ARCHIVOS DE BRONCONEUMOLOGIA

Editorial

Economic Evaluation of Smoking Cessation Interventions: Have We Overlooked Something?

Evaluación económica de las intervenciones antitabáquicas: ¿nos dejamos algo en el tintero?

Marta Trapero-Bertran

Health Economics Research Group (HERG), Brunel University, Uxbridge, Middlesex, United Kingdom

Tobacco use (along with AIDS) is the leading cause of death worldwide.[1-6] If current smoking patterns persist, a billion people will die in the 21st century as a result of their addiction. Moreover, the impact of smoking is rapidly rising every year because of the effects of increased smoking among young people, among other causes.[1-6] The number of young smokers in 2000 will strongly influence the number of deaths in 2050 and beyond.[1-6] Smoking increases morbidity and mortality and continues to cost government agencies billions. Although European governments have made major efforts in recent years through antismoking campaigns and measures, the question as to which public strategies to follow is still a subject of debate. Articles recently published in Spain in this journal describe and promote smoking cessation interventions.[7,8] Although there is insufficient evidence to assess the long-term results of smoking cessation,[9] it is apparent that most interventions of this kind are cost-effective; in other words, the cost savings in terms of morbidity and mortality resulting from people stopping smoking more than offset the additional social costs of intervention.[10] A more analytical approach toward health economics raises questions about whether the economic evaluations used to aid decision making are accurate, realistic calculations of the impact of smoking on morbidity and mortality and on costs. Key questions are: Is the number of smoking-related deaths and comorbidities used in current economic evaluations to support decision making realistic? Are externalities such as passive smoking important? How should we include such effects in economic evaluations?

Economic evaluation of smoking cessation interventions is aimed at identifying the intervention that uses the fewest resources and is most successful in reducing both the number of smokers and smoking-related comorbidities such as lung cancer, coronary heart disease, chronic obstructive pulmonary disease, myocardial infarction, and stroke.[10] Several economic evaluation methods have been developed in the last decade that have invariably included 3 components, namely, direct, indirect, and intangible costs.[11] In most cases, direct costs are associated with health care resources, but could sometimes include costs incurred by the patient and resources from other statutory agencies or voluntary institutions. Indirect costs are generally understood to be associated with work, with indirect costs and benefits synonymous with productivity losses and gains. Lastly, intangible costs refer to consequences that are hard to measure and rate, such as improved health or the pain and suffering associated with a specific treatment.[11] Although these terms have been defined, they are not used uniformly in research and no well-delimited concept of costs exists. Hence, most of these terms create confusion, instead of leading to uniform criteria. If we apply these cost concepts to smoking cessation interventions, we will clearly be able to calculate the disease burden. However, are we really taking into account all significant smoking-related costs, or are we, in fact, overlooking other relevant costs? According to the above definitions, economic evaluations would simply consider internal costs, ie, costs incurred by and on behalf of the person receiving the smoking cessation intervention, whether direct and indirect costs. But what about external costs? Aren't the costs to society of a smoker also important?

In my opinion, the concept of external costs, or negative externalities, should be included in economic evaluations because there is evidence that they represent a significant health burden to society.[12-14] Externalities are defined as the actions of a person or company that impose a cost on or that benefit other persons or companies, who do not receive any compensation or reward.[15] Smoking results in negative externalities; in other words, it generates costs to society. One example is passive smoking, whereby a nonsmoker's health is affected by tobacco smoke in the environment.[12] Externalities are increasingly taken into consideration in economic evaluations, as can be observed in recent publications.[11,16,17] Resource allocation to economic evaluations of smoking cessation interventions will not be optimal, however, unless all the costs and benefits of the

E-mail address: marta.trapero-bertran@brunel.ac.uk
Available online April 22, 2009

intervention are taken account of; in other words, accurate calculations require an analysis of how to handle and include externalities in such interventions. Evaluation of externalities is of paramount importance; otherwise, decision making will be based on inappropriate economic evaluations in which externalities are not considered. Although other fields, such as the environment,[18] transportation,[19] agriculture,[20] innovation,[21] and technology,[22] have considered, assessed, and measured externalities for some time, this is not the case in health care. Recently, 4 articles on externalities in the health care field have been published.[23-26] All 4 cases dealt with externalities that are positive, ie, beneficial to society. Three of the studies assessed the externalities of a vaccination program in the context of an economic evaluation,[23-25] whereas the fourth study discussed the importance of including caring externalities in economic evaluations in health care.[26] Caring externalities arise when an individual's utility or satisfaction is an increasing function of the health care received by other people in society.[26] The first 3 studies are the only published articles that I am aware of that refer to the evaluation and inclusion of externalities in economic evaluations in the health care field–in these cases, in the area of infectious diseases.[24,25] They include and rate the benefit of the intervention to both the vaccinated person and to society. The studies underscore the importance of including such social benefits in health care interventions. In the case of smoking cessation interventions, 3 externalities of smoking mentioned in the medical literature as relevant are passive smoking,[12] smoker behavioral influences on their environment,[27] and smoking by pregnant women.[28]

The next question is how to measure or put a value on these negative externalities. In the above studies, the method used to assess the positive externalities of the meningitis vaccine was, when measuring the impact of the intervention, to apply a dynamic transmission model that considered the risk of infection to depend on the prevalence of infected individuals in the population. An economic evaluation that includes externalities in an impact evaluation takes account of the costs and benefits of the intervention. In the case of smoking, there is evidence that it acts as an epidemic because the smoking habits of parents exert an involuntary influence on the behavior of their children.[27] Could we use dynamic mathematical models to evaluate the externalities of smoking? It seems that the epidemic nature of smoking in young people can probably be investigated using such models. The dynamics of a smoking environment are evident: the greater the number of smokers, the higher the probability that other individuals will start to smoke and the higher the number of passive smokers. Based on recent evidence, the use of dynamic models to value the impact of smoking on society is now recommended.[29] It thus appears that dynamic models can provide a way to measure and assess some of the health externalities of smoking. In fields such as innovation or the environment, these models, known as network models, have been used for some time. Although the models clearly provide a means for measuring externalities, they are not essential; they are complicated and usually require specialized computer applications that are rarely intuitive. Alternative methods—although not of the same quality in a strictly methodological sense—can be used to approximate externalities in the economic evaluation of health care interventions.

A recent study on smoking, in fact, measured and evaluated the externalities of passive smoking,[12] by calculating the reduced life expectancy of a person whose partner was a smoker. This method, which is not complicated, proved capable of estimating a social cost of passive smoking.

In short, in answer to the questions posed above, failure to include externalities in economic evaluations leads to unrealistic calculations as to mortality and comorbidity and may result, in turn, in inappropriate decision making. The available evidence clearly reveals passive smoking to be a relevant negative externality. However, no consensus has been reached on the methodology that should be used to evaluate this externality in health care or other areas. Progress in the area of assessing externalities may be achieved if answers can be obtained to questions such as the extent to which decisions by policy bodies would change if external costs were included in economic evaluations, and whether mathematical or other models could be used to calculate the externalities of interventions.

It is my desire that this editorial will raise the reader's interest in including externalities in future economic evaluations in the health care field.

References

1. Peto R, López AD, Boreham J, Thun M, Health C. Mortality from smoking in developed countries 1950-2000: indirect estimates from national vital statistics. New York: Oxford University Press; 1994.
2. Doll R, Peto R, Wheatley K, Gray R, Sutherland I. Mortality in relation to smoking: 40 years' observations on male British doctors. BMJ. 1994;309:901-11.
3. World Health Organization. Tobacco or health: a global status report. Geneva: World Health Organization; 1997.
4. Ad Hoc Committee on Health Research. Investing in health research and development. Geneva: World Health Organization; 1996.
5. Murray CJL, López AD. The Global Burden of Disease and Injury Series. Volume I: The Global Burden of Disease, a comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020. Cambridge MA: Harvard University Press; 1996.
6. Peto R, Chen ZM, Boreham J. Tobacco – the growing epidemic. Nat Med. 1999;5: 15-7.
7. Sánchez Agudo L, Carreras Castellet JM. Unidades de tabaquismo por internet. Arch Bronconeumol. 2007;43:1-3.
8. Jiménez-Ruiz CA, Riesco Miranda JA, Ramos Pinedo A, Barrueco Ferrero M, Solano Reina S, de Granda Orive JI, et al. Recomendaciones para el tratamiento farmacológico del tabaquismo. Propuestas de financiación. Arch Bronconeumol. 2008;44:213-9.
9. Barrueco Ferrero M, Torrecilla García M, Hernández Mezquita A, Jiménez Ruiz CA, Morales Sánchez A, Alonso Díaz A, et al. Deshabituación tabáquica. Valor del resultado en la fase de acción sobre el resultado en la fase de consolidación. Arch Bronconeumol. 2007;43:136-42.
10. Flack S, Taylor M, Trueman P. Cost-effectiveness of interventions for smoking cessation. Final report. York Health Economics Consortium for National Institute for Health and Clinical Excellence. London: NICE; 2007.
11. Drummond MF, Sculpher MJ, Torrance, GW, O'Brien BJ, Stoddart GL. Methods for the economic evaluation of health care programmes. 3rd ed. New York: Oxford University Press; 2005.
12. Sloan FA, Ostermann J, Picone G, Conover C, Taylor DH. The price of smoking. Cambridge: MIT Press; 2004.
13. Lechon Y, Lepicard S, Schleisner L, Schneider T, Ward D. A comprehensive evaluation of the environmental external costs of a fusion power plant. Fus Eng Des. 2001;56-57:95-103.
14. de Dios Ortuzar J, Rizzi LI. Valuation of transport externalities by stated choice methods. In: Coto-Millan P, Inglada V, editors. Essays in transport economics. Heidelberg: Physica-Verlag; 2007. p. 249-72.
15. Braña F, editor. Análisis económico de los estilos de vida: externalidades y coste social. Madrid: Civitas; 1997.
16. Drummond M, MCGuire A, editors. Economic evaluation in health care. Merging theory and practice. New York: Oxford University Press; 2001.
17. Morris S, Devlin N, Parkin D. Economic analysis in health care. Chichester: John Wiley & Sons, Ltd.; 2007.
18. Rey FJ, Martín-Gil J, Velasco E, Pérez D, Varela F, Palomar JM, et al. Life cycle assessment and external environmental cost analysis of heat pumps. Environ Eng Sci. 2004;21:591-605.
19. Dey Chaudhury P. Competition between intercity rail and road transport in India: external and social costs. J Asia Pac Econ. 2006;11:308-30.
20. Tegtmeier EM, Duffy MD. External costs of agricultural production in the United States. Int J Agr Sustain. 2004;2:1-20.
21. van de Vijver M, Vos B. The F-35 joint strike fighter (JSF) as a source of innovation and employment: some interim results. Defence Peace Econ. 2006;17:155-9.
22. Park G, Park Y. An empirical analysis of the inter-industrial spillover effect of information and communications technology on cost and labor – the case of Korea. J Sci Ind Res. 2003;62:157-67.
23. Brisson M, Edmunds J. Valuing the benefit of varicella vaccination. Comparison of willingness to pay and quality-adjusted life-years [Discussion Paper Series 04/02]. London: City University, Department of Economics; 2004.
24. Brisson M, Edmunds WJ. Economic evaluation of vaccination programs: the impact of herd-immunity. Med Decis Making. 2003;23:76-82.
25. Trotter CL, Edmunds WJ. Reassessing the cost-effectiveness of meningococcal serogroup C conjugate (MCC) vaccines using a transmission dynamic model. Med Decis Making. 2006;26:38-47.

26. Jacobsson F, Cartensen J, Borgquist L. Caring externalities in health economic evaluation: how are they related to severity of illness? Health Pol. 2005;73: 172-82.
27. Simons-Morton B, Haynie DL, Crump AD, Eitel P, Saylor KE. Peer and parent influences on smoking and drinking among early adolescents. Health Educ Behav. 2001;28:95-107.
28. Flack S, Taylor M, Trueman P. Economic analysis of interventions for smoking cessation aimed at pregnant women. Supplementary report. York Health Economics Consortium for National Institute for Health and Clinical Excellence. London: NICE; 2007.
29. Sharomi O, Gumel AB. Curtailing smoking dynamics: a mathematical modeling approach. Appl Math Comput. 2008;195:475-99.