

Analytic validation of a formula estimating the smoking economic burden

Abstract

Introduction: The precise estimation of epidemiologic and economic rates contributes to make better the whole process of taking decisions for the effective smoking control. In 2017 the authors published a new formula to estimate the probability for the effective demand of health services attributable to smoking. This rate is very important because show the representativeness from the smoking economic burden in the burden of sickness related to smoking.

Objective: To check analytically the ability of the rate of probability for the effective demand of health services attributable to smoking suggested by the authors.

Materials and methods: Was made an analytic research for the ability to use a rate to measures the probability of the effective demand of health services attributable to smoking. Were used as theoretical methods the comparative and the inductive-deductive. As empiric method was utilized the bibliographic research and the differential calculus.

Results: The formula of probability of the effective demand of health services attributable to smoking is growing and concave front of the intensity of the tobacco consumption.

Conclusion: The suggested rate to measure the probability of the effective demand of health services attributable to smoking is strong trustable estimating the economic burden attributable to smoking.

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Fé Fernández Hernández, Efraín Sánchez González

University of Medical science of Havana, Faculty of Medical Science "10 de Octubre", Cuba

Correspondence: Fé Fernández Hernández, University of Medical science of Havana, Faculty of Medical Science "10 de Octubre", Havana, Cuba, Email fehh@infomed.sld.cu

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Introduction

The application of many effectives measures for the smoking control start in the estimation of the smoking economic impact over the Public Health. Then, the precise estimation of epidemiologic and economic rates contributes to make better the whole process of taking decisions for the effective smoking control.^{1,2}

In a previous research the authors had appointed about the relevance of the effective demand of health services estimating the economic burden attributable to some risk factor. In this research the authors declare that the estimation of the effective demand of health services attributable to some risk factor must be according to the main and particular characteristic from each risk factor.³

In 2017 the authors published a new formula to estimate the economic burden attributable to smoking.⁴

This research is relevant because support the following ideas:

- The tobacco consumption and the smoker numbers are main variables to estimate the smoking economic burden.
- The burden of sickness related to smoking will be present since the minimum consumption level while the smoking economic burden will exist only if exist the effective demand of health services attributable to smoking.
- The smoking economic burden is a part of the burden of sickness related to smoking.
- There is a minimum tobacco consumption that determines the existence of the effective demand of health services attributable to smoking.

These ideas are agree with the general characteristic from smoking like risk factor.^{5,6} Finally the authors introduce a formula to

estimate the probability for the effective demand of health services attributable to smoking. This rate is very important because show the representativeness from the smoking economic burden in the burden of sickness related to smoking. This research supported other research that introduced an algorithm to estimate the smoking economic burden in active and passive smokers.⁷ However the rate for the probability for the effective demand of health services attributable to smoking must be epidemiologically and economically strong to show the more precise value of the smoking economic burden.

Much of the epidemiologic characteristic from smoking can be checked analytically. That's why the main objective of this research is to check analytically the ability of the rate of probability for the effective demand of health services attributable to smoking suggested by the authors.

Materials and methods

We made an analytic research for the ability to use a rate to measures the probability of the effective demand of health services attributable to smoking. Were used as theoretical methods the comparative and the inductive-deductive. As empiric method was utilized the bibliographic research and the differential calculus.

Results

Smoking is an accumulative risk factor. This characteristic is based in the accumulative effect from smoking over the morbidity and/or mortality attributable to smoking. At same time this morbidity and/or mortality is because of the often consumption of cigarettes and tobaccos. This relation is showed better between the tobacco consumption intensity and the morbidity related with smoking. In mathematic terms the morbidity attributable to smoking is determined by a constant growing front of the tobacco consumption.^{8,9}

While the tobacco consumption intensity's is growing the morbidity attributable to smoking will be winning space in the general morbidity from the smoker. Consequently the effective demand of health services because of the same reason should increase too in the same way and proportionally too.¹⁰

In opinion from authors the economic burden attributable to smoking may be calculated across the following equation:

$$TEB = TPB * PED^4$$

Where, TEB-economic burden attributable to smoking, TPB-sickness burden from morbidities causes related with smoking, PED-probability of the effective demand of health services attributable to smoking

The authors consider PED may be calculated across the following equation:

$$PED = 1 - Cm / Ci$$

Where, Cm-minimum consumption of tobacco that determines the existence of the effective demand of health services attributable to smoking, Ci-intensity of the tobacco consumption

This formula is agreed with the general characteristic from smoking over the morbidity. This formula show a direct proportional relation between PED and Ci as several epidemiologic researches had demonstrated. For example, the successive increasing in the intensity of the tobacco consumption will carry to increase PED and while higher be Ci, PED will be closer to 1 and TEB will be closer to TPB in absolute values. In this case must be agreeing the following equation:

$$\lim_{ci \rightarrow \infty} (1 - \frac{cm}{ci}) = 1$$

Given PED $\frac{dped}{dci} > 0$ This mathematic relation must be thus because of the direct proportional relation between PED and Ci.

Calculating $\frac{dped}{dci}$ the result it shows in the following equation:

$$\frac{dPED}{dci} = \frac{cm}{ci^2}$$

In this case Cm and Ci are always positives and then $\frac{dPED}{dci}$ will be always positive too.

The recurrent tobacco consumption as addiction cause carries to increase constantly the intensity of the tobacco consumption and farer the reserve price of tobacco from the smoker. This behavior determines that tobacco will show a condition of necessary goods each time more while increases the intensity of the tobacco consumption. Consequently the elasticity price-demand front of the intensity of the tobacco consumption will show an inverse relation assuming that tobacco goods are ordinaries all time.^{11,12}

Also, with the increase of the intensity of the tobacco consumption will appear several morbidities causes at same time all attributable to smoking. That's why is expectable that the increase in PED front of Ci by a single morbidity cause never be accelerated because the PED marginal must be always less than the Ci marginal.¹² This relation can be showed in the following equation:

$$\frac{d^2PED}{dci^2} = \frac{-2 * cm}{ci^3}$$

For all possible values from Ci $\frac{d^2PED}{dci^2}$ will be always negative.

This means that PED will be a concave function front of Ci.

In general, the function of PED is growing and concave front of Ci. The function suggested by authors are agree with this characteristic as was showed before and as show the following graph as example (Figure 1).

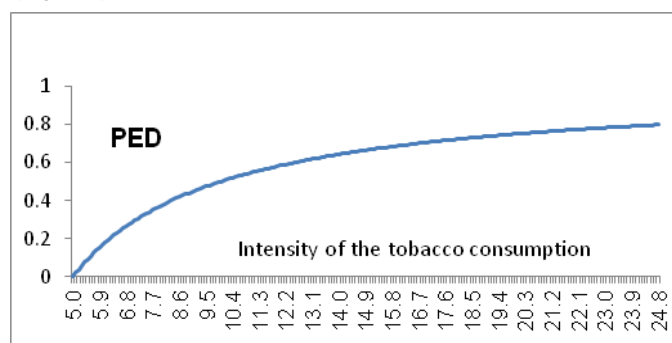


Figure 1

The rate suggested by the authors is agreed with the general characteristic from smoking since the epidemiologic point of view.

The general use of TPB as equal to TEB create several disturbs estimating the actual value of TEB. The suggested rate solve these disturbs. This rate is showing that the smoking control isn't a single subject for the Epidemiology. All sciences around this social strategic most occupy their own space and contribute since them to the smoking control. This mutual collaboration includes that all sciences must be closest around the same social objective: the reduction of smoking effect over the society, the health and the economy at same time.^{13,14,15}

Conclusion

The suggested rate to measure the probability of the effective demand of health services attributable to smoking is strong trustable estimating the economic burden attributable to smoking. This rate is agreed with general characteristic from smoking as risk factor and as consequence from the addictive effect since the recurrent consumption of cigarettes and tobaccos.

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Conflicts of interest

The authors declare that there was no conflict of interest.

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