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# Tobacco and cancer: epidemiology and new perspectives of prevention and monitoring in Mexico

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**Reynales-Shigematsu LM.**  
**Tobacco and cancer: Epidemiology and new perspectives**  
**of prevention and monitoring in Mexico.**  
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## Abstract

Tobacco smoking is causal risk factor of at least 16 different types of cancer. In Mexico, smoking causes 6 035 premature deaths annually of lung cancer and 5 154 from other types. Additionally, 16 408 new smoking- attributable cases are diagnosed, causing high costs in the Mexican health sector. The WHO Framework Convention on Tobacco Control is the global strategy to reduce morbidity and mortality caused by this risk factor. Four more cost-effective strategies to ensure the population benefit are: i) increase tobacco taxes, ii) create 100% smoke-free environments, iii) warn damage through health warnings with pictograms and iv) total ban of advertising and promotion. Mexico is call upon to implement with determination this comprehensive strategy to reduce cancer mortality and assuring the health population.

**Keywords:** tobacco use; cancer / prevention & control; public health policy

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**Tabaquismo: epidemiología y nuevas perspectivas**  
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## Resumen

El tabaquismo es factor de riesgo causal de por lo menos 16 diferentes tipos de cáncer. En México, el tabaquismo causa anualmente 6 035 muertes prematuras por cáncer de pulmón y 5 154 por otros tipos de cáncer. Adicionalmente, se diagnostican 16 408 casos nuevos atribuibles a tabaco, provocando altos costos en el sector salud mexicano. El Convenio Marco de la Organización Mundial de la Salud para el Control del Tabaco (CMCT-OMS) es la estrategia global para reducir la morbimortalidad causada por este factor de riesgo. Son cuatro las estrategias más costoefectivas para garantizar el beneficio poblacional: i) incrementar los impuestos al tabaco, ii) crear ambientes 100% libres de humo de tabaco, iii) advertir los daños a través de advertencias sanitarias con pictogramas y iv) prohibición total de la publicidad. México está llamado a implementar, de manera decidida, esta estrategia integral para reducir la mortalidad por cáncer.

**Palabras clave:** uso de tabaco; cáncer / prevención y control; políticas públicas de salud

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*Tobacco consumption and exposure to tobacco smoke continue to be the primary preventable risk factors for cancer worldwide*

### **Tobacco consumption and the burden of disease from cancer**

In 2012, there were a total of 56 million deaths worldwide, 38 million of which were caused by noncommunicable diseases (NCDs). These deaths were primarily caused by cardiovascular diseases (17.5 million, 46.2%), cancer (8.2 million, 21.7%), respiratory diseases (4.0 million, 10.7%), and diabetes (1.5 million, 4%). Altogether, these four diseases were responsible for 82% of all NCD-related deaths.<sup>1</sup>

Cancers are among the leading causes of morbidity and mortality worldwide. The global incidence of cancer for 2012 was 14 million new cases, and a substantial increase to 22 million is estimated for 2030. Lung, breast, stomach, and colorectal cancer, as a whole, were responsible for half of all cancer deaths worldwide. Unfortunately, two-thirds of these deaths occurred in low- and middle-income countries.<sup>1-3</sup>

The principal risk factors that cause cancer are environmental contaminants, tobacco consumption, poor diet, obesity, occupational carcinogens, infections, and reproductive habits, the majority of which are preventable.<sup>3</sup> There is sufficient scientific evidence that all forms of tobacco are carcinogenic.<sup>4</sup> Tobacco use is a causal risk factor of at least 16 different types of cancer. Compared with nonsmokers, smokers are at 15 to 30 times greater risk of developing lung cancer,<sup>5,6</sup> and tobacco use is responsible for 70% of all deaths from lung cancer and 20% of all cancer deaths that occur annually at the population level.<sup>3</sup>

Nonsmokers exposed to second-hand tobacco smoke have a higher risk of developing lung cancer and other types of cancer.<sup>4-6</sup> It is estimated that this exposure is responsible for at least 21 400 deaths from lung cancer annually worldwide.<sup>3</sup>

In the region of Latin America and the Caribbean, 1.1 million new cancer cases and approximately 600 000 deaths occur annually. Prostate, lung, and stomach cancers are the primary causes of death among men, and breast, cervical-uterine, and lung cancers are the leading causes of death among women. Death rates for lung cancer have begun to stabilize and decrease among men in some countries, such as Brazil and Argentina, due to declines in the prevalence of tobacco use. However, one should not disregard the fact that the mortality from

lung cancer in women is increasing in most countries of the region.<sup>3</sup>

Lung cancer is highly fatal; therefore, the best way to prevent the occurrence of these deaths is to motivate smokers to completely quit smoking and to prevent smoking initiation among young people. Tobacco consumption and exposure to its smoke continue to be the most significant preventable risk factors for cancer worldwide.<sup>3</sup>

### **Mexico**

According to the GLOBOCAN report for 2014, in Mexico, 71 900 cancer deaths occur annually; 33 900 occurred in men, and 38 000 occurred in women. The leading causes of cancer death in men were prostate cancer (17%), lung cancer (11.7%), stomach cancer (9%), liver cancer (7.4%), and colorectal cancers (7.1%). In women, the primary causes of cancer mortality were breast cancer (15.8%), cervical-uterine cancer (12%), liver cancer (7.9%), stomach cancer (7.5%), and lung cancer (6.4%).<sup>7</sup>

In Mexico each year, tobacco use causes 43 246 premature deaths, 6 035 of which are from lung cancer and another 5 154 of which are from other types of cancer. Annually, at least 16 408 new cases of cancer attributable to tobacco are diagnosed, leading to high costs in the Mexican health sector and amounting to 10.5 billion Mexican pesos.<sup>8,9</sup>

The national health surveys (*Encuesta Nacional de Salud y Nutrición* [National Health and Nutrition Survey], Ensanut 2012)<sup>10</sup> and epidemiological systems for the surveillance of tobacco (*Encuesta Global de Tabaquismo en Adultos* [Global Adult Tobacco Survey], GATS 2009,<sup>11</sup> *Encuesta Nacional de Adicciones* [National Survey of Addictions], ENA 2011,<sup>12</sup> and *Encuesta de Tabaquismo en Jóvenes* [Survey of Tobacco Use by Young People], ETJ 2011)<sup>13</sup> confirm that the tobacco use epidemic in Mexico continues to be a serious public health problem, demonstrating an increasing trend among adolescents, young adults (18-25 years), and women, in both urban and rural areas. Although the prevalence of tobacco consumption has decreased among Mexican men in the last decade and despite a consumption pattern of a few cigarettes daily or occasionally, we must not disregard the fact that all tobacco products are carcinogenic; therefore, there are no safe levels of consumption or

exposure to its smoke.<sup>2-6</sup> Thus, the most cost-effective strategy is prevention.

### **Tobacco control within the framework of the Global Action Plan for the Prevention and Control of Noncommunicable Diseases**

Globally, the consumption of tobacco is the most significant preventable cause of cancer, and tobacco consumption is a globalized risk factor for which there is already a comprehensive control strategy led by the World Health Organization (WHO). The cornerstone for the control of tobacco is the WHO Framework Convention for Tobacco Control (WHO FCTC),<sup>14</sup> which was adopted by the 56<sup>th</sup> World Health Assembly on May 21, 2003, becoming a historical event in global public health by promoting, for the first time, a legal instrument that provides guidelines and best practices<sup>15</sup> to prevent tobacco consumption and exposure to tobacco smoke. Currently, 10 years after its entry into force, 180 parties<sup>16</sup> have ratified the WHO FCTC, demonstrating a strong commitment and the political will to make rapid progress on its implementation, with the highest standards of performance.

To help countries with the implementation and fulfillment of the obligations established in the FCTC, the WHO established the MPOWER measures<sup>17</sup> in 2008, which are an integral part of the WHO action plan for the prevention and control of tobacco. MPOWER measures include the six most cost-effective strategies that should be implemented by member countries to abate the tobacco epidemic globally: Monitor the consumption of tobacco and the prevention policies, Protect people from exposure to second-hand tobacco smoke, Offer help for ceasing tobacco consumption, Warn about the dangers of tobacco, Enforce prohibitions on advertising, promotion, and sponsorship, and Raise the taxes on tobacco.

In September 2011, the United Nations (UN) General Assembly adopted the Political Declaration of the High-Level Meeting of the General Assembly on the Prevention and Control of Noncommunicable Diseases<sup>18</sup> worldwide, primarily focusing on the global development agenda and the social and economic repercussions on low- and middle-income countries. Similarly, the declaration reaffirmed all relevant resolutions and decisions adopted by the World Health Assembly in relation to the prevention and control of NCDs, particularly recognizing the conflict of interest between the tobacco industry (TI) and public health. Likewise, the declaration underscored the importance of the issue that the Member States continue to face major preventable risk factors (control of tobacco, reduction of salt intake, improved diet, increased physical activity, and reducing the harm-

ful use of alcohol) through priority interventions that consider the health effects, cost-effectiveness, low cost of implementation, and financial and political feasibility.<sup>19</sup>

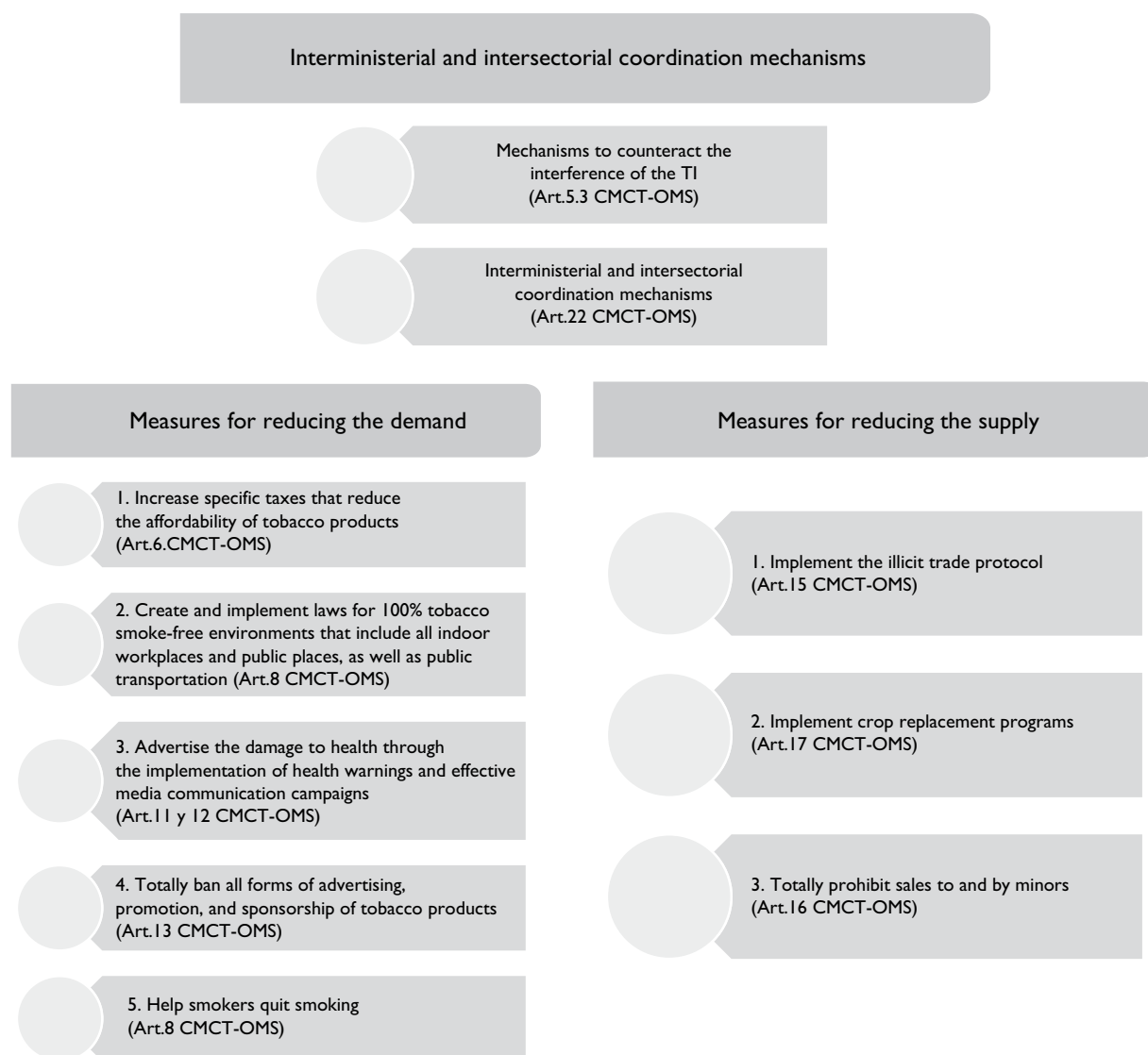
The Global Action Plan for the Prevention and Control of NCDs 2013-2020<sup>20</sup> incorporates the guidelines of the Political Declaration and the guidelines of the WHO FCTC, recommending that Member States should implement the most cost-effective interventions ("best buys") for the control of tobacco during the period 2013-2020. The proposed interventions are grouped into three basic pillars: 1. measures to reduce tobacco demand; 2. measures to reduce the supply of tobacco products, and 3. interministerial and intersectorial coordination (figure 1).

The evidence has demonstrated that there are four highly cost-effective interventions for reducing the demand for tobacco and achieving the greatest benefits in population health when they are comprehensively and simultaneously implemented with the highest standards of execution. The increase of specific taxes on tobacco products<sup>21</sup> is the most cost-effective strategy to reduce the consumption of tobacco because it discourages the consumption of tobacco among smokers and prevents the initiation of smoking among young non-smokers. Additionally, the tax collection levels are increased and earmarked so they can be invested in strategies for the prevention of risk factors or in the treatment of nicotine addiction and NCDs. This approach could also represent an innovative financing mechanism within the health sector, which would permit sustainability of the policy for the control of tobacco in the long term.<sup>19</sup>

Complete implementation implies adopting additional measures to reduce the demand and to help smokers quit, a measure beneficial to all ages but most cost-effective for the prevention of cancer and NCDs when consumption is abandoned before 40 years of age.<sup>22</sup> The economic analysis of the global impact of the fiscal policy for the control of tobacco estimates that a 70% increase in the price of tobacco products could reduce consumption in the population by 10%, avoiding approximately 25 million cancer deaths by 2050.<sup>3</sup>

The integral execution of the WHO FCTC also involves implementing measures oriented at reducing the supply, such as combating illicit trade, implementation of alternative crops, and total prohibition of sale to and by minors (sale of single cigarettes).<sup>20</sup>

Additionally, there are two measures that cannot be ignored; the first measure is oriented at counter tobacco industry (TI) interference and protect the established laws, and the second measure is oriented at establishing and/or strengthening mechanisms for interministerial and multispectral coordination for full WHO FCTC implementation in each country.<sup>20</sup>



**FIGURE 1. STRATEGY FOR THE CONTROL OF TOBACCO WITHIN THE FRAMEWORK OF THE GLOBAL ACTION PLAN FOR THE PREVENTION AND CONTROL OF NONCOMMUNICABLE DISEASES, 2013-2020<sup>19,20</sup>**

Governments should safeguard the achievements made in the control measures already implemented and should not retreat before interference from the tobacco industry. Furthermore, governments should accelerate the full and comprehensive implementation of all measures to reduce the supply and demand for tobacco products, promoting multi-sectoral policies and plans with a broader perspective of the Global Action Plan for the Prevention and Control of NCDs 2013-2020.<sup>20</sup>

The WHO FCTC and its guidelines constitute a global instrument that permits the Member States to achieve a 30% relative reduction in the prevalence of

tobacco consumption by 2025 and consequently achieve a 25% relative reduction in mortality from NCDs, including cancer mortality.

### **Strategy for the control of tobacco within the framework of the National Plan for Cancer Control<sup>23</sup> in Mexico, 2013-2020**

Considering the high healthcare costs generated for the Mexican health sector by cancer treatments and an adverse global economic environment that requires making good use of resources, it is necessary to invest

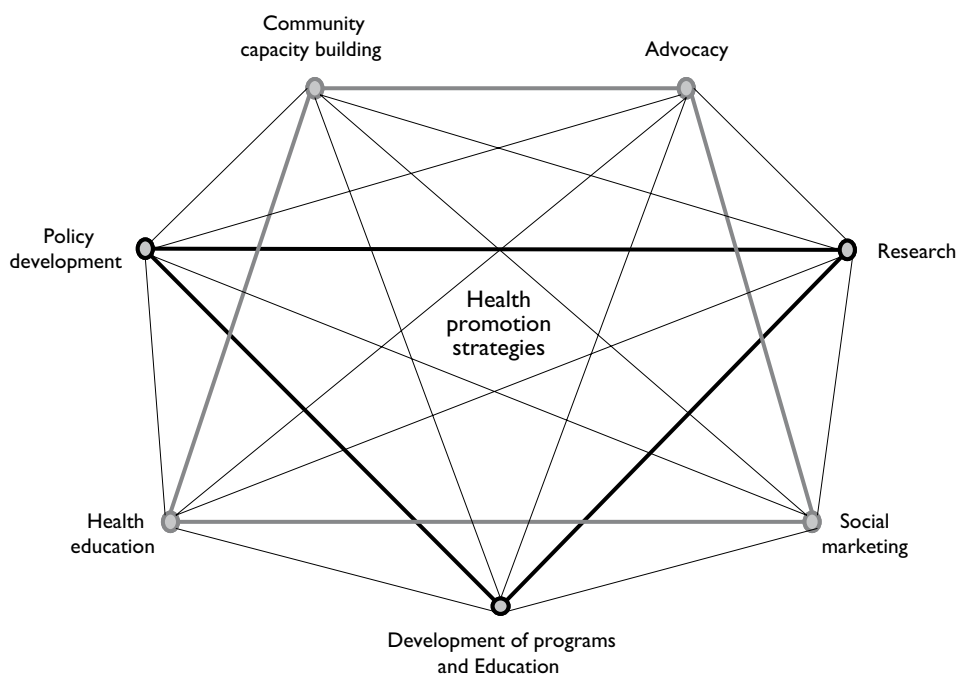
in health promotion and the prevention of risk factors. Health promotion circumscribes not only health education for modifying individual lifestyles but also a set of multidisciplinary and intersectorial societal actions that includes communities as well as governments (figure 2).<sup>3</sup>

Mexico requires the consideration and positioning of health objectives as a priority in all public policies and levels of government (federal, state, and local), with guiding interministerial approaches that involve, as required, secretariats of education, energy, agriculture, sports, transportation, communications, planning, environment, labor, industry and commerce, finance, and social and economic development to prevent all risk factors (consumption of tobacco) of NCDs (cancer) and modify the basic determinants of health comprehensively and decisively.

To achieve the goals set for 2020, Mexico should implement the Global Action Plan for the Prevention and Control of NCDs decisively, synergistically, and sustainably, and in the particular case of tobacco control, Mexico should consider implementing the WHO FCTC completely within a short period.

### Measures oriented at reducing tobacco demand:

1. Substantially increase specific taxes on all tobacco products in such a way that the affordability of tobacco is reduced (Article 6 of the WHO FCTC):
  - a. Promoting an amendment to the Law of Special Tax on Production and Services (*Ley del Impuesto Especial sobre Producción y Servicios - IEPS*) D.O.F. (*Diario Oficial de la Federación* [Official Gazette of the Federation]) December 30, 1980,<sup>24</sup> including the latest reform of November 19, 2010, according to the guidelines of Article 6 of the WHO FCTC.<sup>21</sup>
2. Create and implement national legislation for 100% tobacco smoke-free environments that include all indoor workplaces and public places, as well as public transportation (Art. 8 WHO FCTC):
  - a) Promoting a reform of the General Law for the Control of Tobacco (*Ley General para el Control del Tabaco - LGCT*)<sup>25</sup> that establishes 100% tobacco smoke-free public spaces and indoor workplaces in accordance with Article



**FIGURE 2. STRATEGIES FOR HEALTH PROMOTION WITHIN THE FRAMEWORK OF THE NATIONAL PLAN FOR CANCER CONTROL 2013-2020<sup>3</sup>**

- 8 of the WHO FCTC and its guidelines.<sup>26</sup> This approach is the second most cost-effective strategy for protecting the entire population, especially women and children, from health harm, significantly avoiding the initiation of tobacco use among the young.
3. Advertise the tobacco-initiation damage to health through the implementation of health warnings and effective media communication campaigns. (Art. 11 and 12 WHO FCTC):
    - a) Promoting a reform of the General Law for the Control of Tobacco (LGCT),<sup>25</sup> which increases the size of the pictograms to at least 75% of the surface of the packaging as established by the guidelines of Article 11 of the WHO FCTC.<sup>27</sup> Developing and monitoring compliance with Secretariat agreements for packaging and labeling of all tobacco products in Mexico.<sup>28</sup>
    - b) Implementing intersectorial programs for the prevention of tobacco consumption and health promotion, accompanied by campaigns in mass communications media aimed at vulnerable populations of adolescents, young adults, and women with the participation of key actors in prevention and control, such as health professionals and educational sector personnel.
    - c) Considering the bases and concepts of social marketing in health sector projects that generate a true change of behavior in Mexican society to create a collective of health and well-being. These strategies should move beyond an isolated campaign in the mass communication media and should be creative and innovative, including strategies of research, monitoring, and evaluation.
  4. Totally prohibit all forms of advertising, promotion, and sponsorship of tobacco products. (Art. 13 WHO FCTC):
    - a) Promoting a reform to the LGCT<sup>25</sup> that completely prohibits advertising, promotion, and sponsorship (direct or indirect) of all tobacco products in accordance with Article 13 of the WHO FCTC and its guidelines.<sup>29</sup> The prohibition should include points of sale, internet promotion through social media, and personal mail to private addresses.
  5. Help smokers to quit smoking. (Art. 14 WHO FCTC)
    - a) Integrating diagnostic algorithms of tobacco consumption and exposure to its smoke into health service medical care routines (primary and specialized care), providing preventive actions (brief medical advice) and the referral and counter-referral of patients to specialized centers, promoted in accordance with the guidelines of Article 14 of the WHO FCTC.<sup>22</sup>
    - b) Strengthening the network of support centers for smoking cessation with trained and certified health professionals and psychotherapeutic and pharmacological treatments for nicotine addiction in accordance with NOM 028-SSA2 2009.<sup>30</sup>
    - c) Ensuring access to health services and universal coverage of patients with tobacco addiction through the incorporation of pharmacological treatment for tobacco cessation into the universal catalog of health services (catálogo universal de servicios de salud - CAUSES).<sup>31</sup>

### Measures oriented toward reducing the tobacco supply:

1. Implement the illicit trade protocol (Art. 15 WHO FCTC)
  - a) Adhering to the illicit trade protocol<sup>32</sup> that aims to eliminate all forms of illicit trade in tobacco products, which would force Mexico to take measures to achieve effective control of the supply chain of tobacco products (including tracking and tracing labels) and cooperate internationally in a wide range of related issues.
2. Implement alternative crop programs. (Art. 17 and 18 WHO FCTC)
  - a) Supporting small tobacco farmers with crop replacement programs for sustainable alternatives beneficial to health and the environment in accordance with Articles 17 and 18 of the WHO FCTC.<sup>33</sup>
3. Totally prohibit sales to and by minors. (Art. 16 WHO FCTC)
  - a) Severely sanction noncompliance with the articles of the LGCT that prohibit sale to minors and the sale of loose cigarettes in addition to prohibiting free access to the products at points of sale in vending machines, by free distribution, or in the form of sweets or toys in accordance with Articles 15 and 16 of the WHO FCTC.

### Coordination mechanisms

1. Implement mechanisms to counteract TI interference (Art. 5.3 WHO FCTC)
  - a) Implementing measures for the protection of public health policies regarding the control of tobacco against commercial and other vested in-

terests of the tobacco industry in accordance with the provisions of Article 5.3 of the WHO FCTC.<sup>34</sup>

2. Implement mechanisms for interministerial and intersectorial coordination (Art. 22 WHO FCTC)
  - a) Strengthen the national capacity for the prevention and control of cancer risk factors:
    - i. Promoting academic programs (undergraduate and postgraduate) for the training of multidisciplinary human resources with the possibility of joining in the prevention, health promotion, and medical care programs at the local, regional, or national level.
    - ii. Supporting research at the basic, clinical, and public health levels and promoting relationships and the mobility of teachers-researchers and students within the groups already consolidated nationally and internationally.
    - iii. Strengthening the national programs for the prevention and control of tobacco and cancer and incorporating actions directed at vulnerable groups with active participation of communities and civil society both in the execution as well as the evaluation of programs.
    - iv. Actively involving the civilian population in confidential and anonymous citizen complaints about violations of tobacco legislation and regulations. A timely and effective response of institutions is essential to guarantee the correct application of the federal and local regulations.
  - b) Ensure financial resources for the sustainable execution of preventive programs and control strategies
    - i. Reassigning and optimizing the existing resources into the implementation of new strategies, which should be based on scientific evidence, be highly cost-effective, and attempt equitable benefit for the entire population.
    - ii. Achieving a better negotiation in the budget allocation for all sectors involved in reaching the health objectives.
    - iii. Managing new sources of funding, economic resources, and infrastructure through international or national cooperation that permits the operation of the preventive programs and the action strategies without departing from parameters of ethics, transparency, and accountability.

- iv. Advocating for the earmarking of economic resources from the tobacco taxes revenues for the treatment of nicotine addiction and diseases attributable to tobacco that currently are not covered by social security nor the System of Social Protection in Health (Sistema de Protección Social en Salud - SPSS).

### Strategies for surveillance, monitoring, and evaluation

Surveillance, monitoring, and evaluation of the risk factors, results of interventions, and population impact measures must be analyzed and assessed in an interministerial, intersectorial academic, and research working group that enables the following:

1. Monitoring and surveillance of the tobacco and cancer epidemic and evaluating the impact of control strategies:
  - a) Implementing screening strategies for cancers caused by tobacco consumption and exposure to its smoke, particularly lung cancer.
  - b) Improving the health system information of tobacco legislation and quality of vital statistics registries, particularly the death certificate, to quantify the burden of disease from cancer attributable to each risk factor.
  - c) Implementing a national population-based cancer registry (state and national) that permits the accumulation of reliable data on the incidence and mortality by cancer type, considering the Global Initiative for Cancer Registry Development (GICR).<sup>35</sup> These data orient the planning of medical care services and the evaluation of the impact of population control measures.
  - d) Implementing an observatory (state and national) that considers the epidemiological indicators of the risk factors, especially in vulnerable populations, such as youth, women, and low-income populations without access to social security.
  - e) Monitoring the behavior of the TI to identify about new products in the market, such as cigarettes with flavored capsules,<sup>36</sup> or new technologies, such as electronic cigarettes or nicotine delivery devices,<sup>37</sup> so the contents and the damages to health can be determined to establish mechanisms of regulation and citizen complaint.



- f) Take advantage of New Information and Communications Technology (NICT) so that the data and information are available for patients (support websites for smoking cessation),<sup>38</sup> for decision makers (support software),<sup>39</sup> and for the general public in a timely and transparent manner.

## Impact indicators

The indicators for the prevention and control of smoking and NCDs in accordance with the WHO Global Action Plan for the Prevention and Control of NCDs 2013–2020 are summarized in table I.

## Conclusions

Tobacco control can reduce the consumption of tobacco, which is currently the most significant preventable cause of cancer. Tobacco control measures at the population level can prevent cancer at a low cost when compared with the high costs that would be needed for cancer treatment.

Mexico is called upon to strengthen its governmental and social capacities to adopt lifestyles that promote

the good health of all individuals and the welfare of the population. It is necessary to choose cost-effective alternatives aimed at reducing inequities in cancer prevention and treatment.

*Declaration of conflict of interests.* The author declares not to have conflict of interests.

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**Table I**  
**GOALS AND POPULATION IMPACT INDICATORS IN ACCORDANCE WITH THE WHO GLOBAL ACTION PLAN FOR THE PREVENTION AND CONTROL OF NCDs 2013-2020**

Framework element	Goals	Indicator
Morbidity and Mortality		
Premature death from NCDs	Relative reduction of 25% in overall mortality from cardiovascular disease, cancer, diabetes, and Chronic Obstructive Pulmonary Disease (COPD)	Probability of dying at between 30 and 70 years of age from cardiovascular disease, cancer, diabetes, and Chronic Obstructive Pulmonary Disease (COPD) Cancer incidence by type of cancer per 100 000 persons
Risk factors		
Tobacco consumption	Relative reduction of 30% in the current prevalence of tobacco consumption in the population over 15 years of age	Consumption age prevalence in adolescents Age-standardized prevalence of tobacco consumption among over 18 years of age
Response of the national system		
Pharmacological therapy to prevent Acute Myocardial Infarction (AMI) and Cerebrovascular Disease (CVD)	At least 50% of the population at risk receive counseling and pharmacologic therapy (including glycemic control) to prevent Acute Myocardial Infarction (AMI) and Cerebrovascular Disease (CVD)	Proportion of people at risk (aged 40 years and older with cardiovascular risk $\geq 30\%$ ), including those who have cardiovascular disease and receive pharmacological treatment and counseling to prevent Acute Myocardial Infarction (AMI) and Cerebrovascular Disease (CVD)
Essential medications and basic technology for the treatment of NCDs	Eighty percent availability and accessibility to basic technology and the generic medications required for the treatment of NCDs	Availability, accessibility, safety, and efficacy of essential medications, including generics, and basic technologies in public and private services.

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