Women's education and child growth in urban Papua New Guinea

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Papua New Guinea has the highest rate of infant and child mortality in the Pacific, and one of the highest rates of maternal mortality in the world (UNICEF, 1994). Substantial improvements in family and child health are likely if PNG invested more heavily in the education of women. This assertion has been made by Gannicott and Avalos (1994) on the basis of their summary of overseas research on the link between women's education and economic development.

The purpose of this research note is to report quantitative evidence that supports the claim, made by Gannicott and Avalos, that investing in women's education has a high payoff in improved health. The particular relationship studied is between women's education and the growth of young children.

There are several pathways through which the education of parents and caregivers can affect the growth of children. First, there is an *income* pathway, where education may help to increase incomes, allowing extra spending on food and health care for the child. Second, there is an *efficiency* pathway, where education may improve understanding of health and nutrition so that even with a given income a household is able to produce taller, heavier and healthier children. Third, there is a *power* pathway, where increasing the education of women may increase their say in household decision-making. If women have greater concern for children's growth and nutrition than men do, their increased say may lead to more resources being allocated to the children.

The data come from urban household surveys, conducted by the National Statistical Office between

1985 and 1989. These surveys collected information on the income and schooling of adults within the selected households, and also recorded the weight and length of any children under five years of age. In total, there is full information for 442 children from 262 households. Of these children, 9.2 percent (8.2 percent of boys, 10.4 percent of girls) were stunted (less than 90 percent of standard length for their age) and 15.1 percent (12.3 percent of boys, 18.7 percent of girls) were underweight (less than 80 percent of the standard weight for their age). However, these children were relatively well grown compared to rural children: the 1982-83 National Nutrition Survey found 23.3 percent of rural children stunted and 38.1 percent underweight.

I focus on the children's length, which is considered to be the best indicator of chronic malnutrition, reflecting the accumulated effect of past illnesses and periods of inadequate food intake. The equation used to control for influences other than education is:

$$\text{Length (cm)} = a + b_1 \text{ Age} + b_2 (\text{Age})^2 + b_3 \text{ Male} + b_4 \text{ Highlands Origin.}$$

This equation recognises that length increases non-linearly with age, that length can differ between boys and girls, and that Highlands children are shorter (but heavier) than lowlands children (Heywood, Singleton and Ross, 1988).

The effect of education on child growth is found by adding to the equation a variable measuring the average years of education of adults in the household. This variable is then disaggregated into years of education for women and years of education for men.

The first result, contained in column (i) of Table 1, is that each extra year of education completed by adults in the household increases the length of children by about one-half of a centimetre, holding age, sex, and ethnicity constant.

Table 1: Estimates of Equations for Child Length With Adult Educational Levels Disaggregated by Sex

	Dependent Variable: Length (*N*=442)			
	(i)	(ii)	(iii)	(iv)
Average education level of adults in household	0.4528 (0.0974)	--	--	--
Average education level of men in household	--	0.0579 (0.0911)	0.0181 (0.0946)	0.0190 (0.0947)
Average education level of women in household	--	0.3935 (0.1047)	0.3583 (0.1037)	0.3484 (0.1078)
Real household income per capita	--	--	0.0065 (0.0031)	--
Income earned by men (real per capita)	--	--	--	0.0062 (0.0032)
Income earned by women (real per capita)	--	--	--	0.0103 (0.0096)
t-test for equality of coefficients on male and female education		*t*=1.96	*t*=1.99	*t*=1.89
R^2	0.85	0.86	0.86	0.86

Notes: Each equation also includes an intercept term, the age and $(age)^2$ of the child, and variables indicating whether the child is male, or of Highlands origin.
Numbers in ( ) are heteroscedastically consistent standard errors.

The results in column (ii) show that most of this effect comes from the education of women, rather than of men: an extra year of education for women is six times more effective in improving child nutrition. The size of the *t*-statistic on this difference means that this result is not just a fluke from this particular sample.

The results in column (iii) and column (iv) show the effect of including income. There is a slight fall in the coefficients on women's and men's education, but it does not affect the size or the statistical

significance of the difference in the coefficients. The importance of education, even when income is controlled for, suggests that most of the effect of education on child growth does not come through the income pathway. Instead, it may work either through the efficiency pathway, with women's education most effective because women spend more time caring for children than men do, or through the power pathway, with children benefitting from the bigger say that educated women have in household decision-making.

The results in Table 1 are robust. They are not changed if the percentage of the standard length for age is used as the dependent variable, nor if logarithms are used as the dependent variable (so that coefficients are interpreted as percentages), nor if extra polynomials (up to at least an $(Age)^8$ term) are added to the equation.

These results suggest that efforts to increase the education gained by women will have big payoffs. The adult women in the sample had two years less education, on average, than the men (5.1 years versus 7.0 years). Closing this schooling gap would increase the length of children by almost one centimetre (on average, a one percent increase in length). This would reduce the proportion of stunted children from 9.2 percent to 7.3 percent.

Nationally, the gains are potentially much bigger because (i) malnutrition is worse in rural areas, and (ii) rural women have fewer years of education than urban women, so there is more potential for `catch-up'. The results also indicate a need for public action because private choices are likely to lead to less women's education than is socially desirable. When parents are choosing whether to send their daughter to school they are probably unaware of the impact that this choice has on the nutrition and life chances of their yet-to-be-born grandchildren. Publicising these effects, and also

reducing the costs of educating girls, either in monetary terms or in terms of risks to their physical safety, could go a long way towards improving the nutrition of future generations of children.

REFERENCES

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