

Working paper

Is children's education associated with parental health? Evidence from the Philippines

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Abstract

This study examines the association between children's education and parental health using data from the 2007 Philippine Study on Ageing. It employs a broad, more comprehensive, definition of health to capture the different health dimensions. By employing multiple indicators of health, this study is able to examine whether the influence of children's education is consistent across different health indicators. It also investigates whether parental behavior and receipt of support from children serve as pathways that mediate the relationship between children's education and parental health. Findings show that older women whose children completed tertiary education have lower odds of reporting IADL or ADL difficulty compared with their counterparts whose children attained below tertiary education. These findings contribute to the growing evidence that education is not only an individual resource; rather it could be a household or family resource that could benefit other family members.

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Introduction

A great number of studies have investigated the association between older adults' personal socioeconomic resources and their health status (Hosseinpoor et al., 2012; Zimmer, 2006). However, the health status of older people can also be influenced by the resources of other family members, particularly adult children, who may provide not only caretaking roles but also substantial material and non-material resources (Zimmer, Hermalin, & Lin, 2002a). In addition, children may influence the health status of their parents through social support and social influence (Torssander, 2013). Thus, focusing only on the socioeconomic position of the individual will underestimate the degree of health inequality (Torssander, 2014; Zimmer et al., 2002a). It is therefore important to also consider the position of other family members.

The growing recognition of the influence of one person's resources on another person's well-being has provided the impetus for research on the role of children's resources in shaping the health of elderly parents. Several studies have demonstrated the important role of adult children's education for the physical functioning and survival of their parents (Friedman & Mare, 2014; Lee & Chuang, 2003; Torssander, 2013; Zimmer et al., 2002a; Zimmer, Martin, Ofstedal, & Chuang, 2007). For example, older people with highly educated children in Taiwan are less likely to report functional limitations than their counterparts with less educated children (Zimmer et al., 2002a). Torssander (2013) suggests that the relationship between children's education and parental health may be stronger in settings where coresidence of adult children and their parents is more common. Recent evidence provides support for this view (De Neve & Harling, 2017; Yahirun, Sheehan, & Hayward, 2016; Yang, Martikainen, & Silventoinen, 2016). Previous studies of children's education and parental health focus on functional limitation or death as the health outcome. Other health indicators, including impairment and disability have not been investigated in relation to children's education.

This study employs a broad, more comprehensive definition of health to capture different health dimensions. In addition to functional limitations, it uses the presence of a chronic disease, disability in instrumental activities of daily living (IADL) and in activities of daily living (ADL) as health indicators. By employing multiple indicators of health, this study is able to examine whether the association between children's education and parental health is consistent across different health indicators. Further, it assesses whether parental behaviour and receipt of support from children serve as pathways that mediate the relationship between children's education and parental health. Given the sex differences in health status of older people (Chan & Jatrana, 2007), this study also examines whether the relationship between children's education and parental health differs between older men and older women. The study is contextualized in the Philippine setting, which does not have a welfare-system for most current older adults as many other countries within that region. Therefore, the support of children is crucial for older adults in many Asian countries, which might not be as relevant for countries with an established welfare-system such as European countries.

The rest of the paper is organized as follows. The next section provides an overview of ageing in the Philippines, presenting the context of the study. This is followed by a brief review of previously suggested pathways relating children's education to parental health. Next, we present the aims and objectives of the study, the data and methods used, followed by the description of our results. The final section discusses the main findings and provides conclusions and policy implications.

Ageing in the Philippines

The Philippine population is relatively young, but it is ageing, as evidenced by the increasing proportion of older Filipinos aged 60 years and over, from 4.5% in 1970 to 7.5% in 2015 (Abalos, 2018). The proportion of older people in the country is projected to reach 12.8% in 2035 (Philippine Statistics Authority, 2010b). Improvements in life expectancy contribute to this ageing phenomenon. Life expectancy at birth in the Philippines has increased from 54.2 years in 1970 to 66.9 years in 2010 among men, and from 57.2 years to 73.0 years among women (Philippine Statistics Authority, 2010a). Population ageing in the Philippines occurs in the context of limited formal support although there are recent government initiatives to improve the social pension (Cruz, 2018). In 2007, 22% of older Filipinos reported receiving income from pensions, and only 15% had health insurance (Natividad, Lavares & Saito, 2016). This limited formal support highlights the importance of the family as a source of support. Traditionally, the Filipino family functions as a support system that "provides social security, old age pensions, . . . , care for the sick, home for the aged" (Castillo, 1977, p. 103), and this support system remains resilient over time (Cruz, Abalos, Lavares, Natividad, & Saito, 2009; Cruz & Camhol, 2014). Most older people in the Philippines live with family members and a majority prefer coresidence with children (Abalos & Barona, 2013; Abejo, 2004; Cruz et al., 2009). A high proportion receive some form of financial or material support from their children (Cruz et al., 2016). The fact that such support is received from both coresident and non-coresident children shows that the "intergenerational bond is not delineated by the boundaries of 'home'" (Concepcion & Perez, 2006, p. 305; Natividad & Cruz, 1997).

Adult children also play an active role in providing care to their ageing parents as it is their way of reciprocating their "utang na loob" (debt of gratitude) for all the sacrifices their parents made for them (Concepcion & Perez, 2006). A recent survey found that 48% of older Filipinos were usually cared for by their children when they were sick, and 35% by the older person's spouse (Cruz, Natividad, Gonzales, & Saito, 2016).

As the ageing of the Philippine population is a result of socioeconomic development, it has been accompanied by educational expansion. The share of Filipinos aged 15 and older with no education decreased from 11% in 1970 to 5% in 2010, while the proportion with post-secondary education increased from 4% to 16% (Wittgenstein Centre for Demography and Global Human Capital, 2018). The educational profile of older Filipinos has also improved over time (Abalos, 2018; Hermalin, Ofstedal, & Tesfai, 2007). This educational expansion has been welcomed as an "opportunity to ameliorate some of the challenges posed by population ageing" (Yahirun et al., 2016: 324). Higher education enhances an individual's earnings capacity thereby increasing the available resources for the family. It also grants individuals better access to medical services and health-related information that can benefit older persons through direct care and knowledge transfer (Friedman & Mare, 2014; Torssander, 2013). Given the strength of coresidence and intergenerational support, and the presence of a significant generational divide in terms of educational attainment, the Philippines is an ideal setting to test the relationship between children's education and parental health.

Pathways between children's education and parental health

Very few studies have examined the exact pathways by which children's education positively influences parental health. Torssander (2013), drawing on the Berkman, Glass, Brissette, and Seeman (2000) framework, suggested three pathways that potentially explain this relationship.

The first pathway is through children's social influence on their parents. Highly educated individuals tend to adopt more beneficial health behaviours (e.g., not smoking) than their less educated counterparts (De Walque, 2007). Children's health behaviour may influence their parents' habits, for example by discouraging alcohol use and smoking, and by promoting a better diet and physical activity (Friedman & Mare, 2014; Lee, Gleib, Goldman, & Weinstein, 2017; Torssander, 2013). Friedman and Mare (2014) found evidence in the United States that at least part of the association between children's education and parental survival was due to parental health behaviours such as smoking and exercise. In China, parental smoking was also found to mediate the role of children's education on parents' level of frailty (Bao, 2016) but not on their mortality (Yang et al., 2016).

The second pathway is through the provision of social support, such as emotional, instrumental and informational support, the latter including giving advice or guidance to parents on health-related concerns. Higher education facilitates access to knowledge and information about health, thereby enabling people to better navigate the health care system, follow health providers' instructions, decide on the proper use of health products and adhere to healthier lifestyles (Bao, 2016). Children's knowledge and information about health-related matters become especially useful when older parents experience health problems. This is particularly true for older people whose access to and knowledge of the healthcare system are limited due to their poor socioeconomic conditions. Hence, parental health may benefit from the education of children through the upward transfer of health-related information across generations.

The third pathway is through access to material and non-material resources that accrue from obtaining higher education (Torssander, 2013, 2014). The socioeconomic resources of children allow them to provide financial assistance for medical treatment, to utilize the latest health technology and to access better-quality healthcare services (Bao, 2016). Yahirun, Sheehan, and Hayward (2017) found evidence in Mexico that economic resources can provide a pathway between children's education and short-term changes in parental functional health.

Other potential pathways include the better quality of care that highly educated children can provide, and their greater ability and availability to provide care because they themselves are more likely to be healthy than the less educated (Friedman & Mare, 2014). Employment-related health insurance of highly educated children may also directly benefit their parents as dependents eligible for coverage (Lee & Chuang, 2003; Zimmer et al., 2002a).

Aims and Objectives

The first aim of the study is to examine the relationship between children's education and parental health in the Philippines using multiple indicators of parental health. The objective is to determine whether (and how) the influence of children's education on parental health varies across different health indicators. Expectations are that the relationship will be stronger in health indicators that correspond to more severe health limitations because of the older person's greater need for support. The second aim is to assess whether parental health-related behaviour and receipt of support from children serve as pathways that mediate the relationship between children's education and parental health.

Data and Methods

Data for this study are drawn from the 2007 Philippine Study on Ageing (PSOA). PSOA is a nationally representative survey of non-institutionalized Filipinos aged at least 60 years. It was conducted by the University of the Philippines Population Institute and the Nihon University Population Research Institute. The survey used a structured questionnaire adopted from the multi-wave Nihon University Japanese Longitudinal Study of Ageing. It employed a multiple-stage sampling design with the province as the primary sampling unit, the barangay (village) as the secondary sampling unit, and the older person as the ultimate sampling unit. The study covered seven provinces, 78 barangays, and 3,105 individual respondents. The data are weighted to nationally represent the older population of the country. Further details of the survey can be found in Cruz et al. (2016). The current analysis is limited to older people aged 60 years and older with at least one living child aged 25 years or older (2,832 cases or 91.2% of respondents). Following prior studies, only children aged 25 years and older are included in the analysis as they can be assumed to have completed their education (Friedman & Mare, 2014; Yahirun et al., 2016).

Dependent variables

The primary outcome variables comprise four health measures indicating the presence of health limitations considering different complexities: the presence of a chronic disease, functional limitations, IADL difficulty, and ADL difficulty. Chronic diseases include myocardial infarction, cancer, cerebrovascular disease (haemorrhage, infarction, stroke, etc.), high blood pressure, diabetes and chronic respiratory illness (such as asthma, emphysema). Functional limitations are based on the Nagi (1976) measures of mobility limitations. These include (1) walking 200 to 300 meters; (2) climbing 10 steps without resting; (3) standing for two hours; (4) sitting for two hours; (5) stooping or bending; (6) raising hands; (7) extending arms; (8) grasping with fingers; (9) lifting an object weighing approximately 10 kg; (10) lifting an object weighing approximately 5 kg. More complex activities limitations are addressed by the instrumental activities of daily living (IADL) indicator. Specific IADLs necessary for living independently (Lawton & Brody, 1969) used in this study include (1) preparing own meals; (2) leaving the home to purchase necessary items or medication; (3) taking care of financial matters such as paying utilities (electricity, water); (4) using the telephone; (5) dusting, cleaning-up and other light housework; (6) taking the bus, jeepney or other public transport; (7) taking medication as prescribed. Further, we included difficulties in activities of daily living (ADL) which is related to personal care activities (Deeg, Verbrugge, & Jagger, 2002). The specific ADLs used in this study are (1) taking a bath; (2) dressing; (3) eating; (4) standing up from a bed or chair or sitting down on a chair; (5) walking (around the house); (6) going outside the house; and (7) using the toilet.

Our approach follows previous studies that have examined physical health using dichotomous variables that measure whether an individual has any limitation or difficulty within a specific domain (Chan & Jatrana, 2007; Ofstedal et al., 2007). We measure the presence of health problems using variables indicating whether the respondent reported having at least one chronic disease, at least one mobility limitation (Nagi task), difficulty performing at least one ADL, and at least one IADL (0 = no, 1 =yes), respectively.

In addition to these four health outcomes, several health-related behaviours and receipt of support from children are examined in relation to children's education. Health-related behaviours include smoking, alcohol use and exercise. Smoking status of the respondent is categorized into current smoker and otherwise. Alcohol use is classified into current drinker and otherwise. Exercise habit is categorized into having daily exercise and otherwise. Receipt of different types of support from children in the past 12 months are also examined as mediators. These include financial support, material support (help with material goods), instrumental support (help with food and meals, help with self-care, transportation/getting around, shopping/errands), and emotional (companionship/advice for troubles). These variables are dichotomized indicating the absence (0) or presence of support (1).

Independent variables

Following previous studies, the educational attainment of the most educated child is used to indicate available family resources through children (Bao, 2016; Torssander, 2014; Zimmer et al., 2002a; Zimmer et al., 2007). Further, parental health is likely to be most impacted by the child who can provide the greatest resources, and this is represented well by the most educated child (Zimmer et al., 2002a; Zimmer et al., 2007). In cases where more than one child is most educated, a random selection was used. We differentiate children who completed at least tertiary education versus those who did not. Completion of a tertiary education allows the development of new skills in an individual such as complex reasoning and future-oriented thinking (De Neve & Harling, 2017), which comes into play when children seek possible treatment or avail health services for their parents. Having a tertiary education is also associated with better employment opportunities and higher income that could directly benefit the older persons.

Several characteristics of older persons, that have previously been shown to be associated with health, are included as control variables. Demographic and socioeconomic characteristics of the older person controlled in the analysis include age, marital status, education, type of place of residence, number of children, perceived income adequacy and religiosity. Older people's level of education is categorised as below primary and completed primary education or higher. A lower cut-off for parental education is used given the relatively low level of education of the older people in the sample. Respondent's age refers to their chronological age as of their last birthday and is treated as a continuous variable in the analysis. Marital status is categorised as currently married (including cohabiting or living-together) and unmarried (comprising never-married, widowed and divorced/separated).

The number of living children refers to the total number of biological and adopted children of the respondent. Perceived income adequacy is a proxy measure of respondent's socioeconomic status, considering the income of all household members and the expenses needed to maintain the household. Response categories are (1) enough income with money left over; (2) just enough to pay expenses; (3) some difficulty in meeting expenses; and (4) considerable difficulty in meeting expenses. This variable was re-categorised into (1) at least enough income, (2) some difficulty, and (3) considerable difficulty. Religiosity is an index that captures various domains, including participation in religious activities at home, praying, and reading the Bible.

Two characteristics of respondents during their childhood years are also controlled for in the analyses; these are experience of poverty and self-rated health. Childhood poverty is captured through the following question: "Now think about your family when you were growing up, from birth to age 16. Would you say your family during that time was pretty well off financially, about average, or poor?" The responses were dichotomized into poor and otherwise. Childhood health status is captured through the following question: "Consider your health while you were growing up, from birth to age 16. Would you say that during that time you were: (1) very healthy, (2) healthier than average (3) of average health, (4) somewhat unhealthy, (5) very unhealthy, (6) not sure. The first and second categories were grouped together as "healthy", while categories 3, 4 and 5 are combined as "unhealthy/average." Those who reported "unsure" were treated as missing.

Additionally, the multivariate analyses are controlled for several characteristics of children that have been used in previous studies (Yahirun et al., 2016; Zimmer, Natividad, Ofstedal, & Lin, 2002b). The characteristics of the most educated child include sex, age, marital status, and residential proximity. Age refers to the child's age at the last birthday and is treated as continuous. Sex is categorized into male and female. Marital status refers to current marital status and is classified into married or unmarried in the same way as the respondent. Residential location of child is categorized as living nearby (in the same household or next door) or otherwise.

Statistical analysis

Binomial logistic regression models are used to examine the association between the most educated child's education on the health status of older Filipinos, controlling for the characteristics of both children and parents. Model 1 includes the basic demographic and socioeconomic characteristics of older person and their children. Model 2 adds several indicators of parental health behaviour and receipt of support from children to assess whether these indicators mediate the relationship between children's education and parental health. To further test the presence of mediation in the model, separate models regressing parental health behaviour and receipt of support on children's education are also implemented. All analyses are stratified by sex.

A sensitivity analysis was carried out testing a different specification of children's education and older people's number of children. We replaced the information on the highest educated child with an aggregate measure of adult children's education (i.e., whether the older person's adult children all completed tertiary education, some children completed tertiary education or no child with tertiary education). Our main analysis controlled for the number of children living whereas the total number of children ever born was used as a robustness check. The results are consistent with our results presented here. Educational attainment of the older person's spouse was also added in the model, but the results did not change substantially.

Results

Descriptive analysis

Table 1 presents descriptive statistics of the respondents and their most educated child. The respondents are predominantly female (58.7%), and their average age is 69 years. The majority are married, and the proportion married is almost twice as high among men (82.1%) as among women (44.0%). Slightly more than half of respondents completed primary education. Close to half of respondents have at least enough income to meet their household expenses, while about a third have some difficulty and a fifth have considerable difficulty. About 46% considered their family poor while growing up and three quarters rated themselves healthy when they were young. Respondents have an average of 5.4 living children. About 6 in 10 live in urban areas. More than half of respondents have at least one chronic disease (56.9%), and at least one functional limitation (55.5%). Nearly 1 in 5 has at least one IADL difficulty and about 1 in 7 has at least one ADL difficulty. In general, a higher proportion of women than men have all four adverse health outcomes, with significant differences occurring for chronic disease and ADL difficulty. More than a quarter of the sample are current smokers (26.3%) or current drinkers of alcohol (28.3%) while 59% do physical exercise daily. A higher share of men than women are current drinkers, smokers, and do daily physical exercise. Female respondents (12.0) are more likely to be more religious than male respondents (10.1). The respondents in the sample receive different forms of support from their children, including financial support (83.5%), instrumental support (69.1%), material support (43.0% and emotional support (27.4%). There is little sex difference in the receipt of these types of support, except for emotional support (30.2% for women vs 23.3% for men).

The most educated children of respondents are also predominantly women (57.4%), and their average age is 38 years. Three-quarters of these children are currently married and more than half (51.6%) have completed at least tertiary education. About 4 in 10 of the most educated children live nearby their parents, either in the same household or living nearby.

Table 1. Characteristics of older Filipino men and women and their most educated child

	Men	Women	p
<i>Older person's characteristics</i>			
Mean age	68.2	69.8	**
% currently married	82.1	44.0	**
% with at least primary education	50.1	52.7	
Perceived income adequacy			
At least enough income	44.1	49.0	
Some difficulty	36.0	31.9	
Considerable difficulty	19.9	19.1	
% poor during childhood	48.2	44.0	
% healthy during childhood	77.6	76.0	
Mean number of living children	5.5	5.4	
% living in urban areas	52.5	60.8	*
With at least one chronic disease	53.5	59.3	
With at least one functional limitation	47.8	60.9	*
With least one IADL difficulty	16.4	20.3	
With least one ADL difficulty	12.2	17.5	*
% current smoker	37.5	18.4	**
% currently drinker	49.2	13.6	**
% exercises daily	64.5	55.3	*
% received financial support	83.3	83.7	
% received material support	41.1	44.4	
% received emotional support	23.3	30.2	**
% received instrumental support	66.7	70.7	
Religiosity index	10.1	12.0	**
<i>Most educated child's characteristics</i>			
Mean age	36.7	39.6	**
% female	55.5	58.7	
% married	73.8	75.1	
Education			
Less than tertiary	47.4	48.4	
At least tertiary	52.6	51.6	
Child is living nearby	39.9	42.2	
Number of cases	1171	1661	

Note: p value refers to the test of significance between men and women

** p<0.01, * p<0.05

Multivariate analysis

The demographic and socioeconomic characteristics of older Filipinos are significantly associated with health limitations (e.g. their experience of chronic disease, functional limitation, IADL and ADL difficulty). The pattern and direction of the association are generally similar for men and women. For example, older men and women who have trouble in meeting their household expenses have higher odds of reporting functional limitation and disability, while those who live in urban areas tend to have poorer health than those who live in rural areas. Religiosity is also associated with health of older Filipino men and women, with those more religious reporting lower odds of having poor health. Our results also show that children's level of education is significantly associated with Filipino parents' ADL difficulty, particularly among mothers (Table 3, Model 1). Older women whose children completed tertiary education have lower odds of reporting ADL difficulty compared with their counterparts whose children attained below tertiary education. Although not statistically significant it is worth noting that older men and women with tertiary educated children have lower odds of reporting functional limitations and IADL difficulty. Curiously, older Filipinos with tertiary educated children have higher odds of reporting at least one chronic disease, albeit the association is not statistically significant.

Table 2. Logistic regression adjusted odds ratio (OR) for the presence of health problems among older Filipino men

	Chronic disease		Functional limitation		IADL difficulty		ADL difficulty	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Child has at least tertiary education (ref = below tertiary)	1.13	1.08	0.99	1.03	0.69	0.67	0.67	0.68
<i>Older person's characteristics</i>								
Age	1.00	0.98	1.08**	1.08*	1.11**	1.09*	1.09**	1.07**
Currently married (ref = unmarried)	1.36	1.20	1.24	1.23	1.68	1.53	0.96	0.90
At least primary education (ref = below primary)	1.22	1.24	0.66	0.62	1.09	1.08	1.25	1.20
Perceived income adequacy (ref = enough income)								
Some difficulty	1.16	1.18	1.70**	1.73**	2.23	1.91	2.28**	2.15**
Considerable difficulty	1.04	0.98	1.65*	1.67	2.56*	2.09	1.55	1.30
Childhood poverty (ref = not poor)	0.92	0.94	0.69	0.71	0.83	0.82	0.69	0.67
Childhood health (ref = unhealthy/average)	0.99	1.03	1.04	1.07	1.47	1.77	1.31	1.54
Number of living children	0.99	1.00	0.98	0.98	0.97	0.94*	1.02	1.02
Urban (ref = rural)	1.52	1.49	1.53	1.53	3.43**	3.21**	1.71	1.49
Religiosity	1.05*	1.05*	1.01	1.01	0.98	0.98	0.96	0.97
<i>Child's characteristics</i>								
Age	1.00	1.00	0.99	0.99	1.01	1.01	1.01	1.02
Male (ref = female)	0.90	0.93	0.76	0.74	1.02	1.10	0.88	0.88
Married (ref = unmarried)	0.95	0.82	1.03	0.96	1.31	1.09	0.81	0.63
Child is living nearby (ref = otherwise)	1.11	1.05	1.04	1.08	0.96	0.86	0.94	0.86
<i>Mediators</i>								
Current smoker (ref = otherwise)		0.68		1.27		1.15		1.40
Current drinker (ref = otherwise)		0.44*		0.59**		0.35**		0.36**
Engages in daily exercise (ref = otherwise)		0.76		0.70		0.29**		0.32*
Received financial support (ref = otherwise)		1.00		0.67		1.88		0.96
Received emotional support (ref = otherwise)		1.32		0.79		1.04		1.22
Received material support (ref = otherwise)		1.01		1.27		1.05		1.32
Received instrumental support (ref = otherwise)		0.93		0.86		1.92		1.10
Number of cases	1109	1109	1109	1109	1109	1109	1109	1109

** p<0.01, * p<0.05

Table 3. Logistic regression adjusted odds ratio (OR) for the presence of health problems among older Filipino women

	Chronic disease		Functional limitation		IADL difficulty		ADL difficulty	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Child has at least tertiary education (ref = below tertiary education)	1.21	1.24*	0.86	0.86	0.64	0.58*	0.56*	0.46*
<i>Older person's characteristics</i>								
Age	1.01*	1.01*	1.11**	1.11**	1.12**	1.12**	1.11**	1.10**
Currently married (ref = unmarried)	0.98	0.95	0.96	0.94	1.01	1.03	0.90	0.92
At least primary education (ref = below primary)	1.11	1.07	0.93	0.97	1.16	1.21	1.65	1.83*
Perceived income adequacy (ref = enough income)								
Some difficulty	1.03	1.00	2.25*	2.21*	1.04	1.01	1.03	1.03
Considerable difficulty	0.96	0.96	2.91**	2.76**	1.49	1.35	2.71**	2.32**
Childhood poverty (ref = not poor)	1.10	1.12	1.12	1.13	0.88	0.91	0.93	0.95
Childhood health (ref = unhealthy/average)	0.86	0.84	0.97	0.97	0.92	0.96	1.18	1.37
Number of living children	1.01	1.01	0.97	0.98	0.98	0.98	0.99	1.01
Urban (ref = rural)	1.83*	1.85*	1.47**	1.43**	1.88	1.76	2.01*	1.79*
Religiosity	1.03	1.04	1.00	1.01	0.98	0.99	0.92*	0.95*
<i>Child's characteristics</i>								
Age	0.99	0.99	1.01	1.01	0.98	0.98	0.99*	0.99
Male (ref = female)	1.22	1.20	1.25*	1.22	1.09	1.03	1.14	1.00
Married (ref = unmarried)	0.88	0.88	0.59*	0.56*	1.16	1.16	0.91	0.93
Child is living nearby (ref = otherwise)	1.08	1.06	0.84	0.83	1.02	1.00	0.93	0.85
<i>Mediators</i>								
Current smoker (ref = otherwise)		0.91		0.98		0.78		0.61
Current drinker (ref = otherwise)		0.82		0.92		0.81		0.49*
Engages in daily exercise (ref = otherwise)		0.82		0.62*		0.58*		0.29**
Received financial support (ref = otherwise)		0.97		0.84		1.21		0.72
Received emotional support (ref = otherwise)		0.69*		0.92		0.97		0.92
Received material support (ref = otherwise)		1.23		0.82		1.03		1.32
Received instrumental support (ref = otherwise)		1.43		1.46*		0.97		1.28
Number of cases	1565	1565	1565	1565	1565	1565	1565	1565

** p<0.01, * p<0.05

Table 4. Logistic regression adjusted odds ratio (OR) for the practice of health behaviours and receipt of support among older Filipino men

	Smoking	Drinking	Daily exercise	Financial support	Emotional support	Material support	Instrumental support
Child has at least tertiary education (ref = below tertiary education)	0.88	0.90	1.25	2.12*	1.58	1.68*	0.94
<i>Older person's characteristics</i>							
Age	0.92**	0.93**	0.96*	1.02	1.02	1.02	1.04*
Currently married (ref = unmarried)	0.49	0.67	0.73	0.84	0.97	0.58	0.84
At least primary education (ref =below primary)	0.98	1.15	0.77	0.83	1.08	1.25	0.85
Perceived income adequacy (ref =enough income)							
Some difficulty	1.08	0.95	0.78	2.05*	0.62	1.04	1.14
Considerable difficulty	1.46	0.70	0.83	2.05	1.36	0.93	1.71
Childhood poverty (ref = not poor)	1.17	1.23*	0.90	1.09	1.60	0.97	1.00
Childhood health (ref = unhealthy/average)	1.39	1.06	1.32	0.73	1.33	0.70	1.13
Number of living children	1.10*	1.00	0.99	1.18	0.99	1.07	1.13**
Urban (ref =rural)	0.93	0.86	0.75	1.41	0.96	0.96	1.06
Religiosity	0.98	0.95	1.08	1.03	1.03	0.99	0.97
<i>Child's characteristics</i>							
Age	0.99	0.99	1.01	0.99	0.99	1.00	0.99
Male (ref =female)	1.14	1.11	0.93	0.95	0.60*	0.85	0.87
Married (ref =unmarried)	0.88	0.61*	0.59*	1.05	1.32	1.04	1.37*
Child is living nearby (ref =otherwise)	0.81	0.84	0.99	1.40	1.47	1.10	1.91
Number of cases	1117	1115	1115	1113	1113	1113	1113

** p<0.01, * p<0.05

Table 5. Logistic regression adjusted odds ratio (OR) for the practice of health behaviours and receipt of support among older Filipino women

	Smoking	Drinking	Daily exercise	Financial support	Emotional support	Material support	Instrumental support
Child has at least tertiary education (ref = below tertiary education)	0.78	0.83	0.73*	2.12**	2.10*	1.11	1.03
<i>Older person's characteristics</i>							
Age	0.98	0.94*	0.99	1.04	1.02	1.03*	1.06**
Currently married (ref = unmarried)	0.81	1.16	1.04	1.03	0.64*	1.01	1.16
At least primary education (ref =below primary)	0.80	1.17*	1.35	1.26	0.80	1.83	1.05
Perceived income adequacy (ref =enough income)							
Some difficulty	0.96	1.38	0.85	1.34	0.76*	0.90	1.25
Considerable difficulty	1.16	0.91	0.44*	0.83	1.50	0.95	0.86
Childhood poverty (ref = not poor)	1.10	0.85	1.23	0.98	1.23	0.98	1.13
Childhood health (ref = unhealthy/average)	1.28	1.27	1.18	1.48	0.84	0.96	1.37
Number of living children	1.09	1.00	1.05	1.25**	0.98	1.07**	1.11
Urban (ref =rural)	0.73	0.80	0.61	0.97	1.08	0.87	0.74
Religiosity	0.96	1.05	1.09**	1.01	1.02	0.99	1.00
<i>Child's characteristics</i>							
Age	1.01	1.02	1.01	1.00	0.99	1.02	1.00
Male (ref =female)	1.10	0.77	0.80	1.62*	1.00	0.99	1.18
Married (ref =unmarried)	0.90	1.92*	0.84	0.83	0.89	0.89	0.94
Child is living nearby (ref =otherwise)	1.25	0.72	0.93	1.23	1.35	1.26	1.50**
Number of cases	1581	1581	1571	1575	1575	1575	1575

** p<0.01, * p<0.05

The second aim of this study is to examine whether parental health-related behaviour and receipt of support from children serve as pathways that mediate the association between children's education and parental health. Mediation occurs when the following three conditions are met: (1) a significant relationship between children's education and parental health, (2) a significant relationship between children's education and parental health behaviour or receipt of support, and (3) the relationship between children's education and parental health is reduced or becomes non-significant when parental health behaviour or receipt of support are added in the model. The first condition is tested in Model 1 (Tables 2 and 3). The second condition is tested by analysing the relationship between parental health behavior and receipt of children with children's education (Tables 4 and 5). The third condition is tested by adding the mediating variables in Model 2 (Tables 2 and 3).

Tables 4 shows that older men with college-educated children have higher odds of receiving financial and material support from their children. Table 5 shows that older women with college-educated children are more likely to receive financial and emotional support from their children but less likely to do daily exercise.

Results from Model 2 (Tables 2 and 3) show that parental health behaviours and receipt of support from their children are significantly associated with parental health. Among men, current use of alcohol is associated with lower odds of experiencing the four health problems while engagement in daily exercise is associated with lower odds of experiencing IADL and ADL difficulty. Among women, doing daily exercise is associated with lower odds of reporting functional limitation, ADL and IADL difficulty. Older women's receipt of emotional support is associated with lower odds of reporting chronic disease whereas receipt of instrumental support is associated with higher odds of reporting functional limitations. Adding these mediator variables as covariates does not attenuate, but slightly strengthen the relationship between children's education and parental health,

specifically in the case of mothers¹. Since not all three conditions for mediation are satisfied, we refrain from carrying out more formal ways of testing mediation effects. This implies that although health behaviours and receipt of support are significantly associated with parental health, these pathways do not significantly mediate the relationship between children's education and parental health.

¹ We tested for interaction effects of children's education with receipt of emotional support and mother's practice of daily exercise, and we find that the positive association of these variables on parental health is dependent on children's education. Specifically, the positive impact of receipt of emotional health on women's experience of chronic disease is significant only among those whose children did not complete tertiary education, while the positive influence of engagement in daily exercise is significantly only among those with college-educated children.

Discussion and Conclusion

This study contributes to the growing literature that links children's education with parental health (Bao, 2016; Friedman & Mare, 2014; Torssander, 2013, 2014; Yahirun et al., 2016, 2017; Zimmer, Hanson, & Smith, 2016; Zimmer et al., 2002a; Zimmer et al., 2007). It extends the literature by assessing the association between children's education with several indicators of health. Results of this study echo earlier findings in Mexico and Taiwan, showing children's education to be positively associated with parental health (Yahirun et al., 2016; Zimmer et al., 2002a). It lends support to the argument that education is not only an individual resource but could be a household or family resource that can benefit other family members (Torssander, 2013; Yang et al., 2016; Zimmer et al., 2007).

However, the association between children's education and parental health is only statistically significant among older women. There are several reasons for this sex difference on the influence of children's education on parental health status. First, compared with older men, older women tend to be less educated and less active in the labour force putting them in a disadvantaged socioeconomic position in older ages. This socioeconomic disadvantage makes them more dependent on their children for support compared with older men. Second, the roles that women perform over the life course, such as child-rearing and performing important household services engender a closer emotional connection and greater loyalty from their children (Knodel & Ofstedal, 2003; Risseuw, 2001; Wolf, 1972). The continuity of women's domestic roles even in older ages relative to older men, such as assisting their children in babysitting or doing household chores (Gomes, 2007; Szinovacz, 2000) render women more valued as household members (Beales, 2000; Lopata, 2002; Yount & Khadr, 2008). These maternal investments that accrue over the life course arguably make children more responsive to the health needs of their mothers compared with their fathers' (Zimmer, 2005).

The first objective of this study was to determine whether (and how) the influence of children's education on parental health varies across different health indicators. Functional limitation, which precede the onset of disability, and has been widely used in earlier research as a health indicator, is also examined in this research. However, unlike previous studies (Yahirun et al., 2016; Zimmer et al., 2002a), this study did not find a significant relationship between children's education and parental experience of functional limitations. Instead, we find that parental IADL and ADL difficulty are associated with children's education. These two indicators reflect a more severe health status as any difficulties in IADL or ADL limit the capacity of older people to perform basic activities to live an independent life. Although the presence of functional limitation may cause some forms of difficulty or discomfort among older Filipinos, they may not take it as something that severely affects their health. It is common for some Filipinos to take minor disorders stoically and consider them as a normal part of life that will eventually go away (Pacquiao, 2008). Even if they experience pain, Filipinos consider pain as part of "living an honourable life" and view it as "an opportunity to reach a fuller spiritual life or to atone for past transgressions" (Pacquiao, 2008, p. 193). However, when this pain or difficulty starts to interfere with their ability to live an independent life by preventing them from performing basic activities, such as eating and bathing, they may call on for help from family members, particularly their children for assistance. The study also finds a positive association between children's education and their parents' experience of chronic disease. This could be related to highly educated children's greater access to medical infrastructure that makes screening for chronic disease much easier.

We also investigated whether parental health behaviour and receipt of support from children serve as pathways that mediate the relationship between children's education and parental health. Results show that although health behaviours and receipt of support are significantly associated with parental health, we did not find strong evidence that these variables mediate the relationship between children's education parental health. Other possible pathway could be the better quality of care that highly educated children provide and their employment-related health insurance (which makes their parents eligible for coverage) that are not investigated here due to data limitation.

Consistent with previous studies other characteristics of older persons, such as age, type of place of residence, socioeconomic status and religiosity are significantly associated with their health status. The finding that religiosity of parents was strongly associated with better health is not surprising. It has been shown that the more religious usually adopt more health-enhancing attitudes and behaviours (Oleckno & Blacconiere, 1991) and benefit from enhanced psychological well-being (Gebauer, Sedikides, & Neberich, 2012) compared with the less religious ones.

Although the study demonstrates a significant association between children's education and parental health status, the results remain inconclusive and should be interpreted with caution. Due to the cross-sectional nature of the data, direct causation between children's education and the health status of their parents cannot be inferred. Longitudinal data are better suited in establishing this causation. Although most of the relevant variables that have been shown to influence the health status of older people are included in the model, there may be some characteristics of older persons and their children that could further explain the association but were excluded in the analysis due to data limitations. Like previous studies, the present study may also suffer from problems of endogeneity (Friedman & Mare, 2014; Torssander, 2013, 2014; Zimmer et al., 2002a). One source of this endogeneity is the possibility of reverse causation between children's education and parental health, i.e., healthier parents are more likely to have highly educated children. Healthier parents are then more able to finance and actively support the education of their children. This issue is addressed in this research by including older people's self-rated health when they were growing up in the regression models. The inclusion of this variable did not change the significant relationship between children's education and parental health. It is also possible that parents who are more forward-thinking and invest in their offspring's education may themselves invest in making sure that they have better health in the future by living healthier lifestyles (Yahirun et al., 2016). Another limitation of the study is that the health indicators used are self-reported and not medically validated. Without medical validation it may be difficult to be conclusive and be accurate on the presence and severity of diseases from self-reports, particularly for illness such as myocardial infarction, cancer, cerebrovascular disease, diabetes and respiratory illness. Notwithstanding these limitations, this study contributes to the growing evidence that investments in human capital of younger generation also confers benefits to the older generation (De Neve & Harling, 2017; Friedman & Mare, 2014; Yahirun et al., 2016). This finding is very important in the Philippine setting where one of the motivations of the current older generation for having many children was to secure old age support (Bulatao, 1975), and where investing in children's schooling was a way of ensuring that one's children obtain good jobs and are thus able to later extend support to their parents.

The future generations of older people in the Philippines and many other countries have already been born, but their children are still in school. There is a good argument to support the investment in the education of the younger cohorts as it benefits the older generation, as has been demonstrated in this study. While

existing policies in the Philippines encourage the completion of tertiary education by eliminating tuition fees in some public universities and colleges, attention should also be directed to the quality and content of the education that young people receive. A recent report by the World Bank shows that the quality of education in the Philippines, measured in terms of the human capital index, is low compared with its neighbours in Southeast Asia, such as Malaysia, Thailand and Vietnam (World Bank, 2019). Furthermore, the positive impact of children's education on parental health can only materialize if there is continuity in intergenerational support. However, the widespread migration of young people within and outside the country could widen the physical and emotional distance between parents and their children, which could result in a decline in intergenerational support. About a third of the most educated children of respondents live in another town while around 8 percent live overseas, but children's residential location did not change the relationship between children's education and parental health. While filial piety and other values that encourage familial responsibility towards older people remain strong in the Philippines, educational expansion and increasing modernization may impact these values to the detriment of older people. Some studies report that increasing education may increase the knowledge gap between the younger and older generation that could lead to disrespect for older people (Ingersoll-Dayton & Saengtienchai, 1999). Thus, the future educational curriculum should continue to emphasize traditional familial values that promote care for older persons.

References

- Abalos, J. B. (2018). Older Persons in the Philippines: A demographic, socioeconomic and health profile. *Ageing International*, 1-25. doi:<https://doi.org/10.1007/s12126-018-9337-7>
- Bao, L. (2016). Intergenerational support and well-being of older adults in changing family contexts. (Doctor of Philosophy), University of Maryland.
- Beales, S. (2000). Why we should invest in older women and men: the experience of HelpAge International. *Gender & Development*, 8(2), 9-18.
- Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium ☆. *Social Science & Medicine*, 51(6), 843-857.
- Bulatao, R. A. (1975). *The Value of Children: A Cross-National Study, Volume Two. Philippines*. Honolulu: East-West Population Institute.
- Chan, A., & Jatrana, S. (2007). Gender differences in health among older Singaporeans. *International Sociology*, 22(4), 463-491. doi:10.1177/0268580907078009
- Cruz, G. T. (2018). Demography and population ageing in the Philippines. Paper presented at the South-South Conference on Demography and Population Ageing, The Boulevard Kuala Lumpur Hotel, Kuala Lumpur, Malaysia.
- Cruz, G. T., Natividad, J. N., Gonzales, M. L., & Saito, Y. (2016). *Aging in the Philippines: Findings from the 2007 Philippine study on aging*. Quezon City: University of the Philippine Population Institute and Demographic Research and Development Foundation Inc.
- De Neve, J.-W., & Harling, G. (2017). Offspring schooling associated with increased parental survival in rural KwaZulu-Natal, South Africa. *Social Science & Medicine*, 176, 149-157.
- De Walque, D. (2007). Does education affect smoking behaviors?: Evidence using the Vietnam draft as an instrument for college education. *Journal of Health Economics*, 26(5), 877-895.
- Deeg, D. J. H., Verbrugge, L. M., & Jagger, C. (2002). Disability measurement. In J.-M. Robine, C. Jagger, C. D. Mathers, E. M. Crimmins, & R. M. Suzman (Eds.), *Determining health expectancies* (pp. 203-219). Chichester, UK: John Wiley.
- Friedman, E. M., & Mare, R. D. (2014). The schooling of offspring and the survival of parents. *Demography*, 51(4), 1271-1293.
- Gebauer, J. E., Sedikides, C., & Neberich, W. (2012). Religiosity, social self-esteem, and psychological adjustment: On the cross-cultural specificity of the psychological benefits of religiosity. *Psychological Science*, 23(2), 158-160.
- Gomes, C. (2007). Intergenerational exchanges in Mexico: Types and intensity of support. *Current Sociology*, 55(4), 545-560.

- Hermalin, A. I., Ofstedal, M. B., & Tesfai, R. (2007). Future characteristics of the elderly in developing countries and their implications for policy. *Asian Population Studies*, 3(1), 5-36.
- Hosseinpoor, A. R., Williams, J. S., Jann, B., Kowal, P., Officer, A., Posarac, A., & Chatterji, S. (2012). Social determinants of sex differences in disability among older adults: a multi-country decomposition analysis using the World Health Survey. *International journal for equity in health*, 11(1), 52.
- Ingersoll-Dayton, B., & Saengtienchai, C. (1999). Respect for the elderly in Asia: Stability and change. *The International Journal of Aging and Human Development*, 48(2), 113-130.
- Knodel, J., & Ofstedal, M. B. (2003). Gender and aging in the developing world: Where are the men? *Population and Development Review*, 29(4), 677-698.
- Lawton, M. P., & Brody, E. M. (1969). Assessment of older people: self-maintaining and instrumental activities of daily living. *The Gerontologist*, 9(3_Part_1), 179-186.
- Lee, C., Gleib, D. A., Goldman, N., & Weinstein, M. (2017). Children's education and parents' trajectories of depressive symptoms. *Journal of Health and Social Behavior*, 58(1), 86-101.
- Lee, Y.-J., & Chuang, Y.-L. (2003). Children's education, intergenerational support, and elderly parents' health in Taiwan. *Development and Society*, 32(1), 1-26.
- Lopata, H. Z. (2002). Widower, widow: How same? How different? *The Gerontologist*, 42(4), 564-566.
- Nagi, S. Z. (1976). An epidemiology of disability among adults in the United States. *The Milbank Memorial Fund Quarterly. Health and Society*, 439-467.
- Ofstedal, M. B., Zimmer, Z., Hermalin, A. I., Chan, A., Chuang, Y.-L., Natividad, J., & Tang, Z. (2007). Short-term trends in functional limitation and disability among older Asians: a comparison of five Asian settings. *Journal of cross-cultural gerontology*, 22(3), 243-261 %@ 0169-3816.
- Oleckno, W. A., & Blacconiere, M. J. (1991). Relationship of religiosity to wellness and other health-related behaviors and outcomes. *Psychological Reports*, 68(3), 819-826.
- Pacquiao, D. F. (2008). People of Filipino heritage. In L. D. Purnell & B. T. Paulanka (Eds.), *Transcultural health care: A culturally competent approach* (3rd ed., pp. 175-195). Philadelphia: F.A. Davis.
- Philippine Statistics Authority. (2010a). Life table of the Philippines prepared by the interagency working group. Philippine Statistics Authority. Manila.
- Philippine Statistics Authority. (2010b). Philippine statistics authority, 2010 census-based population projections in collaboration with the inter-agency working group on population projections. Retrieved from <https://psa.gov.ph/statistics/census/projected-population>
- Risseuw, C. (2001). Policy issues of inclusion and exclusion in relation to gender and ageing in the south. *The European Journal of Development Research*, 13(2), 26-48.
- Szinovacz, M. E. (2000). Changes in housework after retirement: A panel analysis. *Journal of Marriage and Family*, 62(1), 78-92.

- Torssander, J. (2013). From child to parent? The significance of children's education for their parents' longevity. *Demography*, 50(2), 637-659.
- Torssander, J. (2014). Adult children's socioeconomic positions and their parents' mortality: a comparison of education, occupational class, and income. *Social Science & Medicine*, 122, 148-156.
- Wittgenstein Centre for Demography and Global Human Capital. (2018). Wittgenstein Centre Data Explorer Version 1.2.
- Wolf, M. (1972). *Women and the family in rural Taiwan*: Stanford University Press.
- World Bank. (2019). *World development report: The changing nature of work*. Washington, DC: World Bank.
- Yahirun, J. J., Sheehan, C. M., & Hayward, M. D. (2016). Adult children's education and parents' functional limitations in Mexico. *Research on Aging*, 38(3), 322-345.
- Yahirun, J. J., Sheehan, C. M., & Hayward, M. D. (2017). Adult children's education and changes to parents' physical health in Mexico. *Social Science & Medicine*, 181, 93-101.
- Yang, L., Martikainen, P., & Silventoinen, K. (2016). Effects of individual, spousal, and offspring socioeconomic status on mortality among elderly people in China. *Journal of Epidemiology*, 26(11), 602-609.
- Yount, K. M., & Khadr, Z. (2008). Gender, social change, and living arrangements among older Egyptians during the 1990s. *Population Research and Policy Review*, 27(2), 201-225.
- Zimmer, Z. (2005). Health and living arrangement transitions among China's oldest-old. *Research on Aging*, 27(5), 526-555.
- Zimmer, Z. (2006). Disability and active life expectancy among older Cambodians. *Asian Population Studies*, 2(2), 133-148.
- Zimmer, Z., Hanson, H. A., & Smith, K. R. (2016). Offspring socioeconomic status and parent mortality within a historical population. *Demography*, 53(5), 1583-1603.
- Zimmer, Z., Hermalin, A. I., & Lin, H.-S. (2002a). Whose education counts? The added impact of adult-child education on physical functioning of older Taiwanese. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 57(1), S23-S32.
- Zimmer, Z., Martin, L. G., Ofstedal, M. B., & Chuang, Y.-L. (2007). Education of adult children and mortality of their elderly parents in Taiwan. *Demography*, 44(2), 289-305.
- Zimmer, Z., Natividad, J. N., Ofstedal, M. B., & Lin, H.-S. (2002b). Physical and mental health of the elderly. In A. I. Hermalin (Ed.), *The well-being of the elderly in Asia: a four-country comparative study* (pp. 361-411). Ann Arbor: The University of Michigan Press.