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Impact of Smoking on Nutrition and the Food Poverty Level in Tanzania*

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Abstract

This study considers the effect of household cigarette expenditure on food poverty indicators in Tanzania. We first compare expenditure patterns as well as the household size of non-smokers and smokers. We find that the majority of non-smokers and smokers have low incomes, and that the mean total per capita expenditure (proxy for income) of non-smokers is slightly higher than those of smokers. On the other hand, the mean household size of non-smokers was smaller compared to that of smokers suggesting that smokers should have spent more on food. Next, we estimate and compare daily calorie intake between both groups. Almost 19 percent of non-smokers were found to be below the poverty line. The corresponding value for smokers was almost 24 percent. Estimates from a multiple linear regression on the determinants of per capita daily calorie intake reveal that per capita cigarette consumption appears to negatively affect daily calorie intake significantly. Given that the majority of all respondents belong to a low income group, this suggests that expenditure on cigarettes may be at the expense of calorie intake.

Keywords

Smoking; Nutrition; Calories; Poverty; Tanzania

Tanzania, a country of 45 million people, is believed to have an adult male cigarette smoking prevalence rate of 20.5 percent. The prevalence rate increases to 24.8 percent when one

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considers any type of tobacco consumption (Pompel 2008). A pack of cigarettes costs approximately $1.10 (imported brand) and 0.85 (local brand). At the same time, Tanzania is classified as a Least Developed Country with a per capita GDP of only $750, and a highly skewed differential between rural and urban households. In terms of head count, 35 percent of Tanzanians are classified as poor in regard to food and basic necessities (Mkenda et al. 2004).

With both a high smoking prevalence and poverty rate, it is reasonable to hypothesize that daily expenditure on cigarettes constitutes a significant proportion of food plus cigarette expenditure. In other words, expenditure on cigarettes is likely to be at the expense of food and other basic necessities. This is expected to be more pronounced among very low income households. As such, in addition to the direct and indirect economic cost of smoking (such as health care costs, productivity loss and so on) the negative welfare effects of smoking on the poor may be significant.

Prior studies have shown an inverse relationship between household level poverty and health status in Tanzania (Khan et al. 2006). However, these and similar studies do not consider the relationship between poverty, smoking and health status. The aim of the study is therefore to estimate the effect of cigarette consumption on calorie intake as a good indicator of the negative effect of cigarette consumption on the welfare of households. We first compare expenditure patterns as well as the household size of non-smokers and smokers. Next, we estimate and compare daily calorie intake between both groups. We then run a multiple linear regression of daily per capita calorie intake on several explanatory variables including per capita cigarette consumption, per capita total expenditure, the interaction between the two, as well as education, household size and residence. Our results suggest that expenditure on cigarettes may be at the expense of calorie intake.

This paper is organized into five sections. The first section considers the links between smoking and poverty. The second section reviews poverty levels and trends in Tanzania. The third section highlights the objectives of the study along with the estimation methods and data sources. The fourth section provides the results and discussion. Finally, the fifth section presents the conclusion and policy implications.

Smoking and Poverty

Like physical inactivity, alcohol consumption, and obesity, there is a consensus in the literature that smoking is a drain on national budgets. For example, in a relatively recent study, Kohl et al. (2012) quantified the economic burden of these risk factors for the United Kingdom, and found the costs to be substantial. It has also been empirically verified that tobacco smoking leads to higher prevalence of cardiovascular disease, lung cancer, gum disease as well as the negative effects of second hand smoking (Cai et al. 2014), all of which imposes a significant burden on health systems.

Smoking also exacerbates poverty among households. Like substance abuse and alcohol consumption, cigarette smoking has been found to be associated with poverty (Efroymson et al. 2001). Higher family expenditure on health care costs and loss of earnings as a result of

health related absences from work exasperate poverty. In addition, tobacco can compete with food and other basic necessities in poor household budgets. This may lead to the daily calorie intake being much lower than the required amount (INTREC 2012). Smoking also leads to the suppression of appetite which may result in poor nutrition (Mkenda et al. 2004).

Relative to the situation in developed countries, the prevalence and consequences of tobacco consumption (cigarette smoking, tobacco chewing or sniffing) in Sub-Saharan Africa has not been investigated in detail. Nevertheless, the impact of tobacco consumption on poverty is thought to be particularly acute in this region for several reasons. Firstly, while over the past thirty years the prevalence of cigarette smoking in the United States and the United Kingdom has decreased by nine and twenty five percent respectively, the smoking prevalence rate for Africa showed a substantial increase (WHO 2013). Second, the per capita income of most Sub-Saharan African countries is already low. Moreover, the average household size in Africa is relatively large, and it has been established that large size households are generally poor (Bloom et al. 1998). The impact of second hand smoking is greater on such large, poor households where the number of rooms in a house may not be more than one or two. In addition, food expenditure as a percent of total expenditure is much higher in developing regions such as Sub-Saharan Africa. For developed countries the estimate ranges between 10 and 12 percent; the corresponding values for developing countries ranges between 50 and 60 percent. Similar results may also be obtained when one compares tobacco expenditure as a percent of total household expenditure for developed and developing countries. So in general, cigarette smoking is expected to lead to lower expenditure on food, education, and health services. In other words, tobacco consumption may lead to higher illiteracy, higher under- and mal-nutrition, and ultimately, higher morbidity and reduced life expectancy.

Several studies have considered the economic and social consequences of tobacco use in Sub-Saharan Africa. The results invariably show that the prevalence is much higher among adult males than females (Pempel 2008). Several studies have also verified that most smokers in Sub-Saharan Africa are relatively poor (male) household heads (Jha et al. 2000). So an increased tobacco prevalence rate is having a disproportionate impact on impoverished households. While few studies have tried to estimate this impact, a study conducted in Ghana (Owusu-Dabo et al. 2009) showed that smoking has imposed substantial economic cost on those who smoke and their dependents.

The negative impact of cigarette smoking on Tanzania is substantial. On the one hand, Tanzania benefits economically from smoking as the second largest producer of tobacco leaf in Africa. In 2012 and 2013, tobacco was the highest valued export, worth $252.6 million and 335.5 million respectively (Kidane et al. 2013). However, this was outweighed by spending on tobacco related diseases. More than 50 thousand children and more than 2.88 million adults are classified as daily smokers. Every year more than 6,800 Tanzanians die due to tobacco related diseases (Tobacco Atlas 2010). However, there is no in depth study on the relation between cigarette smoking and poverty for Tanzania especially when poverty is measured in terms of daily calorie intake.

Poverty in Tanzania: Levels and Trends

Economic growth, population growth and poverty

Over the past 15 years the macroeconomic performance of Tanzania has been relatively high, with an average annual GDP growth rate of over 7.0 percent (Pauw & Thurlow 2010). However the effect of this growth on the plight of the urban and rural poor has not been encouraging. The latest cutoff point for the national poverty line is 35 percent of the total population—a significant value. Furthermore, the annual rate of population growth in Tanzania is also relatively high at 2.7 percent (National Bureau of Statistics 2013). The high population growth implies the doubling of the country's population every 25 years. There is also a very high proportion of less productive and dependent individuals, with 49 percent of the Tanzanian population aged 17 years or under. The negative impact of the high population growth and high dependency ratio on per capita GDP and poverty reduction is likely to be high.

There are several other reasons why the high GDP growth in Tanzania did not lead to reduction in poverty and food security. One of the main reasons is that GDP growth from agriculture in Tanzania is driven by the relatively better performance of large scale commercial farmers producing cash crops such as tobacco and coffee for export. These farmers make up a very small percent of the farming population of Tanzania, and belong to a high income group. On the other hand, the productivity and income growth of small scale food farmers who produce crops such as maize, rice and other staples appears to be minimal. One reason for this is the preferential treatment given to commercial farmers in terms of provision of fertilizers, better seeds, chemicals, credit availability, and extension services.

Due to the lack of a trickle down effect of Tanzania's macroeconomic growth, poverty, under-nutrition and malnutrition in Tanzania is still relatively high. Estimates show a decline of poverty from 47 percent in 1991 to 38 percent in 2003 (Minot et al. 2006). Between 2011 and 2013, the poverty rate decreased by a meager 2.1 percent, from 35.7 to 33.6 percent. Calorie deficiency has declined by only 1.4 percent, from 25 to 23.6 percent (Navuru 2013). Nearly one in four Tanzanian children (five years or younger) is underweight. Deficiencies of essential vitamins and minerals as well as stunted growth are common (INTREC 2012).

The majority of the people in Tanzania live in rural areas. They are predominantly subsistence farmers. Compared to urban dwellers, rural residents have lower incomes. The income differential between the two may be verified by comparing the percent of households below the poverty line (measured in terms of food and basic needs). In urban Tanzania, 34 percent are below the poverty line; the corresponding value in rural areas is 45 percent (Mkenda et al. 2004).

Like in many African countries, Tanzania has a high concentration of the poor living in over-crowded urban areas commonly referred to as shanty towns. In these areas, schools are substandard and overcrowded; the rate of student absenteeism is quite high. The latter is partly explained by parents' low incomes and the corresponding hunger of school going children. Healthcare centers are also overcrowded and significantly below acceptable standards. These facilities are understaffed and the quality of service delivery is low. Indoor

and outdoor sanitation facilities are poor. Crime rates are high. Alcohol and drug abuse, in addition to tobacco consumption, are quite common (Hove et al. 2013).

Magnitude and Depth of Poverty in Tanzania

In this study, the level and magnitude of poverty is taken as a measure of welfare. Poverty is estimated from household expenditure. There are also other indicators of poverty that relate to tobacco consumption (Efroymson 2001). The reason for using household expenditure as an indicator of welfare is based on the theory of consumer behavior (Glewwe 1991). Broadly speaking, there are two broad measures of poverty, namely income poverty and food poverty. The former defines poverty in broad terms (food plus other expenditure on basic necessities) while the latter is confined to food expenditure. Food expenditure is usually converted into daily calorie intake. The percent of people below the poverty line is thus larger when expenditure on food and other necessities is taken as a measure of poverty. Besides estimating the poverty line (the magnitude), the depth of poverty is also considered. The latter refers to the distribution of the poverty profile for those below the poverty line. If most of the poor are clustered immediately below the poverty line then the depth of poverty is not serious. The depth of poverty is said to be significant if most of the poor are significantly lower than the estimated poverty line (Mkenda et al. 2004).

In Tanzania for 2007–2008, the proportion of the population in poverty in terms of expenditure on food plus other basic necessities in Dar es Salaam was 16.4 percent, and 24.1 percent for other urban areas. The corresponding value for rural areas was 37.6 percent. For the same period, the corresponding food poverty rates were 7.4, 12.9 and 18.4 percent respectively. As noted above, over the past 10 years Tanzania has exhibited a high rate of macro economic growth; the impact of this growth on poverty reduction has not been significant (Research and Analysis Working Group 2009).

Objectives, Methods and Data Source

The main objective of this study is to estimate the impact of smoking on food poverty levels in Tanzania. Food poverty will be measured in terms of daily calorie intake. We will utilize two approaches.

The first approach is to estimate and compare indirect measures of poverty between smokers and non-smokers, and rural and urban dwellers in both groups. The first of these indirect measures is comparing per capita total expenditure. In many developing countries, total household income is relatively difficult to measure with accuracy. Total income estimates that are based on surveys show considerable underestimation. The best option is therefore to use total expenditure as a proxy for total income. The proxy is justified by the fact that more than 90 percent of household income in African countries is spent (World Bank 2010).

We then measure per capita food expenditure.

Next, we compare mean daily calorie intake between smokers and non-smokers as a measure of poverty. As noted above, there are several measures of poverty. The most common are monetary estimates of a given basket of goods and services that ought to be

consumed by an individual per day. Naturally the given basket of goods and services may be country and culture specific. In other words, such goods and services may vary by country and may even vary between regions of a country. It is relatively difficult and subjective to make an estimate of a given basket of goods and services. The second and easier approach is to estimate poverty in terms of calorie requirements and intake per adult equivalent and per day, which is the approach we adopt.

The effect of smoking on poverty profiles will also be estimated. By hypothesizing that expenditure on cigarettes is at the expense of basic items (food), we re-estimate per capita daily calorie intake among smokers by assuming that cigarette expenditure is part of food expenditure.

The second approach is to run a multiple linear regression on the determinants of calorie intake. The explanatory variables that we will consider are per capita total expenditure (as a proxy for per capita income), level of education, household size, residence, as well as per capita cigarette expenditure. One should expect a positive relation between calorie intake and per capita total expenditure. Education, which positively affects income, is also expected to positively affect calorie intake. We have noted that in many African societies large size households are generally poor. Thus the relation between household size and calorie intake is expected to be negative. Urban dwellers are expected to have higher per capita expenditure than rural dwellers—the latter are likely to spend less on food than the former. We also expect that an increase in per capita expenditure on cigarettes will have a negative impact on calorie intake. The interaction effect of per capita total expenditure and per capita cigarette expenditure is also expected to reduce calorie intake further.

The data used for this study is based on the 2007/2008 round of the Tanzania Household Budget Survey conducted by the National Bureau of Statistics. The survey involved the collection of a nationally representative sample of 10,464 households (68 percent urban and 32 percent rural). The survey included detailed and itemized information on household consumption, income and expenditure. The results contain extreme outlier values on either end, especially for continuous variables such as expenditure. A decision was made to drop the lowest and highest five percent of values.

Table 1 presents descriptive statistics of some selected variables of the study population. The results show the percentage of smokers in the total population as being slightly lower than the official published figure of 20.5 (WHO 2013). Smoking is more prevalent among rural households who happen to be very poor. It should be noted that many poor urban dwellers are homeless and reside in highly crowded neighborhoods. This population is not captured in the Household Budget Surveys. This means that the reported percentage of poor in urban areas is an under estimate. As expected, the majority of rural respondents are small scale farming households while 36.41 percent of urban dwellers are wage earners. The percent of female headed households appears to be relatively high in urban areas. Also, the percent that are single household heads, as well as the percentage of small size households (two or less members) appear to be much higher in urban areas. Respondents appear to be relatively old, implying that the youth seem to be underrepresented. Nevertheless, in general, based on the characteristics above, the survey data may be declared as reliable.

Results and Discussion

Per capita expenditure between non-smokers and smokers

Before estimating the survey based poverty line for non-smokers and smokers, it is necessary to compare smokers and non-smokers by income group (World Bank 2010). Table 2 shows the comparison of per capita monthly total expenditure and food expenditure between smokers and non-smokers. The results indicate that compared to smokers, non-smokers have 10 percent higher per capita mean total expenditure, implying that smokers generally have a low income. Taking a total per capita expenditure of 60,000 Tanzanian shillings as a cutoff point between lower and higher expenditure (income) groups, it appears that smokers constitute only 10.0 percent of the higher income group. The corresponding value for non-smokers is 16.5 percent. The difference becomes wider when smokers and non-smokers are reclassified by the urban–rural divide. This result again confirms that smokers are generally a low income group.

Food expenditure between smokers and non-smokers

Before assessing the effect of cigarette smoking on food expenditure or calorie intake, It is necessary to first estimate and compare food expenditure as a percent of total expenditure for both non-smokers and smokers. Table 2 shows the results.

Both smokers and non-smokers in Tanzania spend more than 54 percent of their total expenditure on food, suggesting that the two groups are poor in absolute terms. This is in contrast to developed countries where food as a percentage of total expenditure is as low as 10 percent. The results in Table 2 also suggest that non-smokers spend a slightly higher percentage of their total expenditure on food (60.9) compared to smokers (58.6). The results suggest that in rural areas, non-smokers spend slightly more on food compared to smokers. Given that the total expenditure of smokers is less than non-smokers, the former should have allocated more expenditure for food. This does not appear to be the case.

Impact of cigarette expenditure on poverty

Measures of poverty—In this study we convert food expenditure into a calorie equivalent. In Tanzania for 2007-2008 (the year the survey was conducted) it cost 235 Tanzanian shillings to consume food that generates 1000 calories per day (Mkenda et al. 2004). Also, the minimum daily calorie intake for an adult in Tanzania is estimated to be 2200 calories. Any individual who consumes less than 2200 calories per day is classified as poor.

Table 3a shows the effect of cigarette smoking on calorie based poverty. Given that the calorie measure of poverty is 2200 calories per adult equivalent, the results classify 18.87 percent of non-smokers as being poor; the corresponding value for smokers is 23.93 percent, or 5.1 percent higher. A comparison is also made between rural and urban areas. In urban areas, the percent poor among smokers is 2.55 percent more than non-smokers. The corresponding value in rural areas is about 3 percent.

Assuming that extreme poverty is defined as those whose consume below 1500 calories per day, non-smokers in extreme poverty make up 5.88 percent of the total population, the corresponding value for smokers in extreme poverty is 7.39 percent; the difference between the two widens when we consider urban dwellers only.

Impact of smoking on poverty profile—By hypothesizing that expenditure on cigarettes is at the expense of basic items (food), we re-estimated per capita daily calorie intake among smokers by assuming that cigarette expenditure is part of food expenditure. The results are given in Table 3b.

As a result of including cigarette expenditure as part of food expenditure, the percentage of poor individuals among the smokers has been reduced from 23.93 percent to 20.62 percent (a difference of 3.31 percent). A similar reduction is also observed when observations are reclassified by the rural–urban divide.

Determinants of calorie intake

A more revealing result is obtained when we run a multiple linear regression of daily per capita calorie intake on several explanatory variables, including per capita cigarette consumption, per capita total expenditure, the interaction between the two, as well as other poverty-related explanatory variables, namely: education, household size and residence. The estimate results which are based on OLS are given in Table 4. Regression diagnostics regarding OLS estimation assumptions such as heteroscedasticity and multicollinearity errors in variables have been addressed and verified.

The estimated regression equation appears to have a good fit with all of the explanatory variables as being significant at less than five percent and with the expected sign (except education). The regression coefficients are presented in non-standardized and standardized (beta) format. The most important explanatory variable positively affecting daily per capita calorie intake is per capita total expenditure (beta coefficient). There appears to be a significant negative relationship between per capita cigarette smoking and daily per capita calorie intake. Other variables remaining constant, for every one cigarette stick consumed, daily per capita calorie intake is reduced by 14.6 units. This amounts to four Tanzanian shillings. Assuming that a typical smoker smokes 10 sticks per day, the daily forgone calorie intake is 146 units— about five percent of the required amount. For a low income country such as Tanzania this is a considerable amount. On the other hand, higher cigarette consumption and higher per capita total expenditure (the interaction effect) appear to lead to a much lower calorie intake. It appears that expenditure on cigarettes is at the expense of food especially among the low income (expenditure) groups. The other variables also appear to be significant and in the expected direction. In other words, households with less education, rural dwellers and with large size households appear to have low calorie intake. These results are characteristic of poor societies.

Conclusion

The preceding empirical results clearly show that smoking in Tanzania is common among the low income groups, and that compared to non-smokers, smokers spend a smaller

percentage of their income on food. The implication is that expenditure on cigarettes and other tobacco products is at the expense of basic necessities such as food. This is reflected by the lower daily calorie intake among smokers. Most of the smokers are household heads. This means that dependents, who are likely to be spouses and children, are expected to be negatively affected.

Regression estimates on the determinants of calorie intake indicate that large size households and rural dwellers have a lower daily calorie intake when compared to small size households and urban dwellers. The implication here is that smoking would render poor households to be even more impoverished. The findings also indicate that higher expenditure on cigarettes would further reduce daily calorie intake.

Even though compared to Asian and Latin American countries the prevalence of smoking in Tanzania is relatively low, the effect of smoking on food poverty appears to be significant as the country is classified as least developed. There are several policy options. The first is to introduce new policies that enable the country to accelerate the increase of per capita income and narrow the income differential between rural and urban dwellers. This may go a long way towards narrowing the gap between calorie intake and requirements. Such policies will take time to be effective. In the meantime, the impact of poverty can be ameliorated by reducing smoking rates. Government, civic society groups and others should aim to reduce the consumption of cigarettes and other tobacco products. Various measures including the legislation of laws regarding cigarette consumption and tobacco leaf production have proved to be successful in many developed countries (WHO 2013). Laws and regulations may therefore help to further reduce expenditure on cigarette smoking thereby earmarking more on food and other basic necessities. Other negative effects of cigarette smoking such as the poor health of smokers and those exposed to second hand smoke, as well as loss of earnings due to absence from work, will also be minimized.

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Table 1

Descriptive Statistics of the Study Population

Variable	Overall	Urban	Rural
Percent smokers	16.37	13.9	22.96
Percent with relatively high education	17.84	23.83	5.81
Percent of wage/salary earners	26.95	36.41	6.76
Percent of farmers	39.2	19.67	81.01
Percent of female headed households	25.61	26.71	23.26
Percent single	11.39	14.68	4.32
Percent of households with two or less members	25.45	28.34	19.25
Mean age of household head	42.74	41.3	45.81
Sample size (n)	9422	6425	2997

Source: Authors' calculation based on 2008 Tanzania household budget survey.

Table 2

Per Capita Total Expenditure and Food Expenditure among Non-Smokers and Smokers

Region	Per capita total expenditure		ratio A/B	Per capita food expenditure		ratio A/B	Food expenditure as % of per capita total expenditure	
	Non-smokers (A)	Smokers (B)		Non-smokers (A)	Smokers (B)		Non-smokers	Smokers
Urban	38058	36217	1.05	21264	19377	1.09	54.7	53.5
Rural	24125	24066	1.001	16107	15312	1.05	67.1	63.6
All	33975	30796	1.03	19752	17563	1.07	60.9	58.6

Note. Source is authors' calculation based on 2008 Tanzania household budget survey. Values are in Tanzanian Shillings (Tshs). At time of survey USD 1= Tshs1200.

Table 3a

Effect of Cigarette Smoking on Food Poverty

Calorie intake	Overall				Rural				Urban			
	Non smokers		Smokers		Non Smokers		Smokers		Non Smokers		Smokers	
	Freq	Cum	Freq	Cum	Freq	Cum	Freq	Cum	Freq	Cum	Freq	Cum
<1000	1.28	1.28	1.95	1.95	0.78	0.78	1.31	1.31	1.49	1.49	2.46	2.46
1000-	4.59	5.88	5.45	7.39	7.67	8.45	6.54	7.85	3.32	4.81	4.57	7.03
1500-	12.99	18.87	16.54	23.93	21.13	29.58	24.71	32.56	9.62	14.43	9.95	16.98
>2200	81.13	100	76.07	100	30.42	100	67.44	100	85.57	100	83.02	100

Source: Authors' calculation based on 2008 Tanzania household budget survey.

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Table 3b

Effect of Cigarette Smoking on Food Poverty

Calorie intake*	Overall		Rural		Urban	
	Freq	Cum	Freq	Cum	Freq	Cum
Less than 1000	0.97	0.97	0.73	0.73	1.17	1.17
1000 -	4.54	5.51	5.09	5.81	4.1	5.27
1500 -	15.11	20.62	23.4	29.22	8.43	13.7
2200 -	79.38	100	66.35	100	86.3	100

Note. Authors' calculation based on 2008 Tanzania household budget survey.

*Calorie intake among smokers assuming that cigarette expenditure is part of food expenditure.

Table 4

Determinants of Per Capita Calorie Intake

Explanatory variables	Coefficients	Standard error	t	P>t	Beta coefficients
Per capita total expenditure	0.108*	0.0009	124.901	0.000	0.859
Education[1]	−190.751*	15.47	−12.41	0.000	−0.079
Household size[2]	−20.966*	7.003	−2.99	0.003	−0.011
Residence[3]	−255.700*	33.175	−7.71	0.000	−0.049
Per capita cigarette consumption[4]	−14.575*	6.795	−2.14	0.032	−0.034
Per capita total expenditure and per capita cigarette consumption[5]	−0.0003*	0.0001	−2.69	0.007	−0.043
Constant	1219.098*	48.0555	25.37	0.000	
Sample size (n)			9422		
R^2(adjusted)			0.675		
F(6, 9415)			3261.87		
Prob >F			0.000		

Note. Author's calculation based on 2008 Tanzania household budget survey

[1] 0 = no education, 1 = little education, 2 = medium education, 3 = high education.

[2] In terms of adult equivalent.

[3] 0 = rural, 1 = urban.

[4] Number of cigarette sticks.

[5] Interaction.

* Significant at less than 5 percent.