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Alcohol Consumption: Measuring the Risk of Household Poverty (Case of the Urban District of Toamasina - Madagascar)

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ABSTRACT

The individual consumer of alcohol, often the household head, loses part of his income to buy alcohol. Excessive consumption of alcohol causes social costs (support costs of illness, family trauma, car accident, job loss and productivity etc.). Its effects on the health of the individual drinker are asymptomatic. If it is the case of a disease of alcoholism, the household must bear the costs of care, and those whose low-income or average income is below the permanent poverty, are confronted with a financial difficulty, drawing their savings and even selling their property to address this shortfall. The accumulation of costs caused by alcohol consumption is then a catastrophic expense for the household. The aim of the study is to show to what point we can calculate the risk of household poverty with an alcoholic individual head of household between the two periods: "*disease free*" and "*appearance of the disease of alcoholism*" Having obtained the value of the poverty line, a mathematical modeling of the expense of alcohol was made to derive an orientation axis to minimize the risk of poverty.

1. Introduction

Alcohol has had a special place in each country as part of human civilization for thousands of years. Although this product has often connotations of pleasure and sociability, its use may have harmful consequences. It is not an ordinary product due to its economic (production and tax revenues[13]), sociocultural (traditional festivity and ritual) and workplace role (the pots celebrating a promotion, signing a contract, the meals business, retirement etc.). Globally, in the report of 26th May 2010, the Health Assembly on "Reducing the use of alcohol, improving health," represented by delegations from 193 Member States of WHO showed that alcohol kills 2.5 million people, including 320,000 youth aged between 15 and 29. It is the eighth risk factor for death worldwide, and is responsible for nearly 4% of deaths worldwide. It is also a major risk factor for preventable no communicable diseases, particularly cardiovascular disease, gastrointestinal disorders, mental disorders, liver disease of alcoholic origin (liver cirrhosis and ascites) and various forms of cancer. It is also associated with certain infectious diseases like HIV/AIDS and tuberculosis, as well as traffic accidents, violence and suicide. Indeed, alcohol abuse or alcohol dependence[14] the major determinant of these consequences both in health and in social life. Alcohol then generates significant social costs to the health of the household and to the society. In the budget of the health sector, the social costs of alcohol generate an additional cost to the community[15].

In Madagascar, in its Development Plan Sector Health and Social Welfare from 2007 to 2011, the prevalence of alcohol consumption reached 8.9% of the household. For the region of Atsinanana, the geographical location of the urban district of Toamasina, the intensity of poverty is 41.20% of the household,

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[13] Alcohol taxes are composed of two taxes: direct taxes (taxes on income and corporate profits) and indirect taxes (taxes applicable to the operations of production and consumption (value added tax VAT, registration fees, excise taxes etc.). These indirect taxes affect the free movement of goods and freedom to provide services. Different taxation on alcohol depends on the tax regulations of each country. For Madagascar, *[...] Alcoholic products of local production are subject to taxation in the amount of 4 ariari per liter on the quantity released for consumption and those exported are exempt.* Service d'Analyse Economique et Fiscale (SAEF), Sommaire de la politique fiscale, Madagascar, 2009, page 17.
[...] For locally manufactured products: beer, cider, perry 18%, 8% wine, rum and similar 15%, whiskey 75 cl 210 ariary by drinks and other alcoholic beverages 15%. And for imported products: beer, cider, perry 30%, 30% wine, rum and similar 30%, whiskey 75 cl 480 ariary drinks and other alcoholic beverages 30%. MDP/JEXCO, Etude d'impacts des Accords de Partenaire Economique (APE) pour Madagascar, Madagascar, Juin 2004, page 94-95.
For the direct sale of alcoholic beverages to consumers, the State Tax Collection License on Sale of Alcoholic Beverages, Tax License Foraine, Synthetic Tax and the Income Tax.

[14] It is individuals who drink alcohol in excess when the amount consumed is higher compared to the unit defined by WHO: the minimum level of alcohol consumption in a single dose was 20 g / day for women and 40 g/day for men.

[15] Supported the cost of care in public hospital.

which is twice than that its capital (the capital of Analamanga region of 18.20%). In the country, the incidence of various diseases reaches 12.4% of the household and the amount of their possession of durable goods (furniture, household appliances, agricultural equipment and means of transport etc.), which households in financial difficulty are forced to give up or mortgage, varies from 4.8% to 7.9%.[16].

Our goal is to show the influence of alcohol consumption of a household head on household income in the urban district of Toamasina to simulate their risk of poverty. Moreover, we want to make an analysis of a model of the relationship between average household income and consumer's spending on alcohol in order to offer an orientation axis to lower the threshold of poverty risk due to alcohol for household.

2. Methodology

Data collection was conducted through a survey for direct sampling of 260 households in the urban district of Toamasina in October 2010, and another full investigation at the university hospital of Toamasina where we observed 11 patients with disease of liver cirrhosis and its complications during the month of September 2010.

To show the calculation of the risk of poverty, we defined two independent variables: the ability to pay household expenses required to (note F_{cm_ep}) and the household propensity to save (note e_{rm}).

The first stage of the simulation and analysis of the variation data were carried out under three hypotheses (h0, h1 and h2) below:

- h_0 : the household head is a non-drinker of alcohol. His consumption of alcohol (D_{alcool}) and alcoholic diseases (D_{health_alcool}) are zero. The value of the ability to pay household F_{cm_ep} savings after expenses of average consumption (D_{m_bs}) as h0 will be our starting point the value of the tax capacity of the household to calculate their risk of poverty in alcohol (note p);
- h_1 : head of household is drinking alcohol. It is not yet suffering from alcoholic disease[17] (note the period t) and we have a new value of the household ability to pay (note $F_{cm\_ep\_1}$) and with $D_{alcool} > 0$ the value of the loss of average revenue spent on alcohol is $D_{alcool} \times t$;
- h_2 : the head of household is a sick drinker of alcohol at time t + k, where k is the length beyond asymptomatic alcoholic disease, and the household has to bear the expenses of care due to alcohol consumption. Hence, care costs, $D_{health\_alcool} > 0$;

All three assumptions are compared with respect to the value of the household propensity to save e_{rm_i} and their permanent income.

The second step consists in modeling the cost of alcohol relative to permanent income of the household. We chose the simple regression model $Y_i = \alpha + \beta X_i + \varepsilon_i$ where:

Y_i : Dependent variable. It is the expense of alcohol consumption, called *depensealcool* ;

α : The regression constant;

β : The regression coefficient;

X_i : The independent (or explanatory) variables are the average household income, called *revmoyen* ;

ε_i : The error in the approximation of the dependent variable or residual the model;

The model was estimated by ordinary least squares (OLS), where $\hat{Y}_i = \hat{\alpha} + \hat{\beta} X_i + e_i$ with $e_i = Y_t - \hat{Y}_i$, to minimize the value $Min \sum_{i=1}^{t} e_i^2 = \min \sum_{i=1}^{t} (Y_t - \hat{Y}_t)^2 = \min \sum_{i=1}^{t} (Y_t - \hat{\beta} X_i - \hat{\alpha} - e_i)^2$ and t denotes the number of variables Y_i and X_i observations. The coefficient of determination R^2 of the model will be compared to the propensity to save the household, to see the index or the coefficient that the model can explain for the variation in expenditure on alcohol of the head of the family in relation to average permanent income.

3. Alcohol consumption analysis

Alcohol consumption is 125 of 260 (48.08%) of household surveyed, with 87.20% men and 12.80% women. The average monthly income of households with a householder who uses alcohol is 290 680.80 ariaries with an average monthly consumption expenditure for purchase of alcohol 25 033.60 ariaries, or 14.13% of average monthly income.

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[16] Institut National de la Statistique (INSTAT), Enquête périodique auprès des ménages EPM en 2010, Rapport final, août 2011, Madagascar. (ariary is the national currency in Madagascar)

[17] It was after a period of continuous and excessive consumption that alcoholics start contracting various diseases. In our calculation, we selected the case of irreversible liver diseases: liver cirrhosis (because the roles of the liver are absolutely invaluable and it takes care of all the vital processes of the organism to eliminate the toxic content in the blood, regulating the distribution of water between blood and tissues, manufacturing essential components and secretes bile which are needed to digest, and manages energy reserves. All these functions are disturbed when cirrhosis occurs due to alcohol consumption and demands an end to alcohol intake).

Table 1. Average monthly income and average monthly expenditure on alcohol consumption of the household head

Average income (AI)	Average expenditure on the purchase of alcohol	% Relative to the AI
Lower than 200 000 Ar	15 916	4,93%
200 000 à 400 000 Ar	24 730	7,66%
400 000 à 500 000 Ar	27 726	8,59%
Bigger than 500 000 Ar	22 992	7,12%

Source: Survey of 260 households, October 2010

Normally, 66.40% of households say they have their opportunity to save and 33.60% are never able to save. In case of illness, the household with a drinker head, never has the ability to save and from the non-drinkers only 2.69% and 16.16% cannot spare.

Table 2. Capacity of household savings

Savings	drinker (%)	Non-drinker (%)	Total (%)
normal time	66,40%	94,81%	81,15%
In case of illness	0,00%	5,19%	2,69%
never	33,60%	0,00%	16,16%
Total	**100,00%**	**100,00%**	**100,00%**

Source: Survey of 260 households, October 2010

In 2010, in the university hospital of Toamasina, the fatality rate of cirrhosis of liver is 17.24% with a morbidity of 0.01%. The average time of onset is 7 years after the onset of alcohol use in patients (t = 7)[18]. Of the 11 patients' householder with cirrhosis of the liver observed in September 2010, 9.09% mortgage or sell their property, 36.36% drop in hospital care (discharge due to insufficient financial resources and worsening of disease) and 45.45% borrow from their family and loved ones.

4. Simulation of the risk of household poverty caused by alcohol consumption by the head of the family

For heads of household drinking alcohol, the risk of poverty is observed in relation to their income for monthly expenses sacrificed in alcohol and to the expenses referring to treating alcohol based diseases (including hospitalization). That is to say that the economic consequences of alcohol consumption can be severe, particularly for low-income households.

We have a risk of poverty if the household fails to meet its mandatory monthly expenses and if the propensity to save relative to income is below zero. He will have to compensate its ability to pay for various expenses of consumption, either from previous savings or borrowing money, either by selling its assets (a decrease in the duration of possession of the property and will also be devoid of production tools and well-being).

Then we measure the poverty level as indicator of the value of the household's propensity to save above the poverty line denoted by S_{pauv} (the amount of the minimum consumption expenditure for the household).

Household expenditure data according to the National Institute of Statistics[19] :

- Annual poverty per person S_{pauv} : 469 000 Ariary, 39 083.33 ariary per month;
- Annual expenditure for individual consumption[20] include D_{bs} : 403 600 Ariary, 33 633.33 ariary per month.

Data for the study of cases of cirrhosis of liver disease[21] :

- Average monthly income of the household with an alcoholic household head , note with rm : 290 680.80 ariary which means rm_j : 9 689.36 ariary per day ;
- Monthly Average Expenditure on the purchase of alcohol, note with D_{alcool} : 25 033.60 ariary, which means 10.33% of average income ;
- Delay Disability average (mean duration of hospitalization), noted sm_j : 9.87 days ;

[18] According to Professor Thierry Poynard, the time to onset of the clinical liver cirrhosis and its complications is 5.2 to 7.2 years after alcohol consumption. Arel BALIAN, La cirrhose et ses complications, Edition DOIN, 2005, page 30.

[19] Institut National de la Statistique (INSTAT), Enquête périodique auprès des ménages EPM en 2010, Rapport final, août 2011, Madagascar, page 43, 62-63, 149-150, 168-169 et 207.

[20] Components : daily food expenditures, non-food expenditures, gifts and food donations, gifts and non-food donations, agricultural self-consumption, self-consumed livestock products, self-consumption from non-farm business, education expenses, expenses related to health , payments received in-kind, food payments received in non-food, imputed rent and rental value of durable goods.

[21] A. A. M. TSIKOMIA, Analyse des coûts et du financement de la cirrhose de foie et ascite au centre hospitalier universitaire de Toamasina, Mém. DEA, Sciences économiques et sociales de la santé, Université de Toamasina, Madagascar, juin 2011, page 42-72.

- Average expenditure during hospitalization, note with D_{health_alcool} : 198 119.47 Ariary, 20 072.90 ariary per day ;
- Household size, note n_{mg} = 4.8 ≈ 5.

Assume a starting point for the household ability to pay for various expenses :

Consumption expenditure $D_{m\_bs} = D_{bs} \times n_{mg}$ = 63 333.33 ariary x 5 = 168 166.65.

Give F_{cm_d}, the ability to pay monthly average household expenditure where $F_{cm\_d} = D_{m\_bs} + D_{autres}$ with D_{autres} various other expenses. It is considered that $D_{autres} = 0$, that is to say he has no higher[22] standard of life (not to acquire goods and services consumption, or a very low marginal utility of consumption goods).

Give F_{cm_ep}, the ability to pay monthly average household savings where $F_{cm\_ep} = rm - F_{cm\_d}$ with $F_{cm\_d} = D_{m\_bs} + D_{autres}$. Assuming that other expenses $D_{autres} = 0$, we have $F_{cm\_d} = D_{m\_bs}$ = 168.166.65 ariary.

The ability to pay monthly household saving does not have an individual alcoholic $F_{cm\_ep\_1} = rm - F_{cm\_d}$. If a change ΔF_{cm_d} is constant, the $F_{cm\_ep\_1}$ is 122 514.15 ariary and the propensity to save e_{rm_1} is equal to $e_{rm\_1} = \frac{F_{cm\_ep\_1}}{rm}$ per each household. We have e_{rm_1} = 0.42.

The head of the family is drinking alcohol to the probable date of onset of liver cirrhosis (t_1 to t_6) and the household does not change the value D_{m_bs}. :

We have $F_{cm\_d} = (D_{bs} + D_{autres}) + (D_{alcool} + D_{health\_alcool})$ with $D_{autres} = 0$ and $D_{health\_alcool} = 0$ (no disease). The value F_{cm_d} = 193 200.25 ariary and $F_{cm\_ep\_2}$ = 97.480.55 ariary. The propensity to save is equal to $e_{rm\_2} = \frac{F_{cm\_ep\_2}}{rm}$ = 0.34. We note that there is already a decline in value , where $\Delta e_{rm} = e_{rm\_2} - e_{rm\_1}$ = - 0.08, (Δe_{rm} = - 0.08) <0.

During the period of alcohol consumption, the household loses every month a small change (-0.08) in the ability to pay for savings, knowing that no improvement was done in their standard of living and overall consumption.

The head of household drinking alcohol is suffering from cirrhosis of the liver t_7 and that the value D_{m_bs} does not always vary:

So, $D_{health\_alcool} \neq 0$ equals 198 119.47 ariary and the loss of daily income for the hospital stay is equal to $rm_{perte\_j} = rm_j \times sm_j$ = 95 633.98 ariary. This value is *the loss of human capital of the household head* or what is the value of time when he is healthy.

During the period of hospitalization, the head of the family does not drink alcohol, $D_{alcool} = 0$. We have F_{cm_d} = 366 286.12 ariary, then $F_{cm\_ep\_3} = rm - F_{cm\_d}$ = - 75 605.22 ariary.

The threshold of ability to pay for household expenses is $F_{cm\_d} > rm$ and where we have $e_{rm} < 1$, $e_{rm\_3} = \frac{F_{cm\_ep\_3}}{rm}$ = - 0.26.

If the propensity to save $e_{rm} > 1$, the household can cover consumer spending and that of the savings. If it is negative $e_{rm} < 0$, the household needs to offset his income $|e_{rm}|$. And for $e_{rm} = 0$, the household is in poverty or he is at the optimal productive faculty.

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[22] *[...] In its permanent income theory, Milton Friedman argues that the values of consumption and income provided by the consumer, not only depend on the amount of revenues and expenditures in progress, but also on the findings of the past and expectations of the future. Values of consumption and income provided are called permanent income and permanent consumption. These are distinguished from transitory consumption and transitory income that did not affect the general law of consumption generated by Friedman. [...] Consumers would adapt their consumption to changes in their permanent income rather than current income.* DIEMER, La consommation du ménage, Economie générale, IUFM Auvergne, page 288.

Here the household needs of $|e_{rm\_3}|$ = 0.26 surplus revenue to meet his expenses. His poverty increased by 0.26 then. To cover expenses, the household can choose between the following scenarios:

• from t_1 to t_6, he did not choose a better standard of living and no change in consumption spending (ΔF_{cm_d} and ΔF_{cm_ep} are constant) and we have a cumulative savings $\sum_{t=1}^{6}\sum_{i=1}^{12} F_{cm\_ep_{ti}}$. The accumulation behavior of household savings is very rare because over time, the rationality of the household requires it to increase its spending on consumption gradually as its ability to save increases[23];

• from t_1 to t_6, he realized an additional expenditure (*Modigliani* life cycle) and the propensity to save is very low or zero. He will have to go into debt or sell existing assets (the rate of possession of the property will decline and obviously the quality of life) with a value of $F_{cm\_ep\_3}$ de 75 605.32 ariary (which means about 26% of the average monthly income).

If we refer to the value of the poverty S_{pauv} of the National Institute of Statistics:

"[...] Is classified as poor, any individual or household whose value of his consumption is below the threshold of 468 800 ariary per year, or 39 066.67 per month"[24]. We must then find a value F_{cm_d} for which the household manages to prioritize his spending on alcohol $D_{alcool} + D_{health\_alcool}$ = 223 153.07 ariary over expenditure consumption $D_{bs} + D_{autres}$. For $e_{rm} = 0$, $rm = (D_{bs} + D_{autres}) + (D_{alcool} + D_{health\_alcool})$.

If we assume $D = D_{bs} + D_{autres}$, we must have $rm = D + (D_{alcool} + D_{health\_alcool})$, then D = 67 527.73 ariary. But $S_{pauv} = S_{pauv} \times n_{mg}$ = 195 333.35 ariary. We see that $D \leq S_{pauv}$. Thus the use of alcohol causes the risk of poverty if there is a catastrophic[25] expense caused by alcohol consumption which appears to the household.

During the period t_1 to t_6 where there is no disease caused by alcohol consumption, the value $F_{cm\_d} = D_{m\_bs} + D_{autres} + D_{alcool}$ is equal to 193 200.25 ariary. There is a shortage of 2 133.10 ariary compared to S_{pauv}, meaning 1.09% below the poverty line. This means that the low-income household with a head of household drinking alcohol is at a risk of poverty of at least $p = 0{,}0109$.

Let D where $D = D_{bs} + D_{autres}$, $D \geq S_{pauv}$ is the guarantee of ability to support expenses. We have our risk of poverty $p = \frac{D - S_{pauv}}{S_{pauv}} \geq 0$.

If the value $p < 0$, there is a risk of poverty without power savings, depletion of savings and the possibility of free goods, and if $p \geq 0$, *there is* no risk and we could find potential savings for the household.

The balance point of minimum risk, noted p^*, is then :

$$p^*_{\min} = 1 - p = 1 - \frac{D - S_{pauv}}{S_{pauv}}$$

$$p^*_{\min} = 1 - \frac{F_{cm\_d} - S_{pauv} - \Delta(D_{alcool} + D_{health\_alcool})}{S_{pauv}} \qquad (1)$$

Hence, poverty is minimal if $\Delta(D_{alcool} + D_{health\_alcool})$ is minimal, that is to say that $p^*_{\min} = \Delta_{\min}(D_{alcool} + D_{health\_alcool})$. This is the value of the incidence of poverty due to the permanent consumption and excessive alcohol. We now have the poverty risk equation due to alcohol consumption below:

(2)

$\forall\, rm, \forall\, F_{cm\_d}$, $F_{cm\_ep} = rm - F_{cm\_d}$, $F_{cm\_d} = D_{bs} + D_{autres} + D_{alcool} + D_{health\_alcool}$ and $D = D_{bs} + D_{autres}$

[23] [...] The life cycle of Modigliani: A household has a life cycle and his age-life cycle corresponds with specific needs and a certain income level. From this perspective, individuals are farsighted and organize their consumption and savings over the life of their lives. *"[...] Therefore, the expenses are spread over time through savings and credit. In case of cyclical contraction, the level of consumption remains stable from period to period at the expense of savings"*. DIEMER, La consommation du ménage, Economie générale, IUFM Auvergne, page 288.

[24] Institut National de la Statistique (INSTAT), Enquête périodique auprès des ménages EPM en 2010, Rapport final, août 2011, Madagascar, page 222.

[25] We consider that the expenditure of a household is considered catastrophic if the household is obliged to reduce his consumption, such as food, to support himself in health care. *According to the approach advocated by WHO (Ke Xu, et al, 2005), Catastrophic health expenditure occurs when direct payments to household health equal or exceed 40% of their ability to pay (total household expenditure minus the poverty line or food expenses).* Abdeljaouad EZZRARI et al., Etude relative aux dépenses individuelles catastrophiques et leur impact sur l'appauvrissement des ménages : Cas du Maroc, Rapport OMS, 2007, page 25.

for $t_i \in [1..k], D_{health\_alcool} = 0$ and $t_i \in [k+1..n], D_{health\_alcool} \neq 0$

$$p = e_{rm} = \frac{F_{cm\_ep}}{rm} < 0 \text{ and } p^{*}_{\min} = 1 - \frac{F_{cm\_d} - S_{pauv} - \Delta_{\min}(D_{alcool} + D_{health\_alcool})}{S_{pauv}}$$

5. Analysis of the impact of changes on household income expenditure of alcohol consumption

The risk of poverty is minimal if the variation in spending on alcohol is minimal $p^{*}_{\min} = \Delta_{\min}(D_{alcool} + D_{health\_alcool})$. Poverty is also minimal if the variation in spending on alcohol is constant or low compared to a strongly growing variation in the permanent income of the household. We then check the correlation between alcohol consumption spending and the average household income. Alcohol expenditure of the household head drinker of alcohol is of little correlation with the average household income, or 0.5688.

Overall, the first model (Appendix 1) is significant (Critical probability (F) = 2.02 e-16) but the coefficient of determination or regression R^2 is insignificant. The value of R^2 is close to zero (R^2 = 0.3235, note $R^2_{\text{modele}\_1}$). It explains only 32.35% of the dependent variable *depensealcool*. The residuals are homoscedastic (White test: critical probability = 0.2319) and were not correlated (Breusch-Pagan: critical probability = 0.6841).
Using another model of corrected heteroscedasticity (Appendix 2), the dependent variable *depensealcool* is better compared to the first model (R^2 = 0.3621, note $R^2_{\text{modele}\_2}$) to explain the dependent variable depensealcool with the regression equation: ^*depensealcool* = 6.93e+03 + 0.0618**revmoyen*. The differences between the residuals follow a normal symmetric distribution (Appendix 3) around the predicted value, with a flattening of regular ends. Moreover, the second model has a low test value of AIC (*Akaike Information Criterion*). However, the model is statistically relevant to explain the values of *depensealcool* because the F test does indicate that the associated model is overall highly significant (F (1,123) = 69.8264 and a critical probability or p-value 1.15e-13 less than 5%).

In fact, the change in the level of alcohol expenditure of the household head can be predicted from the change in the level of household income only to a degree of measurement of 36.21%. We can also say that $e_{rm} = 0{,}3621$ if the householder does not drink alcohol, household gains 0.3621 of the average income $e_{rm\_2} = 0{,}34$, that is to say that that is a value closer to our hypothesis h_1. This value is between the coefficients of determination of our two models, ie 0.3235< e_{rm_2} <0.3621. We can write the estimate of the maximum and minimum variation in the risk of poverty as follows $p\ R^2_{\text{modele}\_1} \leq \hat{p} \leq R^2_{\text{modele}\_2}$.

What is also remarkable is the value of α = 6.93e+03 which means that if *revmoyen* is zero, the cost of alcohol *depensealcool* always has a value α. We can explain α as a proxy of income on alcohol between the householder and other individual drinkers. α then expresses the value of the relational context between drinkers (eg. the part from the value of alcohol paid by his office colleagues through professional relationships).

Seeking a reduction in spending on alcohol ($\Delta_{\min} D_{alcool}$) by increasing the variation of household income (additional income of other resources) is not a solution because the influence of the value of R^2 is small. This led us to propose a tax measure in order to: - reduce alcohol consumption of individuals because of the price increase induced by the tax[26] - and get a tax that can be allocated to the budget of the local hospital to solve the problem of funding the management costs of care in the health sector.

6. Conclusion

The risk of poverty is related not only to money spent on the purchase of liquor by the head of the family, but also the income lost during the period of disability.

Our model has a lower explanatory power as the examination of the regression coefficient shows that 32% to 36% of the variation in the data on permanent income of households with a householder drinker of alcoholic beverages affects their consumption of alcohol. But this coefficient is exactly our hypothesis h_1,

[26] [...] In general, the way drinkers respond to changes in the price of alcohol is similar to the one they respond to changes in prices of other consumption products. When other factors are also constant, an increase in alcohol prices leads to a drop in consumption and a decrease in alcohol-related harm. We realized that in many high-income countries, the demand for alcohol was relatively inelastic to price, like many other consumer goods, that is to say that a change of price leads to a decrease in consumption, but relatively smaller than the increase of the price. This means that *if one can use the increased tax on alcohol as a strategy to reduce consumption and harm, the state revenue from taxes will actually increase in most countries.*
OMS, Comité d'OMS d'experts des problèmes liés à la consommation d'alcool, Série des rapports techniques, 2ème Rapport, n° 944, 2007, page 30-31.
[...] The Committee considered the elements that indicate that in general the way drinkers respond to changes in the price of alcohol is similar to the one they respond to changes in prices of other consumer products. When other factors are also constant, an increase in alcohol prices leads to a drop in consumption and a decrease in alcohol-related harm.
OMS, Comité d'OMS d'experts des problèmes liés à la consommation d'alcool, Série de Rapports Techniques, 2ème rapport, n° 944, 2007, page 31-32.

which is the amount of the marginal propensity to save of the household if the household head does not drink alcohol. To reduce the risk of poverty, the head of household must reduce these costs of alcohol.

In the future, we'll analyze the willingness to pay of the household the state will thus collect the tax on alcohol to fund the costs of care for hospital care, which public health would benefit, and would then be a sustainable source of revenue for the state, that is to say that this from tax will be considered a source of additional income to supplement the financing of health systems. This choice of financing based on the tax on alcohol has raised our interest ever since 2010, when, in its report, WHO[27] gave practical advice to governments on how to finance health care through general taxation to achieve a 15% allocation of national budgets allocated to health sector.

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[9] OMS, Comité d'OMS d'experts des problèmes liés à la consommation d'alcool, Série des rapports techniques, 2ème rapport, Genève 2006, n° 944 ;

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[12] 12.Institut National de la Statistique (INSTAT), Enquête périodique auprès des ménages EPM en 2010, Rapport final, août 2011, Madagascar, pp. 43, 62-63, 149-150, 168-169 et 207.

[27] To reduce the spendings on health care paid directly by the household by a system of support for the hospital sector it is necessary to provide the health sector with new funding.
According to WHO, [...] If the governments of the 49 poorest countries in the world were allocating each 15% of their national budgets to health, they could raise $ 15 billion euros extra per year. These countries could also generate more money for health, by adopting a more efficient system of tax as the one carried out by Indonesia, which has increased its revenue by 10 percentage points. A study of 22 low-income countries showed that they could meet them all at an additional $ 1.42 billion, increasing by 50% the tax on tobacco and alcohol. OMS, Rapport sur la santé dans le monde en 2010.

Appendix 1 : Model 1, OLS, using observations 1-125, dependent variable: depensealcool, robust standard errors (heteroscedasticity), variant HC1

	coefficient	*Error Std*	*t de Student*	Critical probability	
const	8197,45	1905,15	4,3028	0,00003	***
revmoyen	0,0579197	0,0060873	9,5148	<0,00001	***

Average dependent variable	25033,60	Standard deviation of dependent variable	11210,54
Sum square residuals	1,05e+10	Standard deviation of regression	9257,552
R^2	0,323570	Adjusted R^2	0,318070
F(1, 123)	90,53220	Critical probability (F)	2,02e-16
Log. vraisemblance	-1318,009	Criterion d'Akaike	2640,017
Criterion Schwarz	2645,674	Hannan-Quinn	2642,315

*NB : The Student's t are given with confidence thresholds following: *** p <0.01, ** p <0.05 and * p <0.1*

White test for heteroscedasticity - Null hypothesis: homoskedasticity, the test statistic: LM = 2.92208 with critical probability P = (Chi-square (2)> 2.92208) = 0.231995

Breusch-Pagan test for heteroscedasticity - Null hypothesis: homoskedasticity, the test statistic: LM = 0.165468 with critical probability P = (Chi-square (1)> 0.165468) = 0.684171.

Test for normality of residuals - Null hypothesis: the error is distributed according to Gaussian, is statistic test Chi-square (2) = 9.73737 with p. critical = 0.00768348

Source: Calculated from our sample

Appendix 2 : Modèl 2 - Heteroscedasticity corrected using observations 1-125, dependent variable: *depensealcool*

	Coefficient	*Erreur Std*	*t de Student*	*Critical probability*	
const	6934,47	1926,33	3,5998	0,00046	***
revmoyen	0,0617886	0,00739432	8,3562	<0,00001	***

Statistics based on weighted data :

Sum square residuals	695,6325	Standard deviation of regression	2,378140
R^2	0,362121	Adjusted R^2	0,356935
F(1, 123)	69,82640	*Critical probability* (F)	1,15e-13
Log. vraisemblance	-284,6491	Criterion d'Akaike	573,2981
Criterion de Schwarz	578,9547	Hannan-Quinn	575,5961

Statistics based on the initial data :

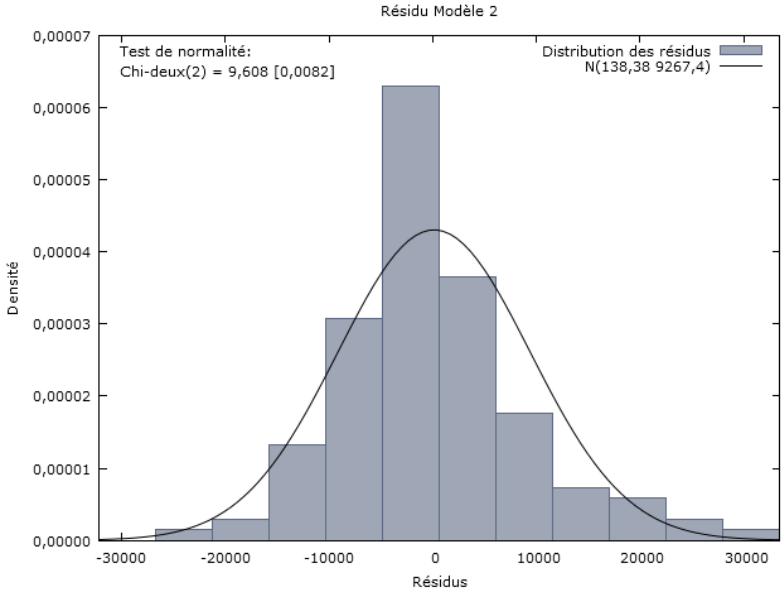
Average dependent variable	25033,60	Standard deviation of dependent variable	11210,54
Sum square residuals	1,06e+10	Standard deviation of regression	9268,476

NB : The Student's t are given with confidence thresholds following: *** p <0.01, ** p <0.05 and * p <0.1

Test for normality of residuals - Null hypothesis: the error is distributed according to Gaussian's, statistic test Chi-square (2) = 9.60843 with p. critical = 0.00819513

Source: Calculated from our sample

Appendix 3 : Chart of normality of residuals of model 2



Source : Drawing a residue of Model 2