

## Model Explanation of the Quantity of Services Provided by Illicit Drug Sellers in Ambohipo

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### Abstract

**Introduction:** The illicit sale of medicines is a scourge in the medicine supply chain. The use of products supplied by illicit drug sellers is imposed on the general population because of the difficulty of accessing drugs on the legal market.

**Objective of the Study:** Describe a model explaining the quantity of services provided by the illicit seller of medicine.

**Method:** This is a descriptive cross-sectional study from January 1, 2020, to February 29, 2020. The study population is made up of sellers of illicit drugs in the place «3 Chemins Ambohipo». The inclusion criteria include subjects who agree to be interviewed and who sells illegal drugs at the study site. An explanatory model of the quantity of service provided is established with linear regression using the social variables studied as an explanatory factor.

**Result:** The present study recruited 35 respondents and was able to show that male sellers ( $\beta = -0.609$ ,  $p = 0.0102^*$ ) negatively influence the quantity of services offered during the illicit sale of medicines, while the number of trainings received in connection with the trade in illegal drug sales shows a positive influence ( $\beta = 0.270$ ,  $p = 0.0342^*$ ) on the number of services offered during this activity.

**Conclusion:** Illicit drug sellers are one of the pillars that perpetuates the supply of drugs on the black market in a difficult socio-economic context. Awareness-raising targeted at the harmful effects of a sale which does not comply with pharmaceutical standards is essential by targeting illicit male sellers who have benefited from a certain number of training courses related to the illegal sale of medicines.

**Keywords:** Ambohipo; Explanatory Model; Illicit Drug Seller; Social Parameters; Services Offered

### Introduction

The illicit sale of drugs consists of the sale of drugs outside pharmacies, drug depots and pharmaceutical centers and the dispensing of training or health establishments.

The illicit drug market is the meeting between the supply and demand for drugs in the black market. In this type of market, neither the quality nor the effectiveness of the products traded can be guaranteed. Access to medicine among legal drug sellers

remains difficult for the general population for many social and economic reasons [1-3]. At the global level, according to the 2013 study report of the Anti-Counterfeiting Research Institute (IRACM), the trafficking of fraudulent medicines concerns 90 countries and kills more than 700,000 people per year [4].

The low purchasing power of the population favors the development of a parallel market for the distribution of medicines [12]. The illicit drug market is becoming a very lucrative business. The development of this type of market is observed throughout the world especially in developing countries such as Africa [5,6]. In Africa, a quantity of 94.4 tons of fraudulent medicines is seized by the authorities in the illicit market [4].

However, few figures are available to understand the extent of the phenomenon and its consequences in terms of public health. Efficacy, safety, compliance with specifications, purity and other characteristics of medicines [7] remain difficult to guarantee in illicit sales. The role of sellers remains preponderant in the maintenance of the phenomenon. Lack of effectiveness and generation of harmful effects can have adverse impacts on the well-being of the population [5,8].

In Madagascar, the illicit sale of medicines constitutes an important part of activities in the informal sector in the context of difficulty in integrating the working population into the legal sector. The sale at the level of streets and small shops seems to be the solution for the population to access medicines with or without a medical prescription and at discounted prices.

For the present study, the site chosen is the Ambohipo Three-Way Square which is reputed to be a place of retail or wholesale commercial transaction for merchants and grocers in the capital but also a place of supply of illicit medicines. The objectives of this study are to describe an explanatory model of the amount of service provided by sellers of illicit medicines and to propose recommendations and suggestions to the competent authority based on the results.

## Methods

The study site consists of the district of Ambohipo, more precisely on the crossroads of 3 paths which responds to the definition of an illicit market of medicines which is a meeting place between the supply and demand of illicit medicines. The site is in

the capital of Madagascar in Antananarivo, Analamanga region, in the administrative unit fokontany Andohan'i Mandrozeza. It is a place of transaction especially for the supply of medicine in the black market.

A descriptive cross-sectional study was chosen for this survey of illicit drug sellers to find out the factors motivating an additional amount of service provided by sellers. The study period ran from January 1<sup>st</sup> 2019, to February 29, 2020. The study duration runs from January 1<sup>st</sup> 2020, to March 31, 2020.

The study population is composed of the sellers of illicit drugs in the square 3 paths Ambohipo. The inclusion criteria include subjects who agree to be interviewed and who are engaged in the sale of illicit drugs at the study site. Exclusion criteria include deafness and muteness of respondents due to difficulty communicating with them.

The study sample is obtained comprehensively during the on-site study period. Educational parameters include (i) gender, (ii) age, (iii) marital status, (iv) level of education, (v) status of the seller (self-employed or employed), (vi) type of sale, (vii) number of training received in the trade, (viii) number of sources of income, and (ix) number of services provided.

The data collection was carried out by an individual telephone survey after collecting the telephone contacts of the sellers then filling in a collection form and finally analyzing the data by Microsoft Excel 2007 and R 3.6.1.

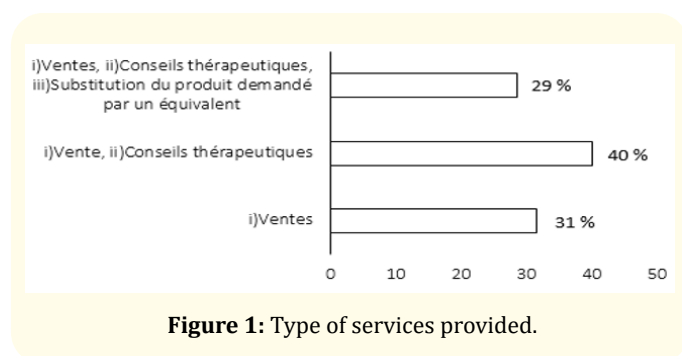
For data analysis, quantitative variables are assigned dispersion and central trend parameters, qualitative variables are assigned their numbers and proportions (%). An explanatory model of the quantity of service provided is established with linear regression (significance threshold  $p < 0.05$ ). To measure the contribution of each variable in the linear regression model, a comparison of the residual variance and variance of the slope by the Snedecor F test (significance threshold  $p < 0.05$ ) is performed. The normality of the residues of the model is tested by a histogram of the residues and the Shapiro-Wilk test (with  $p > 0.20$ , the deviation from normality cannot be rejected). The normality of the residues is checked to allow to affirm a validity of application of the model.

For ethical considerations, this study obtained the authorization of the local authority, respected professional secrecy, anonymity, comfort of the respondent to the survey, respect for informed consent and free choice to participate in the study. And finally, an awareness-raising on the dangers of the illicit sale of medicines to the sellers interviewed was carried out. The limitation of this study lies in the sincerity of the respondents' answers, but this limitation is overcome by putting respondents in comfort.

## Results

The present study was able to recruit 35 respondents. For the social profile, the distribution of the study population by gender and age showed an average age (+/- ET) of 26.25 (+/- 4.91) years, a sex ratio = 1.06, The declared gain or net profit in Ariary (Malagasy national currency unit) of sellers per day (median [min - max]) is 5000 [2500-80,000] Ariary.

Figure 1 below showed the types of services provided by drug vendors in the illicit market found in this study. The services offered include (i) sales, (ii) therapeutic advice, and (iii) substitution of the desired products by an equivalent.



**Figure 1:** Type of services provided.

Table 1 below shows that among the factors studied, male sellers provided fewer services ( $\beta = -0.609$ ,  $p = 0.0102$ ) when selling illicit drugs compared to the female gender. Another finding regarding the model shows that sellers with a number of additional medical training or pharmacological knowledge offer a greater number of services when selling drug products in the illicit market.

Variables	Coef $\beta$	Std.error	T value	p
Intercept	0,957	0,64	1,49	0,1476
Genre (masculin)	-0,609	0,22	-2,77	0,0102*
Age	0,004	0,01	0,3	0,7651

Married (yes)	0,086	0,18	0,47	0,6408
Level of education	0,26	0,13	1,96	0,0609
Status (employee)	0,271	0,22	1,23	0,2293
Type of sale (street)	0,245	0,32	0,78	0,4437
Number of training received on the trade	0,27	0,12	2,24	0,0342*
Number of sources of income	-0,027	0,12	-0,23	0,8218

**Table 1:** Linear model (Mod1) explaining the relationship between explanatory variables (social parameters of sellers) and number of services provided during the illicit sale of medicines ( $R^2 = 0,63$ ).

Table 2 below shows the contribution of each variable studied to the model in explaining the number of services provided by drug vendors in the illicit market. Only the type and number of training received on the trade gives a significant contribution to explain the amount of service offered during the illicit activity of selling medicines.

Variables	F value	p
Age	0,0911	0,7651
Genre	7,6828	0,0101 *
Level of education	3,8391	0,0609
Marital status	0,2229	0,6407
Number of sources of income	0,0518	0,8217
Self-employed or salaried status	1,5154	0,2293
Number of training received on the trade	4,9994	0,0342 *
Type of sale	0,605	0,4437

**Table 2:** Contribution of each variable in the model.

Figure 2 below shows the distribution of residues. Shapiro Wilk's test was able to show that we cannot rule out the normality of the residues of the model (Mod1) with  $p = 0.28$  because the value of  $p > 0.20$ .

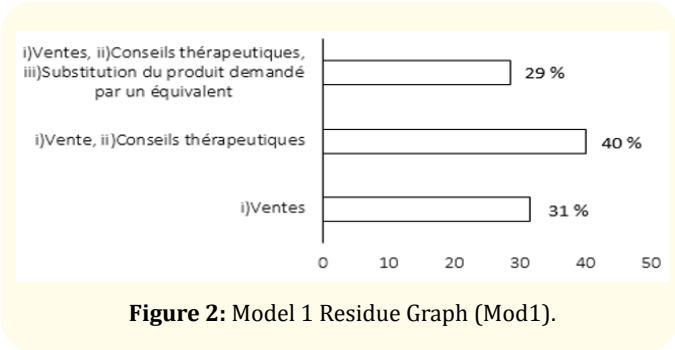


Figure 2: Model 1 Residue Graph (Mod1).

Discussion

Profile of illicit drug sellers

For this study, most of the sales population is made up of young people with an average age (+/- SD) = 26.25 (+/- 4.91) years. A male predominance of the study population is found with a sex ratio of 1.06.

In the literature, most illicit drug sellers are in the younger age group. In a study conducted in Niamey, half of the sellers surveyed are under 24 years old and in Yaoundé 50% of sellers are under 30 years old [9]. The result can be explained by the difficulty of access to the labor market for many on the part of the labor force. The scarcity of interventions to suppress these activities is also a parameter that promotes illicit sales among young people seeking income.

In the present study, the distribution of illicit drug sellers shows a slight male predominance with a sex ratio of 1.06. In Yaoundé the population of sellers surveyed shows a greater number of male sellers with a sex ratio of 8.37 [9]. In other studies, most sellers are trained by women as in Côte d'Ivoire [10] or Benin [11]. The result of male predominance in this study and other literatures can be explained by a greater role played by the male gender in the search for household income or by the difficult context of finding employment in the labor market. The sale of illicit medicines is therefore a financial opportunity to be seized in a difficult economic context.

For the present study the reported gain in Ariary/day (median [minimum - maximum]) is 5000 [2,500-80,000] Ariary. The average profit of a seller in Yaoundé is €20 per day with a 95% confidence interval [14; €26] [9]. For the present study conducted in Ambohipo, the average gain per month calculated from the average daily earnings remains below the national Guaranteed Interprofessional Minimum Wage (SMIG) [12]. For the study conducted in Yaoundé, the gain calculated over a month from the daily average shows a value higher than the national SMIG [13]. The activity of illicit sale is remunerated at various prices but in all cases, it makes it possible to ensure the needs of the household in the absence of a legal source of income.

Factors explaining the number of services offered by sellers

The male seller ( $\beta = - 0.609$ ,  $p = 0.0102^*$ ) is a group less likely to provide an additional amount of service such as therapeutic advice or substitution of products requested by equivalents when selling illicit drugs. The result can be explained by the fact that the provision of other services such as therapeutic advice requires much more time. The activity of isolated sales remains more beneficial for the male gender which is generally the one who provides the most for the needs of the household. The isolated sale consumes less working time and ends with a payment of the cost of the delivered product. For other services such as therapeutic counselling, it generally remains a free service.

The number of trainings received on the trade ( $\beta = 0.270$ ,  $p = 0.0342^*$ ) explains for this study the additional amount of service provided. In Yaoundé, training remains almost zero among illicit drug sellers, learning is carried out in most cases from peers while the services provided include the diagnosis of the disease, the prescription of drugs and therapeutic advice. These types of services cited are provided by more than 50% of interviewees in Yaoundé [9]. Training related to drug knowledge can explain the provision of additional service during the illicit sale of drugs because sellers use their knowledge to convince and reassure their customers about the purchase.

In the other studies, the factors explaining the amount of service provided by illicit drug vendors remain understudied. The activities can be limited to isolated sales as in Senegal, the sellers only deliver to the customers the requested medicines [14]. But this isolated sale remains rare in a context of scarcity of employment [15].

The suggestions are addressed to the authorities and management within the Ministry of Health. There is a need to increase the targeted awareness of vendors, especially in illicit markets known as Ambohipo, small businesses and street vendors, about the danger of illicit drugs and their harmful effects. The Health Promotion Directorate plays an important role in raising awareness about the harmful effects of uncontrolled drugs in the black market. It is essential to strengthen the legal framework and control over the supply, distribution of medicines by the national agency for the management and control of medicines.

There is a need for a multisectoral activity to reintegrate illicit sellers into the labour market through various bodies such as the Ministry of Youth and the Ministry of Population. It is also necessary to train and establish pharmacist inspectors to ensure the quality and safety of medicines. The establishment of universal health coverage by the Ministry of Health can allow better access to medicines for all social classes.

## Conclusion

Sellers of illicit medicines play an important role in maintaining an illegal parallel market. The socio-economic context of the difficulty of access to medicines pushes the population to obtain supplies in the informal drug sales circuit. The present study found that male illicit drug sellers appear to be less likely to provide an additional amount of service in the course of their business, whereas an additional number of trainings received in the trade of illicit drug vendor explains an additional amount of services provided during the sale. Raising awareness of the harmful effects of the illegal sale of medicines among informal sellers is essential. A question about the factors stimulating consumer purchases of illicit drug products seems useful to deepen this study.

## Conflicts of Interest

None.

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