# Enhancing smoking cessation in Mexico using an e-Health tool in primary healthcare

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**Ponciano-Rodríguez G, Reynales-Shigematsu LM, Rodríguez-Bolaños R, Pruñonosa-Santana J, Cartujano-Barrera F, Cupertino AP. Enhancing smoking cessation in Mexico using an e-Health tool in primary healthcare. Salud Publica Mex. 2018;60:549-558.**
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## Abstract

**Objective.** To evaluate an e-Health tool designed to enhance smoking cessation in Mexico in primary healthcare. **Materials and methods.** Smokers 18 years of age and older were recruited in the waiting room of two primary healthcare clinics in Mexico City. Participants used an e-Health smoking cessation tool that included smoking-related assessments, education on pharmacotherapy, and motivational videos. A follow-up assessment was conducted at 12 weeks week on smoking status. Logistic regression models were performed to identify factors associated with smoking cessation or consumption reduction. **Results.** A total of 132 smokers were enrolled in the study. At follow-up, 23.5% of participants self-reported smoking cessation. Among those who did not quit smoking, 65.0% decreased the number of cigarettes. Factors associated significantly with smoking cessation were: being a non-daily smoker, being interested in quitting smoking, having low level of physical dependence, and participating in cessation treatment. **Conclusions.** The e-Health tool produced a high rate of smoking cessation. Better outcomes are obtained when this tool is used with conventional cessation programs.

Keywords: smoking cessation; primary health care; information technologies; telemedicine; e-Health

**Ponciano-Rodríguez G, Reynales-Shigematsu LM, Rodríguez-Bolaños R, Pruñonosa-Santana J, Cartujano-Barrera F, Cupertino AP. Uso de una herramienta electrónica para la cesación del tabaquismo en el primer nivel de atención en México. Salud Publica Mex. 2018;60:549-558.**
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## Resumen

**Objetivo.** Evaluar una herramienta electrónica diseñada para promover la cesación tabáquica en México en el primer nivel de atención. **Material y métodos.** Fumadores de 18 años de edad o más fueron reclutados en el área de espera de dos unidades de atención primaria en la Ciudad de México. Los participantes utilizaron una herramienta interactiva para dejar de fumar que incluía cuestionarios relacionados con el tabaquismo, educación sobre tratamientos farmacológicos y videos motivacionales. Una evaluación de seguimiento acerca de consumo de tabaco se realizó a las 12 semanas. Se realizaron modelos de regresión logística para identificar los factores asociados con cesación tabáquica o reducción de consumo. **Resultados.** Un total de 132 fumadores se inscribieron al estudio. Al seguimiento, 23.5% de los participantes autorreportaron cesación tabáquica. Entre quienes no cesaron, 65.0% redujo su consumo de cigarros al día. Los factores asociados significativamente con cesación tabáquica fueron ser un fumador ocasional, estar interesado en cesar, tener un bajo nivel de dependencia física y participar en tratamientos de cesación. **Conclusión.** La herramienta electrónica produjo una alta tasa de cesación. Mejores resultados se obtienen cuando la herramienta se utiliza con programas de cesación convencionales.

Palabras clave: cese del hábito de fumar; atención primaria de salud; tecnologías de la información; telemedicina; e-salud

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Tobacco consumption and secondhand smoke exposure are the main causes of preventable death worldwide; primarily affecting the most disadvantaged population groups. This situation has led the World Health Organization (WHO) to promote and enforce the Framework Convention on Tobacco Control (FCTC)[1] to create public policies and national programs for a comprehensive approach to deter this epidemic.[2] The integration of smoking cessation treatment into primary health care has shown to be an effective strategy to reduce the burden of the diseases attributable to smoking.[3] The combination of brief counseling and pharmacotherapy have shown to be one of the most effective[4,5] and feasible[6,7] interventions to prompt smoking cessation by primary healthcare professionals.

In Mexico, tobacco use is cause of up to 8% of the annual mortality rate.[8] For the *Instituto Mexicano del Seguro Social* (IMSS), smoking generates an annual cost of up to 7 082 million Mexican pesos. This reported cost is only calculated for the treatment of three related diseases: lung cancer, chronic obstructive pulmonary disease (COPD), and brain-cardiovascular diseases. These diseases represent 4.3% of the total health care cost of this institution.[9]

According to the National Survey of Tobacco, Alcohol and Drug Consumption (Encodat 2016–2017)[10] in Mexico, 17.6% (14.9 million) of the population between 12 and 65 years of age currently smoke; 6.4% (5.5 million) smoke daily; 11.1% smoke occasionally (9.4 million), and 15.4% (13.0 million) are former smokers. The Global Adult Tobacco Survey (GATS Mexico 2015) reports that 8 of 10 smokers reported being interested in quitting, six made at least one attempt in the past year, and only two reported receiving brief counseling on smoking cessation by a health care professional.[11] This data highlights the need to strength smoking cessation services, identify organizational barriers and facilitators, and make a better use of the clinical practices guidelines.[12-15]

The Mexican clinical practice guidelines for treating smokers states that identification of all smokers should be done at the primary health care level. All smokers identified should receive brief smoking cessation counseling, followed with referral to specialized clinics to receive psycho-behavioral and/or pharmacological treatment.[16-18] However, the current implementation of the Mexican practice guidelines is far from being ideal to attend the existing demand.[19]

E-Health interventions have shown to be effective in addressing smoking cessation.[20] The effect of e-Health interventions is synergized by the use of counseling and/or motivational interventions.[21-23] These interventions allow reaching a large number of persons who do not regularly use smoking cessation services.[24] The objective of the present manuscript is to evaluate a web-based and tablet-based tool to promote smoking cessation in two primary healthcare clinics in Mexico City.

## Materials and methods

A study with pre and post-intervention assessments was performed in two primary healthcare clinics of the *Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado* (ISSSTE) in the southern part of Mexico City. These clinics had a smoking cessation program that included behavior intervention and/or pharmacological treatment. This study took place from February to July, 2015. The protocol was evaluated and approved by the Ethics and Research Committees of the National Institute of Public Health.

### Participants

The sample was obtained for convenience, inviting all smokers over 18 years of age who were in the waiting room of the primary health care clinics. A total of 164 smokers were recruited and provided verbal informed consent to participate in the study.

### Intervention

*Vive sin Tabaco… ¡Decídete!* (in english: *Live without Tobacco… Decide!*) is a tablet-based tool to promote smoking cessation. This tool is an adapted version from an *informed decision making* tool for smoking cessation among underserved Latino communities in the US.[24] The e-Health tool used in this study included educational videos of pharmacotherapy treatments; former smoker testimonies, and self-applied questionnaires related to socioeconomic variables; tobacco consumption patterns; nicotine addiction (Fagerström[25,26] and Issa[27] tests) and psychological dependence (*Ponciano* test);[28] smoking history; reasons, motivation, interest, and self-efficacy for cessation, as well as the assessment of accessibility of the tool.

The use of the *Vive sin Tabaco… ¡Decídete!* tool took approximately 15 to 20 minutes per participant to complete. After its completion, two sheets were generated: one for the participant that included relevant information regarding physical and psychological nicotine addiction, motivational advice, and an invitation to participate in the smoking cessation group counseling formal program of each clinic; the second for the healthcare personnel, that included smoking history and the nicotine addiction test results.

At week 12, a follow-up assessment was performed via a phone call. The primary outcome was self-reported 7-day point prevalence abstinence—*defined as a period of at least 7 days without smoking*. The assessment also gathered information on the number of cigarettes smoked per day, participation in formal tobacco cessation programs during this period, satisfaction, and recommendations regarding the use of the tool.

To evaluate the impact of the intervention, three indicators were obtained: 1) the proportion of smokers who reported 7 days-abstinence from tobacco, 2) the amount of decrease in the number of cigarettes smoked by daily smokers who did not quit, and 3) the proportion of smokers enrolled in smoking cessation programs in the participating clinics.

Pearson chi-square test was used for the comparison of proportions in categorical variables. Student T test, or Mann-Whitney U test, was used for continuous variables. Statistical significance was estimated as $p<0.05$ with 95% confidence intervals in categorical variables. Three logistic regression models that included variables theoretically related to the effect were generated, which showed a statistically significant association (OR) with the measured effect or generated a significant confounding effect (≥10%).[29] Each model incorporated a predictive effect variable and the three tests used to measure the nicotine addiction. For the analysis, the SPSS (V.15) and Epi Info (V.7) programs were used.

## Results

From the total sample (n=164) of participants, 132 answered the follow-up phone call. Therefore, the results presented belong to this group. The final sample represents 80.5% of the initial participants. The mean age was 51 years (±14.6), with similar distribution by sex (53% were women) and with middle school and higher education levels.

The majority of participants (84.8%) reported being daily smokers, with an average consumption of 9.5 cigarettes/day (±6.3). Levels of dependence varied from low to moderate levels of physical dependence according to the Fagerström and Issa tests (80.3 and 65.2%, respectively), and from low to moderate psychological dependence according to the Ponciano test (97.7%) (table I).

In the baseline assessment, 88% of the participants were in the preparation phase for smoking cessation, according to the Prochaska and Di Clementi model. A 63% of the participants reported having made at least one quit attempt in the past year, 80% reported being very or totally interested in quitting smoking, 60% were self-perceived as very or fully capable, 92% reported interest attending group counseling, and 73% chose a quit-date within the next 30 days. Only 36% had received brief counseling on smoking cessation by a healthcare professional in the previous 12 months (table II).

Table III presents the results of the intervention. We divided the population into two groups: Group 1 were the smokers who reported having participated in a formal tobacco cessation program at follow-up (20.3%), and Group 2 were the smokers who did not attend a formal cessation program after the intervention (79.7%). The abstinence found for Group 1 at follow up was 38.5 (95%CI: 20.2-59.4) vs 16.7% (16.7%, 95%CI: 10.0-25.3) for Group 2, with a statistically significant difference. The general abstinence found was 23.5% (95%CI: 16.5-31.6).

Among those who did not quit smoking, 65% reduced the number of cigarettes per day from 9.5 to 6.01, representing a reduction of 3.12 cigarettes/day (±4.98). This reduction was higher in Group 1 (6.3 cigarettes/day, SD±8.2) than in Group 2 (2.5 cigarettes/day, SD±3.8) with a statistically significant difference ($p=0.047$).

Table IV shows three logistic regression models developed for the analysis of factors associated with abstinence. Each model was adjusted by the tobacco dependence test used. From the three models, the one that includes the Issa test best fits the data to predict abstinence. In this study, we observed that non-daily smokers (OR=5.15) showed higher levels of interest in quitting smoking (OR=13.3), were classified as having low physical dependence according to this test (OR=8.34), participated the most in a smoking cessation program at follow-up (OR=4.5), and were the most likely to quit smoking ($p<0.05$) when adjusting by the other variables included in the model.

It is important to highlight that being a non-daily smoker and participating in a program for smoking cessation were predictor variables for smoking cessation in the three analyzed models with similar ORs and statistical significance. Participants who fully recommended the smoking cessation program to their family and friends, reported high acceptability of the tool.

## Discussion

This study indicates that a single 15-minute exposure to *Vive sin Tabaco... ¡Decídete!*, an e-Health tool for smoking cessation, favored abstinence in 23.5% of the participants. This effect was increased when it was combined with the behavioral intervention for smoking cessation offered by the primary health care clinics (38.5%). This potentiation when combining different types of interventions has been reported in earlier studies.[20-23] It was

**Table I**

**Sociodemographic characteristics, smoking pattern, and nicotine dependence levels. Primary Health Care Units in Mexico City. Mexico, 2015**

| *Characteristics* | *Total* | | | *Abstinent* | | | *Non-abstinent* | | |
|---|---|---|---|---|---|---|---|---|---|
| | *n* | *%* | *CI95%* | *n* | *%* | *CI95%* | *n* | *%* | *CI95%* |
| Number of participants | 132 | 100.0 | | 31 | 23.5 | 16.5 - 31.6 | 101 | 76.5 | 68.3 - 83.4 |
| Sex | | | | | | | | | |
| Female | 70 | 53.0 | 44.2 - 61.8 | 13 | 41.9 | 24.5 - 60.9 | 57 | 56.4 | 46.2 - 66.3 |
| Male | 62 | 47.0 | 38.2 - 55.8 | 18 | 58.1 | 39.1 - 75.4 | 44 | 43.6 | 33.7 - 53.8 |
| Age | | | | | | | | | |
| Average /SD | | 51.4 ± 14.58 | | | 51.03 ± 14.97 | | | 51.5 ± 14.53 | |
| Age group (years) | | | | | | | | | |
| 18 to 40 | 33 | 25.0 | 17.9 - 33.3 | 8 | 25.8 | 11.9 - 44.6 | 25 | 24.8 | 16.7 - 34.3 |
| 41 to 54 | 34 | 25.8 | 18.5 - 34.1 | 7 | 22.6 | 9.6 - 41.1 | 27 | 26.7 | 18.4 - 36.5 |
| 55 to 63 | 35 | 26.5 | 19.2 - 34.9 | 10 | 32.3 | 16.7 - 51.4 | 25 | 24.8 | 16.7 - 34.3 |
| 64 or more | 30 | 22.7 | 15.9 - 30.9 | 6 | 19.4 | 7.4 - 37.5 | 24 | 23.8 | 15.9 - 33.3 |
| Educational level | | | | | | | | | |
| Basic | 8 | 6.3 | 2.8 - 12.0 | 3 | 9.7 | 2.0 - 25.7 | 5 | 5.2 | 11.7 - 17.7 |
| High school | 91 | 71.6 | 62.9 - 79.3 | 22 | 70.9 | 51.9 - 85.8 | 69 | 71.9 | 61.8 - 80.6 |
| Higher education | 28 | 22.1 | 15.2 - 30.3 | 6 | 19.4 | 7.4 - 37.5 | 22 | 22.9 | 14.9 - 32.6 |
| *Smoking pattern* | | | | | | | | | |
| Daily | 112 | 84.8 | 77.6 - 90.5 | 20 | 64.5 | 45.4 - 80.8 | 92 | 91.1 | 83.8 - 95.8 |
| Non-daily | 20 | 15.2 | 9.5 - 22.4 | 11 | 35.5 | 19.2 - 54.6 | 9 | 8.9 | 4.2 - 16.2 |
| Number of cigarrets per day (CPD) | | | | | | | | | |
| Average S/D | | 9.49 ± 6.3 | | | 9.1 ± 5.13 | | | 9.56 ± 6.6 | |
| Categories | | | | | | | | | |
| Ultra light (<5 CPD) | 18 | 16.1 | 9.8 - 24.2 | 3 | 15.0 | 3.2 - 37.9 | 15 | 16.3 | 9.4 - 25.5 |
| Light (5 a 9 CPD) | 46 | 41.1 | 31.8 - 50.8 | 8 | 40.0 | 19.1 - 63.9 | 38 | 41.3 | 31.1 - 52.0 |
| Moderate (10 to 19 CPD) | 39 | 34.8 | 26.1 - 44.4 | 8 | 40.0 | 19.1 - 63.9 | 31 | 33.7 | 24.2 - 44.3 |
| Severe (20 or more CPD) | 9 | 8.0 | 3.7 - 14.7 | 1 | 5.0 | 0.1 - 24.9 | 8 | 8.7 | 3.8 - 16.4 |
| *Physical or psychological level of dependence to tobacco* | | | | | | | | | |
| Fagerström * | | | | | | | | | |
| Physical - low | 87 | 65.9 | 57.2 - 73.9 | 22 | 71.0 | 51.9 - 85.8 | 65 | 64.4 | 54.2 - 73.6 |
| Physical - moderate | 19 | 14.4 | 8.9 - 21.6 | 3 | 9.7 | 2.0 - 25.7 | 16 | 15.8 | 9.3 - 24.4 |
| Physical - high | 26 | 19.7 | 13.3 - 27.5 | 6 | 19.4 | 7.4 - 37.5 | 20 | 19.8 | 12.5 - 28.9 |
| Issa‡ | | | | | | | | | |
| Physical - low | 19 | 14.4 | 8.9 - 21.6 | 9 | 29.0 | 14.2 - 48.0 | 10 | 9.9 | 4.8 - 17.5 |
| Physical - moderate | 67 | 50.8 | 41.9 - 59.6 | 14 | 45.2 | 27.3 - 63.9 | 53 | 52.5 | 42.3 - 62.5 |
| Physical - high | 46 | 34.8 | 26.8 - 43.6 | 8 | 25.8 | 11.9 - 44.6 | 38 | 37.6 | 28.2 - 47.8 |
| Ponciano§ | | | | | | | | | |
| Psychological - low | 51 | 38.9 | 30.5 - 47.8 | 15 | 48.4 | 30.1 - 66.9 | 36 | 36.0 | 26.6 - 46.2 |
| Psychological - moderate | 77 | 58.8 | 49.8 - 67.3 | 15 | 48.4 | 30.1 - 66.9 | 62 | 62.0 | 51.7 - 71.5 |
| Psychological - high | 3 | 2.3 | 0.5 - 6.5 | 1 | 3.2 | 0.1 - 16.7 | 2 | 2.0 | 0.2 - 7.0 |

* Physical dependence to nicotine: Low 0-3; Moderate 4-5; High 6-10

‡ Physical dependence to nicotine: Low 0-1; Moderate 2-3; High 4

§ Psychological dependence to nicotine: Low 0-7; Moderate 8-17; High 18-24

CPD: cigarretes per day

**Table II**
**ATTEMPTS TO QUIT SMOKING AND MOTIVATIONAL ASPECTS AND SELF-EFFICACCY. PRIMARY HEALTH CARE UNITS IN MEXICO CITY. MEXICO, 2015**

| *Characteristics* | *Total* | | | *Abstinent* | | | *Non-abstinent* | | |
|---|---|---|---|---|---|---|---|---|---|
| | *n* | % | *CI95%* | *n* | % | *CI95%* | *n* | % | *CI95%* |
| Classification according to Prochaska and Di Clementi model | | | | | | | | | |
| Precontemplation and contemplation | 15 | 12.4 | 7.1 - 19.6 | 3 | 10.0 | 2.1 - 26.5 | 12 | 13.2 | 7.0 - 21.9 |
| Preparation | 106 | 87.6 | 80.4 - 92.9 | 27 | 90.0 | 73.5 - 97.9 | 79 | 86.8 | 78.1 - 93.0 |
| In the last 12 months have tried to quit smoking | | | | | | | | | |
| Yes | 83 | 62.9 | 54.0 - 71.1 | 23 | 74.2 | 55.4 - 88.1 | 60 | 59.4 | 49.2 - 69.1 |
| Average / SD | | 2.5 ± 3.9 | | | 3.8 ± 4.7 | | | 2.2 ± 3.6 | |
| Interest to quit smoking* | | | | | | | | | |
| Average / SD | | 8.5 ± 2.14 | | | 9.2 ± 1.28 | | | 8.3 ± 2.31 | |
| Nothing. Not much or slightly interested (0 to 7) | 26 | 19.7 | 13.3 - 27.5 | 2 | 6.5 | 0.8 - 21.4 | 24 | 23.8 | 15.9 - 33.3 |
| Very or totally interested (8 to 10) | 106 | 80.3 | 72.5 - 86.7 | 29 | 93.5 | 78.6 - 99.2 | 77 | 76.2 | 66.7 - 84.1 |
| Self-efficacy to quit smoking* | | | | | | | | | |
| Average / SD | | 7.6 ± 2.19 | | | 8.39 ± 1.56 | | | 7.35 ± 2.31 | |
| Nothing. Very little or slightly capable (0 to 7) | 53 | 40.2 | 31.7 - 49.0 | 8 | 25.8 | 11.9 - 44.6 | 45 | 44.6 | 34.7 - 54.8 |
| Very or totally capable (8 a10) | 79 | 59.8 | 51.0 - 68.3 | 23 | 74.2 | 55.4 - 88.1 | 56 | 55.4 | 45.2 - 65.3 |
| Interest in getting help to quit smoking | | | | | | | | | |
| Yes | 122 | 92.4 | 86.5 - 96.3 | 28 | 90.3 | 74.2 - 98.0 | 94 | 93.1 | 86.2 - 97.2 |
| Election date to quit smoking | | | | | | | | | |
| In the next 30 days | 96 | 73.8 | 65.4 - 81.2 | 25 | 83.3 | 65.3 - 94.4 | 71 | 71.0 | 61.1 - 79.6 |
| Within 1 or 2 months | 9 | 6.9 | 3.2 - 12.7 | 1 | 3.3 | 0.1 - 17.2 | 8 | 8.0 | 3.5 - 15.2 |
| Within 3 to 5 months | 14 | 10.8 | 6.0 - 17.4 | 2 | 6.7 | 0.8 - 22.1 | 12 | 12.0 | 6.4 - 20.0 |
| Within 6 months or more | 11 | 8.5 | 4.3 - 14.6 | 2 | 6.7 | 0.8 - 22.1 | 9 | 9.0 | 4.2 - 16.4 |
| In the last 12 months, have you received advice from a health professional to quit smoking | | | | | | | | | |
| Yes | 48 | 36.4 | 28.2 - 45.2 | 10 | 32.3 | 16.7 - 51.4 | 38 | 37.6 | 28.2 - 47.8 |

* Median estimation and standard deviation, using the original question scale

also observed that participants who reported not being able to quit smoking at week-12, reduced the number of cigarettes smoked per day (2.5 SD±3.86) as compared to the baseline assessment (6.26 SD±8.2).

The use of e-Health tools has led to the development of effective, low-cost, and high-population-based interventions to promote healthy behaviors, including smoking cessation.[19-22] In Mexico, few experiences using web-based devices to promote smoking cessation have been developed. Smoking cessation prevents chronic-degenerative diseases, such as cardiovascular and cerebrovascular diseases, COPD, lung cancer, and many other diseases that have a significant impact on mortality.[12,30]

Mexican practice guidelines emphasize the importance of the identification, diagnosis, motivational

**Table III**

**Effects of the intervention identified in the participants of the study. Primary Health Care Units in Mexico City. Mexico, 2015**

| | Total | | | Participation in the Program | | | | | | p |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Group 1* | | | Group 2* | | | |
| | n | % | CI95% | n | % | CI95% | n | % | CI95% | |
| All sample included | | | | | | | | | | |
| Achieved abstinence | 31a | 23.5 | 16.5 - 31.6 | 10 | 38.5 | 20.2 - 59.4 | 17 | 16.7 | 10.0 - 25.3 | 0.028‡ |
| Did not achieve abstinence | 101 | 76.5 | 68.3 - 83.4 | 16 | 61.5 | 40.6 - 79.8 | 85 | 83.3 | 74.7 - 90.0 | |
| Total | 132 | 100.0 | | 26 | 20.3 | 13.7 - 28.3 | 102 | 79.7 | 71.7 - 86.3 | |
| Results obtained in which abstinence is not referred (mean - SD) | | | | | | | | | | |
| Number of CPD at the beginning of the study | | 9.49 ± 6.3 | | | 11.4 ± 7.8 | | | 8.9 ± 5.9 | | |
| Number of CPD at the end of the study | | 6.01 ± 4.6 | | | 6.18 ± 3.3 | | | 5.9 ± 4.8 | | |
| Changes in the intensity of consumption (mean - SD) | | -3.12 ± 4.98 | | | -6.26 ± 8.2 | | | -2.5 ± 3.86 | | 0.047§ |
| Decreases the number of CPD | 60 | 65.2 | 54.6 - 74.8 | 12 | 80.0 | 51.9 - 95.7 | 48 | 62.3 | 50.6 - 73.1 | |
| Keeps the number of CPD | 21 | 22.8 | 14.7 - 32.7 | 3 | 20.2 | 4.3 - 48.1 | 18 | 23.4 | 14.5 - 34.4 | |
| Increases the number of CPD | 11 | 12.0 | 6.1 - 20.4 | 0 | 0.0 | 0.0 - 21.8 | 11 | 14.3 | 7.3 - 24.1 | |

CPD: Cigarretes per day

* Group 1: Participated and Group 2: Did not participate in a program to quit smoking
‡ Estimated with Pearson chi square test, using the Exact Fisher test.
§ Estimated with Mann-Whitney U test

a: Only 27 participants who quit gave information about attending or not to a cessation program

intervention, and reference of all smokers in the primary health care clinics.[8-10] However, only 36.4% of the participants reported having received medical advice to quit smoking in the last year. When the participants were recruited in the intervention, we observed that only 20.3% had participated in a smoking cessation program. This data shows the existence of two problems related to smoking cessation in Mexico. First, healthcare professionals are not providing brief counseling during medical consultation, and second, there is little use of current smoking cessation programs. The first problem could be explained by various factors, including organizational ones, or by the lack of knowledge, attitudes, and skills in health personnel.[16,19,31] The second problem requires further analysis to identify the barriers that limit the use of these services by the smoker.[31]

The results were obtained with three indicators used to evaluate the impact of the web-based tool: the number of smokers who quit, reduction in the number of cigarettes smoked daily, and the percentage of smokers who decided to attend a formal tobacco cessation program. This data justifies the use of an e-Health intervention for a population that attends the primary health care clinics for unrelated causes to enhance smoking cessation.

The analyzed sample shares important characteristics with the general population of Mexican smokers, such as consuming an average of less than 10 cigarettes per day, as well as the fact that 6 out of 10 smokers reported making one quit attempt in the last year. This consumption pattern may explain why the multivariate analysis of the Issa test better predicts abstinence, as it was developed for a population that consumed less than 10 cpd,[27] compared to the Fagerström test, which was designed for smokers consuming more than 15 cigarettes/day.[25]

The non-daily smokers showed low levels of physical dependence to nicotine and high participation in a smoking cessation program, both key factors to predict abstinence in the three multivariate analyses. These factors have been suggested as predictors in other studies,[32-34] and should be taken in consideration by health personnel.

**Table IV**

**Logistic regresion models to identify factors associated with abstinence at the end of the intervention. Primary health care units in Mexico City. Mexico, 2015**

| Variables included in the models | Category | Issa test model | | | | Fagerström test Model | | | | Ponciano test model | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | OR | Low. L | High. L | p | OR | Low. L | High. L | p | OR | Low. L | High. L | p |
| Sex* | Man | 2.18 | 0.74 | 6.40 | 0.156 | 2.48 | 0.88 | 7.02 | 0.086 | 2.46 | 0.87 | 6.96 | 0.091 |
| Age‡ | 46 to 60 years | 1.47 | 0.40 | 5.34 | 0.562 | 1.95 | 0.55 | 6.97 | 0.304 | 1.75 | 0.50 | 6.14 | 0.380 |
| | 61 years or more | 1.00 | 0.24 | 4.19 | 0.998 | 1.32 | 0.34 | 5.10 | 0.688 | 1.19 | 0.28 | 4.97 | 0.812 |
| Consumption pattern§ | Occasional | 5.15 | 1.24 | 21.40 | 0.024 | 6.43 | 1.60 | 25.88 | 0.009 | 6.44 | 1.70 | 24.37 | 0.006 |
| Capability to quit smoking# | Very or totally capable | 1.46 | 0.41 | 5.19 | 0.557 | 1.75 | 0.55 | 5.53 | 0.340 | 1.58 | 0.48 | 5.19 | 0.447 |
| Interest level to quit smoking& | High or very high | 13.30 | 1.01 | 174.77 | 0.049 | 4.70 | 0.52 | 42.38 | 0.168 | 5.77 | 0.61 | 54.87 | 0.127 |
| Prochaska phases≠ | In preparation phase | 1.52 | 0.27 | 8.56 | 0.638 | 1.17 | 0.25 | 5.56 | 0.846 | 1.10 | 0.23 | 5.37 | 0.902 |
| Participates in a program to quit smoking∞ | Yes | 4.50 | 1.30 | 15.57 | 0.017 | 4.46 | 1.21 | 16.40 | 0.025 | 4.04 | 1.24 | 13.15 | 0.020 |
| Attempted to quit smoking in the past 12 months⌀ | Yes | 1.41 | 0.46 | 4.36 | 0.550 | 1.19 | 0.40 | 3.55 | 0.751 | 1.34 | 0.45 | 3.94 | 0.597 |
| Physical dependence level according to ISSA test◊ | Low (0 to 1) | 8.34 | 1.39 | 50.03 | 0.020 | | | | | | | | |
| | Moderate (2 to 3) | 1.18 | 0.34 | 4.15 | 0.792 | | | | | | | | |
| Physical dependence level according to Fagerström test€ | Low (0 to 3) | | | | | 0.99 | 0.26 | 3.80 | 0.989 | | | | |
| | Moderate (4 to 5) | | | | | 0.61 | 0.10 | 3.81 | 0.597 | | | | |
| Psychological dependence level according to Ponciano test∆ | Low (0 a 7) | | | | | | | | | 0.96 | 0.06 | 14.57 | 0.976 |
| | Moderate (8 a 17) | | | | | | | | | 0.69 | 0.05 | 10.07 | 0.785 |

Reference:
* Woman
‡ Less than 46 years of age
§ Daily
# Non of moderately capable (0 to 7)
& Low or moderate level of interest (0 to 7)
≠ Precontemplation and contemplation
∞ Does not participate
⌀ Has not tried
◊ High physical dependence (4)
€ High physical dependence (6 to 10)
∆ High psychological dependence (18 to 24)

The lack of a biochemical verification of abstinence could favor an overestimation of the cessation effect measured in the study. However, this bias could have equally occurred in those that did or did not participant in smoking cessation programs (non-differential classification bias).[35]

It is important to emphasize that the smoking cessation process is a multi-causal event associated with multiple variables (biological, social, psycho-behavioral) and with the available resources in the environment, some of which may favor relapses.[4,6,34,35] However, the primary objective of this study was to evaluate the impact of the e-Health tool *Vive sin Tabaco... ¡Decídete!*, specifically on cessation and on abstinence maintenance at 12 weeks after using it. Thus, no changes were evaluated in motivational aspects nor levels of addiction analyzed at the initial evaluation.

## Conclusions and recommendations

The evaluated e-Health tool proved to be an excellent means to provide personalized support and advice to motivate smoking cessation in smokers attending primary healthcare clinics. To increase its performance, it should be ensured that it is used in a complementary way to other interventions offered for the treatment of smoking in this level of care.[36] Therefore, the health care professionals who attend in the specialized cessation clinics in this level should be trained and incentivized to deliver a high quality cessation service.

Mexican clinical practice guidelines[16-18] always recommend the use of the Fagerström test to diagnose the level of physical dependence to nicotine. However, the results of this study show that its usefulness is limited for the Mexican smokers because they generally consume less than 10 cigarettes per day. We consider it pertinent to validate the use of the Issa test, or even the development of a specific test for this population.

Also, it is interesting to emphasize the results obtained with the Ponciano test (approaching psychological dependence) which found low to moderate dependence in the population studied. More research is needed to fully understand the meaning of this parameter and its association with physical dependence. Psychological dependence is a multifactorial variable, the evaluation and understanding of which will allow us to have a better knowledge of the characteristics of the Mexican smoker.

Information and communication technologies (ICT) usage in the treatment of tobacco smoking can increase the health coverage of smokers who otherwise would not quit. It is important to increase the capacity of e-Health in Mexico since it is a low-cost and secure way to reach and treat a large numbers of subjects, as could be confirmed in this study. The use of *Vive sin Tabaco… ¡Decídete!*[37] represents a great opportunity to reach the population of smokers who are highly motivated to quit smoking and that attend primary health clinics for causes unrelated to smoking cessation.

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*Declaration of conflict of interests. The authors declare that they have no conflict of interests.*

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