

Child Health and Maternal Labour Supply: A Chi Square Approach

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ABSTRACT

This study attempts to examine the socioeconomic effects of child health on maternal labour supply in rural Cameroon, using the χ^2 approach. The subject of child health and its influence on maternal labour supply and family income after child birth is of growing importance due to the significant increase in child health problems in sub Saharan Africa and Cameroon in particular. We used primary data, collected in Tombel with a random sample survey of 100 questionnaires. Based on our objectives and hypothesis, the χ^2 test of independence is used to determine the relationship between child health and maternal labour supply and family income. The result obtained on child health - maternal labour relationship shows that χ^2 calculated value (6.68) is greater than the χ^2 critical value (3.841) implying that there is a strong correlation between child health and maternal labour force participation. Further, the contingency coefficient (CC) of 25% compared to the contingency maximum (C_{max}) of 70.7% also reveals a positive relationship. On the other hand, the result obtained from child health and family income relationship shows that the χ^2 calculated value (92.43) is greater than the χ^2 critical value (3.841), implying a significant relationship between child health and family income. Similarly, the contingency coefficient of 28% compared to the contingency maximum of 70.7% means a positively moderate relationship. Socio - Economically, this result implies that poor child health affects negatively the time spent by women in activities such as agricultural practices, food preparation, marketing and consequently the income of the household.....etc. On the basis of this results, we recommend that; decision makers should encourage mutual health registration in the rural zones so as to reduce the rate of self-medication; mothers should be educated on preventive health and first aid measures as propagated by PLAN-Cameroon.

Keywords: *Child health, maternal labour supply, family income, Chi square, Socio-economic, Cameroon*

1. INTRODUCTION

Child health and general health provides utility not only directly but also indirectly, since it is a key input into many household production processes. Family health, especially child health is an important component of socio-economic growth and poverty reduction because it shapes both the present and future human capital, as well as livelihood prospects. Good health at childhood, as argued, does not only affect the physical growth potential, risk of morbidity and mortality in later years of life; but also releases potential household savings on medical expenditures and extra-time to adult household members to take more advantage of labour market opportunities (Baye and Fambon, 2009), as well as the child's capacity to learn and prospects for better future standards of living.

As noted in Powers (2003), it has been widely recognized that women in developing countries have dual roles in maintaining family welfare such as: generators of household income and primary caregivers to children, for instance, programs to reduce child malnutrition, typically target mothers as caregivers. However, because of time constraints women face, there are potential conflicts between women's different activities about which policy makers are rarely informed. Nutrition interventions have not usually considered the barriers to participation in such programs facing mothers who, either by choice or necessity have entered the labour force (Engle and Breaux, 1994). Similarly, policies directed at improving female employment opportunities typically ignore women's

important role in household activities related to children's healthy development (Glick and Sahn, 1998).

Looking critically at the labour market, the increase in the proportion of women participating in paid work that began shortly after the start of World War II has been one of the most significant social and economic trends in modern history. The movement of large numbers of women into the workplace has resulted in substantial changes to public policy, organizational practices, family relations and cultural attitudes and norms as well as contributing to the creation of entire new industries, such as childcare. While the level of attachment to the labour market of childless women is generally unopposed, the same cannot be said for women with dependent children. Being primarily responsible for the care of young children in an emotion-laden role and any behavior that are thought to impact on that role, including participation in paid work is scrutinized accordingly.

A crucial aspect of child health and maternal labour force participation relationship is the fact that in the long run, such a connection can lead to the persistence of a low socio-economic status from one generation to the next. Thus Hogan et al (2000) found for example, that in the US, children with health problems more often come from poor or welfare dependent families. Brandon and Hogan (2001) also found that the existence of health problems in both mothers and children has a negative

effect on these women's ability to get off welfare (Dunkelberg and Spiess 2007).

Nevertheless, more women are working in the marketplace today than ever before. Specifically, about 60 percent of women are currently in the labour force, which is almost a 50 percent increase from 30 years ago (Bureau of Labour Statistics, 2000). Much of this increase is due to mothers participating in the labour force. In fact, 61 percent of all mothers are working within three years after their child's birth (Bureau of Labour Statistics, 2000). In Cameroon about half of these mothers who are civil servants return to work within the first three months after giving birth (Klerman and Leibowitz, 1990). Many of these women find that marketplace work and household production increasingly compete for their time. Consequently, many employed pregnant women return to work quickly after giving birth to keep their jobs, taking only a brief period of time off from work. The proportion of women in the labour force may be further increased by welfare reform's recent emphasis on moving recipients to work (Baum, 2004), this situation is typically what we are experiencing in Cameroon and the situation is worst in the rural milieu.

This demographic trend is important because a woman's work decisions may have an effect on her child. In fact, some researchers have found that maternal employment during a child's first year significantly hinders cognitive development. (Desai et al, 1989; Blau and Grossberg, 1992; Baum, 2003). Others have found that a woman's behavior during the pregnancy (cigarette smoking, illegal drug use, and receipt of prenatal care) have important effects on her child's health at birth.

Consistent with this analysis, the result of a United State study shows that the reverse effect of labour on health might also play an important role, since lower household income due to decreased maternal labour market participation could lead to decreased investments in the family members' health, and thus, poorer health outcomes. This effect probably applies more to countries such as the US that lack universal health care coverage, however the Cameroon health care system can be expected to produce weaker or even non-existent effects. According to the Demographic Health Survey, (2004), about 22 percent (22%) of those respondents living close to the poverty line in Cameroon said their reasons for having not gone to the doctor when they needed to were financial in nature. Only seven percent (7%) of those not living close to the poverty line stated financial reasons for not going to the doctor.

Tsafack and Zamo-Akono (2009) observed that since the pioneering work of Mincer (1962) and Cain (1966), there have been numerous studies on female labour force participation. These studies highlight that women's labour supply depends upon sociology, economic and demographic characteristics such as female

earnings, male earnings; non-earnings income, schooling, age and the number of children (see Hill, 1983 for a complete review). Some of them have documented strong ties between women's work patterns and changes in their family status (Rosenfeld, 1996; Ellingsæter and Rønsen, 1996; Rindfuss et al. 1999). These results are based on the evidence that women who work for pay have fewer children (on average) than women who do not, and that mothers spend less time in paid employment (on average) than childless women.

Generally, it has been proven in literature that, health is one of human capital characteristics (Scheffler and Iden, 1974; Bartel and Taubman, 1979; Parsons, 1980) as such, health status variables influences labour force decisions. By these Marmot et al (1991) noted that there exist a positive relationship between health and economic prosperity. Using self-reported measures, Bound et al (1996) also find that health have positive and significant effects on labour force participation, hence, they demonstrated that the lower labour force participation rates of blacks (relative to whites) in the united state of America, can be explained by differences in health status.

Most existing health care-maternal labour literature have either used the ordinary least square regressions, probit or ivprobit models (see for example, Cramer, 1980; Salkever, 1982; Mroz, 1987; Stern, 1989; Haveman et al.1989; Blau and Grossberg, 1990; Wolfe and Hill, 1995; Lavy et al. 1995; Glick and Sahn, 1998; Angrist and Evans, 1998; Powers, 2001; Leung and Wong, 2002; Baker et al 2005; Frijters et al, 2008; Tsafack and Zamo-Akono, 2009) to provide evidence on the effect of various child health problems to labour force participation. The results from these studies indicate that poor child health generally has a negative effect on maternal employment and to a lesser extent hours worked. None of these studies socioeconomically speaking have use the Chi Square Approach either in sub Saharan Africa or elsewhere to carry out any empirical analysis in this light.

To do this, the study seek to examine the following objectives; 1) to determine child health effects on rural maternal labour supply, 2) to observe the influence of child health on family income, 3) to make possible policy recommendations on the basis of our analysis. Based on these objectives, we hypothesis that; 1) child health is relatively significance in explaining maternal labour force participation in rural Cameroon, 2) child health contributes in determining family income in the rural community of Tombel.

2. LITERATURE REVIEW

There has been relatively little empirical research to date on the effects of child health on maternal labour market outcomes using large micro-datasets. The few existing studies of which we are aware are based exclusively on US data, and these have consistently found negative effects of child health on maternal labour force

participation. Their results differ, however, depending on the group in question: for wives and female household heads the effects of child health have been found to be of differing magnitudes. The results for the effect on working hours are also somewhat inconclusive concerning the significance of the effect.

Some of the first studies of the influence of child health on maternal labour supply were those by Salkever (Salkever 1980, 1982a, 1982b and 1990). In the last two of these, Salkever used the Survey of Income and Education (SIE) and found significant negative effects of child health on the probability of both wives and female household heads working, but no effects on their number of working hours. These results suggest that it is mainly the decision to work that is affected by children's health problems, but not the number of working hours. Norberg (1998), whose study was based on similar child health data to ours namely, low birth weight, prolonged hospitalization after birth, and disabilities investigated the influence on the mother's re-entry to the labour force up to five years after childbirth. On the basis of the NLSY (National Longitudinal Survey of Youth) of 1994, she found a significant negative effect of child health problems, as well as of the mother's own poor state of health, on the time of re-entry to the labour force.

A number of more elaborate studies concerning the influence of the child's health on the mother's labour supply have been conducted by Powers (Powers 1999, 2001 and 2003), in all of which she controls for possible endogeneity of the health variables. This endogeneity problem can occur because measurement errors in health variables might be correlated with the working behavior of mothers. For example, working mothers might report a better health status than non-working mothers in order to justify either why they are working or why they are not.

In her third study (Powers 2003), Powers uses the Survey of Income and Program Participation (SIPP) from 1992 and 1993 to implement models of dynamic labour market outcomes such as the transition from not working to working that are less prone to endogeneity issues. In these studies, she finds some support for endogeneity, mainly for wives: in the dynamic models the effects are smaller, and for wives the effects are no longer significant. She fails to find a significant effect on working hours for wives in all model specifications, suggesting that at least for wives the child's disability affects mainly the probability of working but not the number of hours. For female household heads, the effects on the probability of working and on working hours remain significant in all model specifications and are always larger than for wives. Again, she also finds a negative effect regarding the mothers' own poor state of health on their involvement in the labour force.

Another recent study is that of Corman et al. (2004) based on the "Fragile Families and Child

Wellbeing Study" covering the years 1998 to 2002. They, too control for possible endogeneity of the child health variable. They investigate the influence of child health at a very young age (12 to 18 months). Using the number of adoption agencies in town and the existence of a neonatal intensive care unit in the hospital where the child was born as instruments for the health variable, they do not find support for endogeneity of the health variable. Concerning maternal work behavior, they find significant negative effects of a child's disability on the probability of the mother working, as well as on the number of working hours for both wives and female household heads. Here again, the effects for female heads are stronger.

The study by Wolfe and Hill (1995), based on the 1994 SIPP, investigates the influence of child and maternal health indicators on different labour market outcomes of female household heads. They find a significant negative effect of mothers' poor health on their market wages, as well as a significant negative effect of problems with activities of daily living (ADL's) on maternal labour force participation. They also find a significant negative effect of children's health problems.

Summarizing the results of these studies, one can say that the more recent studies have generally found stronger effects of health problems for female household heads than for wives, inconsistent results for working hours regarding the degree of statistical significance, and no definite support for the issue of endogeneity of the health variables. The negative effects on the probability of working are always significant and more robust for both wives and female household heads.

3. THEORETICAL FRAMEWORK

In this framework, the economic model of the family developed by Becker, (1965) and others forms the conceptual basis for our analysis of the consequences of maternal labour supply. The family's objective is assumed to be maximization of the utility that it derives from consuming the various goods that it produces using inputs of family members' time and market-purchased goods and services. In this framework, child services are viewed as consumption good from which parents derive utility. The family's level of consumption of child services depends on both the number of children that it produces and on the quality of each child Blau and Grossberg, (1990).

The time spent by women in activities such as food preparation, breastfeeding, collecting water and fuel as well as seeking preventive and curative medical care is an important input into the production of infant or child health. Mothers, who work, however, may lack the time to adequately breastfeed or prepare nutritious foods for their young children or make use of public services designed to improve child nutrition. Although market substitutes for some time-intensive inputs exist (e.g. prepared foods, hired domestic help, these may be too costly for many women; for many other time-related inputs into health,

there are unlikely to be functioning markets. Working women may rely on other members of the household to provide child care while they work, but the quality of care provided by these substitutes, especially if they are older children, may be poor (Glick and Sahn, 1998). However, women's income generating activities also increase the level of household resources, which should improve nutrition. As a result, detrimental effects of changes in time allocation may be partially or completely offset. Moreover, there is some evidence that women are more likely than men to spend their income in ways that improve children's welfare. What then can we say? The net effect of child health on maternal labour force participation and family income outcomes is an empirical question.

4. METHODOLOGY AND DATA SETTING

Our study zone is Tombel – Cameroon, found in latitude $4^{\circ} 42.35' N$ and longitude $9^{\circ} 42.34' E$ of the equator, this zone covers a land surface of $2007/KM^2$ with a population density of about 25 persons/ KM^2 and a total population of about 50,000 persons. The female population is predominantly depended on the primary sector of labour (agriculture) and small scale businesses. There are a few administrative offices and the private sector is also represented. Our study will consider this population composition in order to ensure the representation of the sample. The methodology used here is the purposive sampling method; this method consist of choosing members of the sample population at random, thus, every member has the same chance of being a part of the sample population. Those consider for the survey were presented a questionnaire of 33 questions after intense interview, other relevant information judged necessary but not included in the questionnaire was collected during the interview process. The data collected is analysed in the SPSS 17 software using the Chi-square (χ^2) test of independence

4.1 Descriptive Sample Characteristics

The table below, reveals that the majority of women included in the sample are of age 31- 40 years, 51% of this age group constituted the sample, the ages 21-30 years made up 26% of the sample, while those of 41 years and above is 23%. A majority of the participants are currently married comprising 49% of the sample while those living with a man made up 23% and 28% of the participants were not in any union. Further, of the 72 participants who are either married or living with a man, 58 comprising 80.56% are with husbands that schooled while 19.44% have partners who did not schooled. As seen in the table, a majority of the participants have attended secondary school (secondary school in this study includes the 1st and 2nd cycle of secondary education) 61.11% of the partners were identified in this category while 22.22% ended in the primary school level, 5.56% had never been to school and 11.11% had university level.

Upon 100 women, included in the sample, 11% have not been to school while 28% ended their education at the primary level. The majority of the participants, comprising 56% had attained secondary education, 5% of the participants have university level of education. Combining the educational statistics of mothers and their partners reveals that most of them ended mainly at secondary education. This statistics implies Tombel is a typical rural area with a high dependent on agricultural activities.

As noted above, participants included in the survey are mainly involved in the primary sector of activities, thus, while 61.63% of them were identified in this category, 16 of them constituting 18.6% indicated being in the secondary sector. This category involves mothers working in maize and cassava transformation as well as banana factory. 19.77% of the participants were identified as workers of the tertiary sector such as teachers of primary schools, nurses, shop owners and petty traders. The above analysis on occupational activities therefore reveals that 86 women are engaged in activities other than home chores. Amongst these participants a small proportion are involved in family businesses while the majority (80.23%) of the 86 women are engaged in other jobs of the primary sector while those working in paid jobs constitute only 81.4%. The above occupational trend is characteristic of a typical agriculture dominated area, where planting and harvesting season determine a lot of other activities. During these two major periods, women are engaged in food sales and during harvesting periods, especially cocoa harvest, wine shops do progress.

Almost all of the participants revealed that the health of a child affects household income. Some gave as reasons the fact that when children are sick they need attention, money is spent in hospitals. Some participants have children who are usually sick in the age range of 0-5 years, this category of participants made up 86.87% of the sample while 13.13% indicated that their children are not usually sick. The sample descriptive statistics also reveals that most mothers went for antenatal while pregnant (94.95%) as well as gave birth to their children in hospital and most children received their vaccines. However, 76.77% of the participants fed their children exclusively with breast milk while an important proportion of 23.23% did not rely exclusively on breast milk to feed their children. Some mothers reveal that their children are often ill of malaria this group of participants were 55 and constituted 60.44% of the sample. 13 of the participants revealed that children suffer from diarrhoea and this group made up 14.29% while those confirming cough and respiratory infections made up 12.09% of the sample. However, of the 6.59% of working mothers of the sick children in the sample, some were dismissed from their jobs, while 43.43% testifies of not going to work when children are sick. This survey statistics is summarised in table 1 below:

Table 1: The descriptive sample characteristics of maternal labour supply

Description	N° of persons	Percentage (%)
Distribution of mothers according to currently work status		
Yes	86	86.0
No	14	14.0
Distribution according to mother participation in child vaccination		
Yes	99	100
No	00	0
Distribution according to mother's Age range		
21-30	26	26
31-40	51	51
41 and above	23	23
Distribution according to married or living with a man or not in union		
Married	49	49
Living with a man	23	23
Not in union	28	28
Husband's or partner's highest level of education		
Have never been to school	04	5.56
Primary	16	22.22
Secondary (1 st and 2 nd cycle)	44	61.11
University level	08	11.11
Distribution according to Mother school attendance		
Yes	89	89.0
No	11	11.0
Distribution according to whether their children are usually sick in the age range of 0-5 years		
Yes	86	86.87
No	13	13.13
Distribution according to mother's responses on the economic impact when the child is sick		
Don't go to work	43	43.43%
Dismissed from job	06	6.59%
Fall in household income	72	72.72%
Total Percentage	-----	100

Source: Field Survey, 2012

5. EMPIRICAL RESULTS AND DISCUSSION

The objective of this section is to present the results obtained from data collected on child health in relation to maternal labour force participation and family income in Tombel - Cameroon. The research is design such that we used as instrument for analysing our data the Chi-square (χ^2) test of independence in the SPSS 17 software.

5.1 Determination of Maternal Labour Supply function

Verification of Hypotheses I

As seen above, the hypothesis to be verified is thus;

- Null Hypothesis (Ho): there is no significant relationship between child health and maternal labour

- Alternative Hypothesis (Ha): there is a significant relationship between child health and maternal labour

Computing for the χ^2 test of independence in the SPSS 17, we observed that using χ^2 critical value of 5% level of significance with 1 degree of freedom (*df*), we compute the χ^2 calculated values to obtain the observed and expected frequencies. Considering the child health, maternal labour statistics obtained from the survey, we compute for the high and low impact of child health on maternal labour supply.

As noted below, 86% participants indicated that their children are usually sick, 46 of their responses revealed that the children's sickness has a high impact on their involvement in gainful labour while 40% shows that the

effects is mild. Amongst the 13 participants whose children are not usually sick, 04 revealed that children's health impact maternal labour while 9 indicated that the impact is low. Generally, of the 99 participants with children, 50% showed that children's ill health impact highly on maternal labour while 49% showed that it has a low impact. This expected frequency has been used to compute the Chi-square value.

Table 2: The observed and expected frequencies on the child health - maternal labour relationship

Description	High impact on maternal labour	Low impact on maternal labour	Total
Participants with children who are sick	46 (52.12)	40 (33.88)	86
Participants with children who are not usually sick	04 (7.88)	09 (5.12)	13
Total	50	49	N = 99

Source: Field Survey, 2012

5.1.1 Chi Square (t^2) Value on Child health and Mother Labour Supply

From table 3 below, the χ^2 calculated value (6.68) is greater than the χ^2 critical values (3.841), we reject the null hypothesis based on the decision rule. Therefore, we conclude that there is a significant relationship between child health and maternal labour force participation. Further, the contingency coefficient (CC) of 0.25 compared to the contingency maximum (C_{max}) of 0.707 confirms this relationship. This result is consistent with the findings of other contemporary studies in this domain as observed by Powers (1999; 2001; 2003) Dunkelberg and Spiess (2007). For example, Powers (2003) finds that child disability reduces females labour force participation by (6%) six percentage points and reduces desired work by 3.7 hours per week.

As noted in most conventional literature, improve prenatal care and nutrition has been proven to have direct effects on maternal labour productivity especially among poorer individuals in Tombel. Improve prenatal care, nutrition and medical care of the child reduces medical expenditure on the child in times of illness, the psychological trauma of staying at home to take care of the child is also reduced, hence giving the mother the extra time to participate in the labour market (see, (see, Angrist and Evans, 1998).

The time spent by women in activities such as food preparation, breastfeeding, collecting water and fuel, and seeking preventative and curative medical care is an important input into the production of infant or child health. Mothers, who work, however, may lack the time to adequately breastfeed or prepare nutritious foods for their young children or make use of public services designed to improve child nutrition (see, Hill, 1983). Although market

substitutes for some time-intensive inputs exist (e.g. prepared foods, hired domestic help), these may be too costly for many women. Working women may rely on other members of the household to provide childcare while they work, but the quality of care provided by these substitutes; especially if they are older children may be poor.

The child health - maternal labour relation is that of a reverse causality, the relationship between female labour force participation and child health is even more complex though causal. On the one hand, labour force participation can have an adverse impact on child health as the child will not get full attention from its mother and may even forgo the benefits of breastfeeding.

The empirical evidence on this issue also reflects some conflict. Many of the international studies suggest an inverse relationship between child health and female labour force participation (Baum, 2003). Some studies suggest that, after controlling for family income, children are better fed and looked after in households where women work. In such households a large proportion of the family's earnings are expended on child care and related activities. A study in Kerala indicated a positive association between female earnings and child nutrition, but a similar association between paternal income and child nutrition was not found. Another study of poor households in Kerala and Tamil Nadu categorically states that "eliminating female work, even if it means some improvement in male employment, would have a very negative effect not only on the females themselves but also on the families the support"

As observed with our studies, many other studies indicate a direct relationship between child health and maternal labour force participation. For instance, a recent

Indian study reported an adverse impact on child mortality of the mother's participation in the labour force. The authors trace this to the inability of working mothers to

give adequate care to infants and to breastfeed them properly. This relationship is summaries in table 3

Table 3: Presentation of the χ^2 value on the relationship between child health and maternal labour

OBSERVED FREQUENCY (O)	EXPECTED FREQUENCY (E)	O -E	(O-E) ²	$\frac{(O-E)^2}{E}$
46	52.12	-6.12	37.45	0.72
40	33.88	6.12	37.45	1.11
04	7.88	-3.88	15.05	1.91
09	5.12	3.88	15.05	2.94
				$\Sigma = 6.68$

Source: Field Survey, 2012

χ^2 calculated value (χ^2_{cal}) = 6.68

Level of significance = 0.05

Degree of freedom (df) = 1

χ^2 critical value (χ^2_{cv}) = 3.841

5.2 Determination of Family Income Function

Verification of Hypothesis II

- Null Hypothesis (Ho): There is no significant relationship between child health and family income
- Alternative Hypothesis (Ha): is a significant relationship between child health and family income.

The χ^2 test of independence is also computed here, the χ^2 critical values are read at 0.05 level of significance. The χ^2 calculated values were obtained after computing the observed and expected frequencies. These observed and expected frequencies are presented below. Table 4 below shows that of the 99 participants, 66 shows that child health has high impact on family income while 33 revealed a low impact. Amongst the 66 who revealed high impact on family income, 62 were participants whose children are usually sick while 4 are participants whose children are not usually sick. Amongst the 33 participants who revealed low impact on family income, 24 are with children who are usually sick while 9 are participants who revealed their children are not usually sick.

Table 4: The observed and expected frequencies on the child health and family income relationship

Description	High impact on family income	Low impact on family income	Total
Participants with children who are sick	62 (57.33)	24 (28.67)	86
Participants with children who are not usually sick	4 (8.67)	9 (4.33)	13
Total	66	33	N= 99

Source: Field Survey, 2012

5.2.1 Chi Square (t^2) Value on Child health and Family Income

Since the χ^2 calculated value (92.43) is greater than the χ^2 critical values (3.841), we reject the null hypothesis based on the decision rule. Therefore, we conclude that there is a significant relationship between child health and family income. The contingency coefficient (CC) of 0.28 compared to the contingency maximum (C_{max}) of 0.707 also shows a positive relationship. This result is in line with what Mirvis and Chang (2003) obtained. In connection to this, Mirvis and Chang (2003), describes three major path ways through which child health is related to family income. Firstly, child ill health or disease causes the direct loss of income either through medical care or the labour market. By virtue of child poor health, the parent will spend much money in buying medication and so reducing household economic wellbeing. Child illness provokes the physical depreciation of the

mother due to psychological trauma, because of these; the mother will forgo future income by not going to work. All these have negative consequences in family.

Secondly, poor child health has life cycle consequences. Early childhood or even in utero diseases reduce both cognitive and physical capacities later in life (Baye and Fambon, 2009), both of which reduce economic productivity and household income. These effects are due to direct biological consequences of diseases as well as to lower educational attainment. Sick children miss school and commonly dropout. Thus, childhood illness results in the dual burden of limited education and limited natural ability. These effects of poor health on personal economic capacity may be intergenerational, that is the poor health of one generation may affect the economic productivity of subsequent generations. The illness of a parent may abort the

education of a child and may reduce parental guidance and support and hence a drop in future family income.

Another remarkable relation is that between child health and fertility rates. The evidence indicates that poor families (households) compensate for children's deaths by having large numbers of children. The fertility rates in countries with high infant mortality rates may be five times greater than rates in countries with low infant mortality rates. Thus, poor child health leads to large families with low "parental investments" per child, hence hindering future income and economic wellbeing.

Generally, poor health in a population produces societal consequences that reduce family income beyond the direct effects on individual workers. Poor health in an area reduces external investment and tourism. The workforce is affected as employee turnover and skilled workers leave the area because of fear. Similarly, illness in a society diverts communal resources to healthcare and away from other needs. A greater proportion of overall expenditures are directed to health care while overall tax revenue is reduced due to lower personal economic productivity. Social

programs become fully occupied caring for the sick rather than attending to other social programs such as education.

From the foregoing, there are a myriad of mechanisms through which poor health in a community can impede family income. Some are direct, others are indirect, and some are short-term while others may last for generations. Based on the above discussion, addressing under nutrition/child health is likely to yield high economic returns and speed up poverty reduction. The economic benefits from improved nutrition come in part, from reduced costs of health care for neonates, infants and children. However, the economic benefits are dominated by productivity gains from reduced stunting and from increased schooling and cognitive ability attributable to health in early childhood. Under-nutrition affects the timing of school entry, the number of years completed and the learning that takes place per year of school. Years of schooling and actual achievement in school are commonly shown to lead to increased lifetime earnings. Moreover, even controlling for schooling, individuals with higher cognitive abilities are found to earn more.

Table 5: The χ^2 value on the relationship between child health and family income

OBSERVED FREQUENCY (O)	EXPECTED FREQUENCY (E)	O - E	(O-E) ²	$\frac{(O-E)^2}{E}$
62	57.33	4.67	21.81	0.38
24	28.67	-4.67	21.81	0.76
4	8.67	-4.67	21.81	2.52
9	4.33	4.67	21.81	5.04
				$\Sigma=8.7$

Source: field survey, 2012

χ^2 calculated value (χ^2_{cal}) = 8.7
 Level of significance = 0.05
 Degree of freedom (df) = 1
 χ^2 critical value (χ^2_{cv}) = 3.841

The combine effect s of child health on maternal labour force participation and family income as seen in both hypothesis one and two can be summarised in the table 7 below:

Table 6: Summary table on the results of Hypotheses I – II

Hypo	t^2_{cal}	Df		t^2_{cr}	Decision	Degree of Relationship
I	6.68	1	0.05	3.841	$\chi^2_{cal} > \chi^2_{cv}$ Reject Ho and retain Ha. Child health influences maternal labour	The contingency coefficient of 0.25 compared to the c_{max} of 0.707 infers a positively moderate relationship.
II	8.7	1	0.05	3.841	$\chi^2_{cal} > \chi^2_{cv}$ Reject Ho and retain Ha. Child health influences family income.	The contingency coefficient of 0.28 compared to the c_{max} of 0.707 infers a positively moderate relationship

Source: field survey, 2012

6. CONCLUSION

This study attempts to examine the effects of child health on maternal labour supply and family income in rural Cameroon using the Chi Square Approach. The subject of child health and its influence on maternal labour supply and family income after child birth is of growing importance due to the significant increase in child health problems in sub Saharan Africa and Cameroon in particular. We used primary data, collected in Tombel municipality with a random sample survey of 100 questionnaires. To do this, the study has examined the following objectives; 1) to determine child health effects on rural maternal labour supply, 2) to observe the influence of child health on family income, 3) to make possible policy recommendations on the basis of our analysis. Based on these objectives, we hypothesised that; 1) child health is relatively significant in explaining maternal labour force participation in rural Cameroon, 2) child health contributes in determining family income in the rural community of Tombel.

Two principal results have been generated for maternal labour and family income respectively: for the case of child health and maternal labour force participation, it is important to note that since the χ^2 calculated value (6.68) is greater than the χ^2 critical value (3.841), we reject the null hypothesis based on the decision rule. Hence, there is a significant relationship between child health and maternal labour force participation. The contingency coefficient (CC) of 0.25 compared to the contingency maximum (C_{max}) of 0.707 also means; a positively moderate relationship. Whereas, in the case of child health and family income, we observed that the χ^2 calculated value (92.43) is greater than the χ^2 critical values (3.841), we reject the null hypothesis based on the decision rule, meaning there is a significant relationship between child health and family income. Considering, the contingency coefficient (CC) of 0.28 compared to the contingency maximum (C_{max}) of 0.707 implies a positively moderate relationship. On the basis of this result, decision makers should promote mutual health registration in the rural zones so as to reduce the rate of self-medication; mothers should be educated on preventive health and first aid measures as propagated by PLAN-Cameroon.

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