(0.0137)	(0.0241)	(0.0092)	(0.0241)
Unmet need for medical examination or treatment (No)	0.3183***	0.5483***	0.2958***	0.5109***	0.3343***	0.5109***
	(0.0248)	(0.0433)	(0.0351)	(0.0610)	(0.0247)	(0.0610)
Dwelling Size	0.0005	0.0009	0.0006	0.0012	0.0007*	0.0012
	(0.0004)	(0.0007)	(0.0005)	(0.0009)	(0.0004)	(0.0009)
Monthly expenses	0.0001	0.0001	0.0001	0.0001	0.00009	0.0001
	(0.0001)	(0.0002)	(0.0001)	(0.0002)	(0.0001)	(0.0002)
Heating problems because of insulation (no)	0.1177***	0.2020***	0.1257***	0.2196***	0.0726**	0.2196***
	(0.0251)	(0.0443)	(0.0331)	(0.0584)	(0.0351)	(0.0584)
Pollution, grime or other environmental problems (No)	0.0762***	0.1300***	0.0768**	0.1360**	0.0801***	0.1360**
	(0.0261)	(0.0458)	(0.0336)	(0.0592)	(0.0261)	(0.0592)
Urban Area	-0.0675**	-0.1320***	-0.0644*	-0.1279**	-0.0698**	-0.1279**
	(0.0273)	(0.0481)	(0.0364)	(0.0637)	(0.0279)	(0.0637)
Wald Chi-Square	3,084.53	2,997.64	1,633.19	1,611.78	3,048.15	1,611.78
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Observations	11,389	11,389	6,621	6,621	11,387	6,621

Notes: Robust standard errors within brackets, p-values within square brackets, ***, ** and * indicate significance at 1%, 5% and 10% level.

Table 3: Propensity Score Test Before and After Matching

Variables	t-test Before matching	t-test After matching	Variables	t-test Before matching	t-test After matching
Age	0.583 (0.463)	0.281 (0.782)	Heating problems in the house	1.29 (0.129)	-0.83 (0.421)
Education Level	1.57 (0.147)	1.26 (0.179)	Fuel Heat Type	1.77 (0.123)	1.37 (0.172)
Employment Status	1.80 (0.121)	0.84 (0.345)	House size	10.45*** (0.041)	-5.03*** (0.533)
Household Income	1.92* (0.051)	-0.85 (0.461)	Monthly household expenses	2.15 (0.0034)	-0.02 (0.983)
Tenure Status	-1.03 (0.232)	-0.32 (0.748)	Unmet doctor needs	16.69*** (0.000)	-2.09** (0.037)
Household Size	-1.23 (0.216)	-1.06 (0.237)	Urban and Rural Area	1.58 (0.104)	1.00 (0.231)
Self-reported Air Pollution	1.76* (0.094)	-1.49 (0.137)	Region	-1.76 (0.105)	-1.54 (0.124)
Number of Leaking problems in the house	1.24 (0.175)	0.78 (0.546)			

Notes: p-values within square brackets, ***, ** and * indicate significance at 1%, 5% and 10% level

Table 4: Ordered Probit Estimates for the Survivor Benefits and Health Status of Children.

Variables	Ordered Probit	Ordered Logit	Variables	Ordered Probit	Ordered Logit
Gender (Female)	0.0067 (0.0984)	0.0258 (0.1070)	Heating problems (No)	0.1378* (0.0807)	0.3038** (0.1480)
Dummy of Survivor Benefits	0.0617 (0.0643)	0.1147 (0.1168)	Age group of mother (reference category= 25-29)		
Age group of child (reference category= 15-19)			Age group 30-34	-0.0654 (0.2279)	-0.0873 (0.4148)
Age group 20-24	-0.1558** (0.0610)	-0.2982*** (0.1124)	Age group 35-39	0.0107 (0.1834)	-0.0102 (0.3336)
Education Level of child (Reference category= Illiterate)			Age group 40-44	0.1228 (0.1758)	0.2143 (0.3253)
Literate but not graduate	0.2514*** (0.0503)	0.4144*** (0.0947)	Age group 45-49	0.0547 (0.1730)	0.0642 (0.3151)
Primary School	0.2452*** (0.0657)	0.3808*** (0.1248)	Age group 50-54	0.0489 (0.1794)	0.0265 (0.3289)
Secondary school	0.3124*** (0.0502)	0.5079*** (0.0945)	Age group 55-59	0.0524 (0.1834)	0.0394 (0.3326)
High School	0.4234*** (0.0546)	0.6851*** (0.1014)	Age group 60-64	-0.0893 (0.1922)	-0.1355 (0.3526)
Vocational/Technical school	0.2737*** (0.0598)	0.4189*** (0.1111)	Age group 65+	-0.2412* (0.1298)	-0.4612* (0.2498)
Higher Education	0.5162*** (0.0647)	0.8360*** (0.1186)	Employment status of mother (Reference category= Full-Time)		
Leaking roof, damp walls or rot in window frames problems (No)	0.0866 (0.1246)	0.1845 (0.2331)	Employment (Part-Time)	-0.1185 (0.1882)	-0.2935 (0.3416)
Type of the fuel for heating (Reference category=wood)			Employment (Retired)	0.1805 (0.1647)	0.1953 (0.3101)
Type of the fuel for heating (Coal)	0.0603 (0.0744)	0.1394 (0.2347)	Employment (Seasonal)	-0.4331* (0.2531)	-0.8059* (0.4662)
Type of the fuel for heating (Natural gas)	0.1200 (0.1282)	-0.0628 (0.0693)	Employment (Old permanently disabled)	-0.2647** (0.1085)	-0.4674** (0.1985)
Type of the fuel for heating (Fuel-oil)	0.0450 (0.1167)	0.0460 (0.2045)	Employment (Fulfilling domestic tasks)	0.0175 (0.1146)	0.0680 (0.1331)
Type of the fuel for heating (Electricity)	0.5332*** (0.1877)	1.0091*** (0.3490)	Household Size	0.0462 (0.0290)	0.0669 (0.0151)
Type of the fuel for heating (Diesel oil-gasoil)	0.0026 (0.0577)	0.9844 (2.3582)	Pollution, grime problems(No)	0.1760* (0.0904)	0.2542** (0.1146)
Type of the fuel for heating (Dried Cow Dung)	-0.2475** (0.1026)	-0.5107*** (0.1878)	Logarithm of Household Income	0.2007*** (0.0571)	0.3365*** (0.1031)
Education Level of mother (Reference category= Illiterate)			Unmet need for medical treatment (No)	-0.4935*** (0.0780)	0.9836*** (0.1551)
Literate but not graduate	0.1766 (0.1187)	0.3447 (0.2248)	Size of the dwelling (m^2)	0.0019 (0.0080)	0.0075 (0.0087)
Primary School	0.0834 (0.2433)	0.0319 (0.4502)	Average monthly expenses	0.0003 (0.0004)	0.0005 (0.0004)
Secondary School	0.3703 (0.2259)	0.6360 (0.5972)	Tenure Status (Reference category=owner)		
High School	0.3165** (0.1580)	0.5709** (0.2884)	Tenure Status (Tenants)	-0.2050 (0.1750)	- 0.3057 (0.3285)
Vocational/Technical school	0.4404 (0.2717)	0.5230 (0.4830)	Tenure Status (rent free)	-0.1696 (0.1306)	-0.3096 (0.2532)
Higher Education	0.4117*** (0.1717)	0.7043*** (0.2969)	Wald statistic	178.13 [0.000]	151.05 [0.000]
No. observations	2,255	2,255			

Notes: Robust standard errors within brackets, p-values within square brackets, ***, ** and * indicate significance at 1%, 5% and 10% level.

Table 5: Factor Analysis Including all Items

Factor	Eigenvalue	% Variance Explained
Factor 1	4.83576	62.33%
Factor 2	1.83247	23.62%

Table 6: Factor Analysis for the Proposed Poverty-Deprivation Measure

Variables	Factor 1	Factor 2	Factor 3
Holiday	0.359	-0.3242	-0.0715
A meal with meat, chicken or fish	0.4788	-0.2768	-0.1301
Unaccepted expenses	0.3944	0.3613	0.0281
To keep home warm	0.4381	-0.0105	0.1188
Arrears on mortgage, loan or rent	0.5402	0.3603	-0.0292
Arrears on utility bills	0.3556	-0.1333	0.0032
Arrears on purchase instalments	0.4557	0.4106	-0.0964
Car	0.4977	0.3358	-0.0585
Washing Machine	0.3563	0.3941	-0.0335
Telephone	0.561	0.1514	-0.0399
Colour TV	-0.4492	-0.3826	0.1065
Leaking roof	0.4052	0.2086	0.0594
No Bath or shower	0.6882	-0.319	0.3204
No indoor flush toilet	0.6735	-0.3698	0.3269
Dark rooms	0.3451	0.2861	-0.0133
Shortage of space	0.6123	-0.219	0.0563
Spending more than 40% on housing	0.4503	-0.2832	-0.0348
Kitchen	-0.3943	0.0438	0.1416
Piped water	0.4682	-0.2982	-0.1147
Hot water	0.4093	-0.1476	-0.1425
Mobile phone	0.1038	0.0999	0.1588
Computer	-0.1539	0.2483	0.4418
Internet connection	0.0317	0.2379	0.4623
Refrigerator	0.2588	0.0159	0.132
Dishwater	-0.1368	0.0198	-0.2044
Air conditioner	-0.0696	-0.043	0.0304
Fuel heat	0.3121	-0.1761	0.0836

Table 7: Poverty-Deprivation OLS Estimates

Variables	Old Index (1)	New Index (2)	Old Index (3)	New Index (4)
Dummy of Survivor			0.2195***	0.1790**
			(0.0315)	(0.0840)
Logarithm of Household Income			1.5513***	2.0646***
			(0.0274)	(0.0625)
Logarithm of Survivor Benefits	0.6327***	0.5908***		
	(0.0441)	(0.0850)		
Logarithm of Household Income-Survivor Benefits	0.9697***	1.2340***		
	(0.0262)	(0.0688)		
Age (reference category= age group 20-24)				
Age group 25-29	2.1606**	2.5965***	0.3827	0.5038
	(0.9506)	(0.4037)	(0.5019)	(0.8149)
Age group 30-34	2.2429**	2.7500***	-0.2059	0.4632
	(0.9023)	(0.4498)	(0.4639)	(0.7584)
Age group 35-39	2.4655***	2.8821***	0.1131	0.8241
	(0.8979)	(0.4354)	(0.4607)	(0.7473)
Age group 40-44	2.5384***	2.7236***	0.1804	0.9736
	(0.8937)	(0.3895)	(0.4566)	(0.7362)
Age group 45-49	2.2396**	2.3243***	0.0557	0.7561
	(0.8920)	(0.3779)	(0.4548)	(0.7351)
Age group 50-54	2.3092***	2.3559***	0.2182	0.7577
	(0.8915)	(0.3708)	(0.4539)	(0.7322)
Age group 55-59	2.3565***	2.4219***	0.3593	0.8172
	(0.8913)	(0.3670)	(0.4538)	(0.7331)
Age group 60-64	2.5231***	2.7153***	0.4390	0.9713
	(0.8910)	(0.3821)	(0.4535)	(0.7325)
Age group 65+	2.6292***	2.7520***	0.6092	0.9392
	(0.8905)	(0.3664)	(0.4527)	(0.7305)
Education Level (Reference category= Illiterate)				
Literate but not a graduate	0.1921***	0.5779***	0.1721***	0.3247***
	(0.0526)	(0.1140)	(0.0422)	(0.0886)
Primary School	0.4526***	0.8270***	0.4189***	0.7288***
	(0.0455)	(0.1035)	(0.0365)	(0.0821)
Secondary School	0.5145***	1.0076***	0.4598***	0.9256***
	(0.1052)	(0.2203)	(0.0883)	(0.1758)
High School	1.1103***	2.0208***	0.9376***	1.6967***
	(0.1318)	(0.2882)	(0.1122)	(0.2297)
Vocational/Technical school	0.7931***	1.1731***	0.7160***	0.9626***
	(0.1514)	(0.2848)	(0.1336)	(0.2454)
Higher Education	1.0854***	1.2101***	0.8692***	1.1812***
	(0.1925)	(0.3458)	(0.1594)	(0.3230)
Tenure Status (reference category=Owner)				
Tenure Status (Tenant)	-0.1261**	0.1606	-0.0742*	-0.2326***
	(0.0538)	(0.1033)	(0.0406)	(0.0790)
Tenure Status (Lodging)	0.5656*	1.1332	-0.7465***	-1.1117***
	(0.3198)	(0.7888)	(0.2220)	(0.3902)
Tenure Status (Other free-rent accommodation)	-0.3476***	-0.3653***	-0.2053***	-0.0999
	(0.0518)	(0.1083)	(0.0386)	(0.0864)
Employment Status (reference category=Full-Time)				
Employment Status (Part-Time)	-0.0669	-0.0270	0.0036	-0.1704
	(0.1227)	(0.2441)	(0.0828)	(0.1752)
Employment Status (Unemployed)	-0.5542**	-0.0346	-0.4883	-0.7624
	(0.2509)	(0.4769)	(0.3131)	(0.4997)
Employment Status (Student or unpaid work experience	-0.2461	0.1643	-0.9617***	0.8100
	(0.4884)	(0.3781)	(0.3181)	(0.5184)
Employment Status (Retired)	0.1607	0.4892	0.0684	0.4157
	(0.1001)	(0.4029)	(0.0772)	(0.3603)
Employment Status (Seasonal)	-1.0852**		-0.9338**	-0.7434***
	(0.5222)		(0.4220)	(0.1889)
Employment Status (Old, permanently disabled)	-0.1571**	0.2356	0.0706	0.0326
	(0.0790)	(0.1584)	(0.0609)	(0.1265)
Employment Status (Fulfilling domestic tasks)	-0.2563***	-0.3588***	-0.2165***	0.1597
	(0.0726)	(0.1363)	(0.0565)	(0.1131)
Employment Status (Other inactive)	-0.3920**	0.1658	0.2121	-0.0570
	(0.1800)	(0.3157)	(0.1518)	(0.2631)
Household Size	-0.2019***	-0.0965**	-0.2010***	-0.0640***
	(0.0175)	(0.0375)	(0.0117)	(0.0237)
Pollution, grime or other environmental problems (No)	0.2000***	0.0383	0.2207***	0.0767
	(0.0406)	(0.0794)	(0.0322)	(0.0626)
Urban Area	0.1295***	0.4489***	0.2391***	0.5141***
No. Observations	6,621	1,565	11,389	3,044
R-squared	0.3167	0.5619	0.4465	0.5913

Notes: Robust standard errors within brackets, ***, ** and * indicate significance at 1%, 5% and 10% level.

Table 8: Bayesian Network Estimates

	DV: Health Status (1)	DV: Wealth (2)
Dummy of Survivor Benefits	0.1234**	0.1370***
	(0.0576)	(0.0139)
Logarithm of Survivor Benefits	0.1190***	0.4905***
	(0.0239)	(0.0205)

Notes: Standard errors within brackets, *** and ** indicate significance at 1% and 5% level.

Table 9. Bayesian Network Estimates for the Children

	DV: Health Status (1)	DV: Wealth (2)
Dummy of Survivor Benefits	0.1941**	0.1095**
	(0.0903)	(0.0477)
Logarithm of Survivor Benefits	0.1750**	0.4374***
	(0.0803)	(0.0501)

Notes: Standard errors within brackets, ** indicates significance at 5% level.

Table 10: SEM Estimates for the Survivor Benefits Dummy

	Direct Effects (1)	Indirect Effects (2)	Total Effects (3)
Panel A: Health <-			
Dummy of Survivor Benefits	0.0272**	0.0836***	0.1108***
	(0.01283)	(0.0159)	(0.0202)
Panel B: Wealth Index <-			
Dummy of Survivor Benefits	0.1087***	0.0556***	0.1643***
	(0.0189)	(0.0129)	(0.0079)
No. Observations		8,882	
CFI		0.912	
TLI		0.895	
RMSEA		0.038	
SRMR		0.074	

Notes: Standard errors within brackets, *** and ** indicate significance at 1% and 5% level.