DEVELOPING EFFECTIVE RISK COMMUNICATION STRATEGIES TO REDUCE CARBON MONOXIDE POISONINGS

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Narrative Summary

This study generated an immediately useful risk communication protocol to inform the public of the health hazards of carbon monoxide poisoning from unvented heat sources.

Using the mental models approach (Morgan et al. 2001), interviews with expert and non-expert community members were conducted to develop a model that identified knowledge gaps about CO poisoning between experts and lay people. These data were used to guide the development of a comic book style risk communication protocol that was developed using entertainment-education principles (Singhal & Rogers, 1999) and the opinion leadership elements used in diffusion of innovations theory (Rogers, 2003).

This project provides a base in skills and experience for further research into communication protocols for a wide range of health and technological risks commonly found in the many peri-urban settlements of the border region, such as drinking water quality, fire safety, electrical safety, and asthma triggers.
Introduction

Carbon monoxide is a major cause of unintentional poisoning throughout the world. In the United States alone, approximately 200 people die annually from carbon monoxide intoxication (CPSC, 2004). Poisoning typically results from carbon monoxide in the exhaust gases of improperly functioning or poorly vented home appliances, such as stoves and heaters that burn wood, coal, or gas (U.S. AID, 1999). Carbon monoxide poisoning is a serious risk in the Paso del Norte region, particularly among low-income residents of Ciudad Juárez, who lack central heating and rely on unvented wood and gas heaters in the winter. In 2003 there were 128 reported non-fatal intoxications and 15 deaths in Ciudad Juárez from carbon monoxide poisoning. Over the past 12 years, 1,381 people have been intoxicated and 167 more have died (Calentadores Mortales, 2004). The population-averaged fatality rate for Ciudad Juárez is roughly an order of magnitude higher than the U.S. death rate of 0.2 fatalities per 100,000 individuals (Gurian et al., 2005). In addition, exposures that do not reach fatal levels may contribute to a number of sub-clinical effects such as headaches, nausea, and fatigue (CPSC, 2004).

Previous studies have documented high levels of exposure to carbon monoxide in homes in low-income neighborhoods of Ciudad Juárez. During an initial survey in 2001-2002, a single instantaneous measurement of carbon monoxide was made at 300 homes in Ciudad Juárez. Measurements exceeding the OSHA 8-hour exposure limit of 35 ppm were observed for 23% of the homes with unvented gas heaters (Graham et al., 2004). Figure 1 summarizes the carbon monoxide levels measured by this study.

Figure 1: Instantaneous carbon monoxide levels in 300 homes in peri-urban Ciudad Juárez

A follow up study (Montoya et al., in press) conducted in the winter of 2003-2004 conducted weeklong monitoring at 63 homes in Ciudad Juárez. Preliminary results of this study indicate that roughly 10% of homes have peak CO levels exceeding 100 ppm. (The World Health Organization recommends that 15-minute exposures not exceed 87 ppm). A retrospective analysis of carbon monoxide cases in Ciudad Juárez (Gurian et
al. 2005) identified several risk factors for CO intoxication including sealing windows and doors to prevent drafts, overnight use of heaters, and use of El Sol brand heaters.

These dangerous exposures to carbon monoxide can be prevented by a number of simple steps, such as (a) the use of appropriate carbon monoxide alarms, (b) turning off indoor heaters at night, (c) allowing for appropriate ventilation, or (d) using catalytic (flameless) heaters. The challenge is to communicate the risk and the appropriate risk reduction strategies to the public in a form that they will both understand and that will lead them to act on the information. Protección Civil, the agency of the Mexican government responsible for public safety, has expressed concern and frustration that, despite publicity campaigns, residents have not changed their behavior and continue to subject themselves to unnecessary risks from unsafe heat sources, according to one of their officials (P. Jacinto, personal communication, February 9, 2004). Such difficulties in communicating technical information about fatal risks to the public are common. Research is required to identify the risk communication strategies most likely to be effective in practice.

Where earlier research identified and monitored CO poisonings in Ciudad Juárez, no study had examined how to most effectively communicate this information to the Ciudad Juárez community. Effective public communication protocols must identify a problem, inform the public, and promote changes in individual behavior via a culturally relevant communication protocol (Rogers, 2003). The difficulty of getting people to adopt behavior change primarily has been linked to interpersonal and mass mediated efforts, particularly when they are culturally relevant to people’s lives (Rogers, 2003; Singhal & Rogers, 1999).

Research Objectives

The main goal of this project was to generate an immediately useful risk communication protocol to inform the public of the health hazards of carbon monoxide poisoning from unvented indoor heat sources. The specific objectives of this study were to:

- Establish baseline knowledge of the CO problem in the area via a combination of expert and public semi-structured interviews
- Develop a culturally sensitive communication protocol to inform people of the dangers of CO and to provide people with information to make safer their use of indoor heaters.
- Identify opinion leaders within the target community to promote to their peers in Ciudad Juárez neighborhoods the safety strategies suggested by local experts and reported in the communication protocol.
• Measure the success of the health campaign to improve the development of future campaigns.

Research Methodology / Approaches

Approval for the participation of human subjects in the study was obtained from the Institutional Review Board of the University of Texas at El Paso and their equivalent at Universidad Autónoma de Ciudad Juárez.

This pilot study used the mental models framework (Morgan et al., 2001) to identify what is known about indoor heaters and CO poisoning in the local area. These data were used to develop an effective risk communication protocol that can be used to lower CO deaths in Juárez. This approach consists of developing an expert model that explains a problem and a lay person model that reflects community knowledge of a problem. The two models are then used to develop a third model used to educate the public. The mental models approach (Morgan et al., 2001) does not view the public as a blank slate to be educated by “experts” but rather acknowledges that the public has existing knowledge and beliefs about technological risks. While the public’s understanding (or mental model) of risk may be faulty, risk communication efforts should, nevertheless, take into account the public’s current knowledge, in order to more effectively target the intervention towards those areas where existing knowledge is most often deficient.

Diffusion of innovations theory (Rogers, 2003) and entertainment education (EE) principles (Singhal & Rogers, 1999) were used to develop a pilot communication protocol aimed at informing people of CO dangers to help reduce the likelihood of CO poisonings and deaths in the areas of study.

The mental models framework has four major steps:

• Expert beliefs are elicited and represented graphically with a concept map.

• Lay beliefs are elicited through semi-structured interviews and the frequencies of different attitudes and beliefs are estimated through a survey.

• A risk communication tool is designed using the information from the previous two steps. The performance of this tool is evaluated first through less formal methods such as “think aloud protocols.”

• These steps are followed by more formal surveys of knowledge before and after the communication effort.
Expert and lay beliefs were recorded using semi-structured interviews. Interviews of professionals lasted about 30 to 40 minutes and were composed of questions about CO dangers, heater use precautions, common mistakes made when using indoor heaters, and strategies for better safety. Laypeople interviews lasted approximately 30-minutes and included questions about CO safety precautions, indoor heater use, and the identification of people with large amounts of social influence in each respondent’s immediate neighborhood. (Instruments in Appendix 1).

Ing. Héctor Apodaca from Protección Civil, Capitán Jacinto of the Juárez Fire Department and a representative from the El Paso Fire Department provided information for the expert model. Twenty low income individuals from Ciudad Juárez were interviewed by students from the Autonomous University of Ciudad Juárez (UACJ) to develop the lay person mental model. These individuals were selected from colonias on the Ciudad Juárez periphery to represent the target population for this project.

After analysis of the interview transcriptions, mental models were completed and compared to identify gaps in the information each group had. The “mental model for indoor carbon monoxide exposure” is included in Appendix 2.

A survey instrument was then developed for the identification of baseline perceptions of CO damage within the target population. The questionnaire is included in Appendix 1. Data collection took place in public locales where people typically have to wait for extended periods of time before receiving a government or social service (e.g., car registration offices, local clinics –IMMS, ISSSTE). In appreciation of their time and effort, a $50 pesos gift card was given to each respondent, 150 surveys were completed.

A carbon monoxide risk communication protocol was developed in the form of a comic book that included the information elicited through interviews and surveys from the experts and lay people. The first draft of the comic book was examined using semi-structured think-aloud interviews with 10 people (individually) and two focus groups with 4 and 7 participants. An updated version of the comic book was tested using 100 surveys that included questions before and after the respondents read the comic book in order to determine the efficacy of this risk communication instrument. An electronic version of the comic book can be downloaded from http://research.utep.edu/Portals/72/EPA/CO16jan07.pdf. A hard copy is attached to this report.

Problems / Issues Encountered
The development and use of questionnaires and unstructured interview protocols led us to submit materials for IRB review and approval three times. Additionally, Dr. Patrick Gurian’s move to Drexel University and Mtro. Velázquez’s move to San Luis Potosí forced us to communicate with them via teleconference and email. Also, three of our...
students graduated during project implementation; as such, the project required greater coordination than originally planned. We were granted a 10-month no-cost extension to finish project activities and were able to meet all original goals. Research team member Veronica Corella-Barud secured $25,000 in external funding from Johnson & Johnson to use toward environmental health outreach activities. Approximately $9,000 was specifically for CO risk communication. Portions of this funding were used to cover the costs of publishing 7,000 comic books. Eight-hundred were distributed with coupons in varying amounts ($50, 40, 30, and 20 pesos) for discounts on indoor CO monitors. The remaining comic book-formatted risk communication protocol booklets will be shared with the Ciudad Juárez community in winter 2007. The willingness of people to purchase indoor CO alarms when provided with a coupon is being analyzed at the time of this writing.

Research Findings

The study results confirm that many in Ciudad Juárez are exposed to one or more risk factors (Figure 2). Seventy nine percent (79%) of survey respondents were exposed to at least one risk factor, with unvented gas heaters being the most common risk factor (63% of respondents exposed). Many safety measures are already known and practiced (Figure 3). Using blankets rather than constantly relying on a heater, opening a window while the heater is running, and turning off the heater before going to sleep are all practiced by greater than 90% of respondents.

The survey identified two important and common misperceptions:

1. 79% of respondents mistakenly believe that they can smell carbon monoxide
2. 30% overestimate the cost of an alarm.

These misconceptions may contribute to the fact that only 7% of respondents own carbon monoxide detectors. While the use of alarms is uncommon, many respondents express a willingness to purchase alarms when informed of the price, particularly if it is possible to pay in installments (Figure 4). Based on these results interventional efforts to increase the use of alarms may be appropriate. Alarms are considered (a) effective, (b) are not widely used currently, and (c) a large fraction of survey respondents indicate a willingness to purchase alarms (i.e., the light blue in Figures 3 and 4). The use of heaters with oxygen depletion sensors is less protective (high levels of carbon monoxide are harmful even in the presence of oxygen) and more expensive.

Based on the responses to the baseline survey and information from the expert model indicating that CO alarms are effective risk mitigation measure, lack of knowledge about CO alarms was identified as a critical gap in public understanding of this risk. Accordingly a risk communication protocol was designed to emphasize the low cost and effectiveness of CO alarms. This comic book-style pamphlet, titled *El Asesino Invisible* (*The Invisible Assassin*), was intended to combine entertainment and education.
The performance of this risk communication instrument was evaluated empirically using a survey (N = 100) that assessed knowledge about CO and willingness to make changes to combat CO poisoning before and after participants read the comic book. Differences in the frequency of responses between the pre-test and post-test were analyzed to determine the success of _El Asesino Invisible_ in relaying important information to the public.

After reading the comic book, a higher percentage of participants answered the questions correctly (Table 1). General knowledge about CO increased when comparing pre-test and post-test answers. For example, only 41% correctly identified CO as a gas before reading the comic book, while 80% did after reading it (p < 0.01). Before reading the comic book, 21% mistakenly believed CO could be detected by scent, and only 2% still believed so post-test (p < 0.01). An increase to 88% (from a pre-test value of 67%) was found when participants were asked if sensors on heaters would help in lowering the risk of CO poisoning in the home (p < 0.01).

A significant increase (p < 0.01) in the awareness of CO poisoning as a health concern was found when participants were asked if CO poisoning would cause nausea, dismay, or headaches. Also, CO was identified to be a poison significantly more (p = 0.018) when participants were questioned after reading the information provided. Because 98% of those asked knew CO could cause death before reading the comic book, a significant increase was not found, but there was a slight increase to 99% in the post-test survey (p = .561).

The principal target of the comic book, increasing knowledge of CO alarms increased greatly in the post-test. Only 29% of those surveyed before reading the comic book were aware CO could be detected by a CO alarm. However, after reading the comic book, 86% of participants knew this (p < 0.01). The percentage of respondents stating that they knew how to use a CO alarm increased from 20% to 76% (p < 0.01), and those conscious that a CO alarm could protect their homes increased from 76% to 91% (p < 0.01). Knowledge of CO alarm price (100 pesos) and availability in supermarkets also increased significantly (p < 0.01). A significant increase in those willing to install CO alarms (70% pre-test, 89% post-test, p < 0.01) was found, perhaps due to improved understanding of CO alarms, CO, and the dangers associated with it.

The causes of CO were more readily identified by participants after reading the comic book. Significant increases (p < 0.01) were found when comparing pre-test and post-test results of questions asking if CO is generated when something is burned, and if it is generated by a gas heater and a gas stove. Although there was a slight increase, it was not significant when participants who had already read the comic book were asked if heating, wood and electric heaters, gas, wood, and electric stoves, or roasters generate CO (when compared to pre-reading responses). Although only a small amount (6%) felt they did not know what generated CO in the pretest condition, only 1% surveyed after reading the comic book answered that they did not know (p=0.054).
In many cases high percentages of respondents indicated a willingness to implement CO risk reduction measures on the pre-test, making it difficult for this to increase significantly on the post test. For example, 94% of respondents were already willing to turn off heaters during the night before exposure to the comic book. While this tendency increased to 97% post-test, the increase was not statistically significant (p=.306). Similarly, post-test results show that 98% of those asked were willing to open windows when heaters are on, which was not statistically significantly elevated from the pretest value of 95% (p=.248). Significant increases were found (p-values <0.01) when participants were asked if they were willing to install metal hoses (increase from 79% to 92%) or change to a heater with a sensor (73% to 89%). Most importantly, expressed willingness to use CO alarms, the key behavioral changed targeted by the comic book, increased from 70% to 86% (p < .01).

Looking at these results, there appear to be noteworthy changes between the pre-test and post-test survey results. General knowledge increased in areas where it was lacking prior to reading the comic book (i.e. “CO is a gas” and “CO is generated when something is burned”). Several intended changes to offset the dangers of CO poisoning showed significant increases after participants read the comic book, although many expressed willing to alter practices before even reading it. In general, the results show that the principal objective of the informational handout was achieved as significant increases in both knowledge of and expressed willingness to use CO alarms were observed after participants read the comic book.
Table 1. Results of pre- and post-test surveys

<table>
<thead>
<tr>
<th>QUESTION</th>
<th>Pre-Test % answering yes</th>
<th>Post-Test % answering yes</th>
<th>Significance of change p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO is a gas</td>
<td>41%</td>
<td>80%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>CO is generated when something is burned</td>
<td>31%</td>
<td>68%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>Gas heaters generate CO</td>
<td>84%</td>
<td>96%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>Wood heaters generate CO</td>
<td>52%</td>
<td>62%</td>
<td>0.15</td>
</tr>
<tr>
<td>Electric heaters generate CO</td>
<td>8%</td>
<td>8%</td>
<td>1</td>
</tr>
<tr>
<td>Heating generates CO</td>
<td>34%</td>
<td>37%</td>
<td>0.66</td>
</tr>
<tr>
<td>Gas stove generate CO</td>
<td>51%</td>
<td>70%</td>
<td>&lt;.01*</td>
</tr>
<tr>
<td>Wood stove generate CO</td>
<td>31%</td>
<td>37%</td>
<td>0.37</td>
</tr>
<tr>
<td>Electric stove generate CO</td>
<td>3%</td>
<td>3%</td>
<td>1</td>
</tr>
<tr>
<td>Roaster generate CO</td>
<td>13%</td>
<td>17%</td>
<td>0.43</td>
</tr>
<tr>
<td>I don’t know what generates CO</td>
<td>6%</td>
<td>1%</td>
<td>0.054*</td>
</tr>
<tr>
<td>CO is detected with a CO alarm</td>
<td>29%</td>
<td>86%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>CO can be detected by the scent</td>
<td>21%</td>
<td>2%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>CO is detected with a smoke alarm</td>
<td>5%</td>
<td>8%</td>
<td>0.39</td>
</tr>
<tr>
<td>A CO alarm would protect my home</td>
<td>76%</td>
<td>91%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>I already know how to use a CO alarm</td>
<td>20%</td>
<td>76%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>I already know that a CO alarm costs 100 pesos</td>
<td>11%</td>
<td>30%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>I already know that I can buy a CO alarm in the supermarket</td>
<td>33%</td>
<td>76%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>Heaters with sensor would help</td>
<td>67%</td>
<td>88%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>I agree to install a CO alarm at my home</td>
<td>70%</td>
<td>89%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>I agree to turn off the heaters during the night</td>
<td>94%</td>
<td>97%</td>
<td>0.31</td>
</tr>
<tr>
<td>I agree to install metal hoses</td>
<td>79%</td>
<td>92%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>I agree to open two windows when the heaters are on</td>
<td>95%</td>
<td>98%</td>
<td>0.25</td>
</tr>
<tr>
<td>I would change to a heater with sensor</td>
<td>73%</td>
<td>89%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>CO can cause headaches</td>
<td>90%</td>
<td>99%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>CO can cause nausea</td>
<td>72%</td>
<td>94%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>CO can cause dismay</td>
<td>78%</td>
<td>92%</td>
<td>&lt;.01 *</td>
</tr>
<tr>
<td>CO can cause poison</td>
<td>85%</td>
<td>95%</td>
<td>0.018*</td>
</tr>
<tr>
<td>CO can cause death</td>
<td>98%</td>
<td>99%</td>
<td>0.56</td>
</tr>
</tbody>
</table>

N=100 for all questions. *p-value of 0.05 or less
Figure 2. Survey respondents’ exposure to risk factors (figure by Lindsey Canfield).

Figure 3. Fraction of respondents already practicing safety measure (dark blue) and fraction of remainder expressing willingness to practice (light blue) (figure by Lindsey Canfield).
Figure 4. Fraction of respondents already owning (dark blue), willing to purchase (light blue), or willing to purchase with a payment plan (aqua) (figure by Lindsey Canfield).

Conclusions
The project yielded many important insights into the problem of carbon monoxide poisoning in Ciudad Juárez. The mental models provided insights into the most common misconceptions lay people in Ciudad Juárez have about carbon monoxide from unvented indoor heaters. These elements were addressed in *El Asesino Invisible* using culturally sensitive EE strategies: (a) carbon monoxide is odorless, (b) the symptoms associated with CO poisoning include feelings of lethargy and headaches, (c) having adequate ventilation minimizes the risk of CO poisoning, and (d) the use of a CO alarm can help people escape exposure to the gas without incident.

Acknowledgements
This work was sponsored by the Paso del Norte Health Foundation through the Center for Border Health Research. Teresa Montoya and Susana Flores were supported by an EPA research fellowship. The assistance of Efrén Matamoros Barraza, and Comandante Guadalupe Sandoval of Protección Civil/Bomberos, and César Alberto Rodríguez of SMART is gratefully acknowledged.
References


Appendix 1. Data collection instruments (originals in Spanish)

**Expert Interview Questions**

1. What is carbon monoxide?

2. Where does it come from? How does it accumulate? (Sources)

3. What are the symptoms of a carbon monoxide inhalation?

4. What are the consequences of inhaling carbon monoxide for a short term?

5. for a long term?

6. What should someone do if there is a suspicion of carbon monoxide inhalation?

7. If there is a CO poisoning case in El Paso, who gets called in? How do they take care of it? Do they give to the victims any information; do any follow up, etc.?

8. Do you feel carbon monoxide poisoning is a serious problem in the community?

9. What are some safe options that people have to stay warm in the winter and at the same time reduce their risk of CO poisoning?

10. What are some safety guidelines that you can give to reduce the risk of CO poisoning for example, with regards to heater usage, household ventilation, etc.?

11. Do firefighters or some other organism here in El Paso conduct any education campaigns with regards to CO awareness?

12. Any other comment you would like to add in regards to the subject…
Lay people’s interview questions

1) Heater usage
   a) How do you stay warm in the winter?
   b) If you use a heater, what kind of heater?
   c) On a daily basis, how many times or for how long is the heater used in a typical winter day?
   d) Who is typically at home when the heater is operated?
   e) When do you use your heater more? (Day or night? Weeknights of weekends?)
   f) Do you use your heater at night, for how long?
   g) If you leave it on overnight, under what conditions (Meaning, do you stay up? Leave a window open, etc.)?
   h) Do you know of any problems with using a heater?
   i) Have you experienced anything dangerous when using your heater (Meaning small fires, etc.)?
   j) Have you ever felt nauseous or ill after using your heater?

2) Carbon monoxide knowledge
   a) What comes to your mind when I mention carbon monoxide?
   b) Can you tell me where CO comes from?
   c) What can CO do to you?
   d) How can you detect the presence of CO?
   e) Tell me some of your feelings about the risk of CO poisoning. Do you feel this might be a serious problem in your community? Neighborhood? Why? What can be done? What can you do?
   f) Do you know anyone who has had CO poisoning?
   g) Have you ever had a problem with CO poisoning in your home or know of someone who has/ if yes, what did you or that person experience? What did that person do to return to good health? How long did it take this person to recover?

3) Behavioral Factors
   a) Do you know what people can do to avoid exposure to carbon monoxide
   b) Would having a layaway plan or being able to borrow money make you more likely to buy an alarm or a new heater? Which would you prefer (layaway or borrowing)? What payment plan would work for you (weekly, monthly)? What payment amount would work for you (amount of money per payment)?

4) Finally, we would like to ask, when it comes to problems in the neighborhood or your community, please give the name of the person you would most likely talk to in order to solve that problem. Is there anyone you ask for help with these issues at work? Schools? The Church? Social service agency? (Solicit BOTH specific names as well as occupations or trades)

5) Is there anything else you want to add that I have not asked about?
Structured Interviews

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ID Number
Interviewer initials
Date: (Day/ month/ year)

1. How do you keep your house warm during the winter season?

   Nothing............................... 0
   Heater................................... 1
   Central Heating.................... 2
   Stove.................................... 3
   Blankets............................... 4
   Other..................................... 5 Specify: ____________________

Questions #2-10 are only for those people who use a heater

2. What type of heater do you use?

   Gas....................................... 1
   Wood.................................... 2
   Electric................................. 3
   Other.................................... 4 Specify: ____________________

3. If you use gas heater, does it have radiants?

   No......................................... 0
   Yes....................................... 1 Number of radiants: ____________

4. What is the brand of your heater?

   Don’t remember................... 0
   Sol........................................ 1
   Solmatic................................ 2
   Cosmo.................................. 3
   DeLonghi.............................. 4
   Calorex................................ 5
   Laminox............................... 6
   Magic Heat........................... 7
   Other.................................... 8 Specify: ____________________

5. What is the model of your heater?

   Model: ___________________ Don’t remember...................... 0
6. Does your heater have an oxygen depletion sensor?

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<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
<tr>
<td>Don't remember</td>
<td>2</td>
</tr>
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7. How long have you had your heater for?

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<tr>
<td>_______ years</td>
<td>_______ months</td>
<td>Don't remember</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

8. Who is at home while the heater is on?

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</thead>
<tbody>
<tr>
<td>Nobody</td>
<td>0</td>
</tr>
<tr>
<td>Adults and children</td>
<td>1</td>
</tr>
<tr>
<td>Adults only</td>
<td>2</td>
</tr>
<tr>
<td>Children only</td>
<td>3</td>
</tr>
</tbody>
</table>

9. Do you know if there is any kind of problems because of the use of heaters?

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<tbody>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Yes</td>
<td>1</td>
</tr>
</tbody>
</table>

10. What comes to your mind when I mention “carbon monoxide”?

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nothing</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dust</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoke</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poison</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intoxication</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>7</td>
<td>Specify: ____________________________</td>
<td></td>
</tr>
</tbody>
</table>

11. Can carbon monoxide come from.....?

<table>
<thead>
<tr>
<th>Type</th>
<th>No</th>
<th>Yes</th>
<th>Don't know</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Dust</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Smoke</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c. Natural Gas</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d. Gas LP</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e. Electric heaters</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f. Gas heaters</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>g. Wood heaters</td>
<td>No</td>
<td></td>
<td></td>
</tr>
<tr>
<td>h. Stove</td>
<td>No</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
12. Can carbon monoxide make you/cause.....?

   a. Sleepy  
   No.....0  Yes.....1  Don't know.....3  
   b. Headache 
   No.....0  Yes.....1  Don't know.....3  
   c. Nausea 
   No.....0  Yes.....1  Don't know.....3  
   d. Faint 
   No.....0  Yes.....1  Don't know.....3  
   e. Convulsions 
   No.....0  Yes.....1  Don't know.....3  
   f. Poisoning 
   No.....0  Yes.....1  Don't know.....3  
   g. Death 
   No.....0  Yes.....1  Don't know.....3  

13. Can you detect the presence of carbon monoxide with.....?

   a. Odor 
   No.....0  Yes.....1  Don't know.....3  
   b. Alarm 
   No.....0  Yes.....1  Don't know.....3  
   c. Smoke 
   No.....0  Yes.....1  Don't know.....3  

14. Do you know someone who has been intoxicated by carbon monoxide?

   No................................. 0  
   Yes................................. 1  

15. Have you ever had any problems caused by carbon monoxide?

   No................................. 0  
   Yes................................. 1  

Describe the impact of that experience in your lifestyle

________________________________________________________________________
________________________________________________________________________

16. On a scale of 1-5, with 1 representing “not serious” and 5 “very serious,” how serious do you think the problem due to carbon monoxide intoxications is in the community?

   Not serious  A little serious  More or less serious  Serious  Very serious  
   1  2  3  4  5  6  

17. If you have problems with carbon monoxide, who would you go to or what organization would you chose to solve this problem?

   Don’t know............................. 0  
   Relative............................... 1  
   Neighbor............................... 2  
   Friend................................. 3  
   Fire Department..................... 4  
   Red Cross.............................. 5  
   Other................................. 6  Specify: ____________________________________
Safety measures

18. During winter time, do you usually make use of blankets and clothing to stay warm instead of using a heater or central heating system?

No......................................... 0
Yes........................................ 1
Other..................................... 2

18a. On a scale from 1-5, tell me how willing would you be to replace the use of a heater with the use of blankets and coats only in order to stay warm

Not willing Somewhat willing Maybe Willing Strongly Willing
1 2 3 4 5

19. Do you usually open a window when the heater is on?

No......................................... 0
Yes........................................ 1
Other..................................... 2

19a. On a scale from 1-5, tell me how willing would you be to open a window when your heater is on

Not willing Somewhat willing Maybe Willing Strongly Willing
1 2 3 4 5

20. Do you usually turn off your heater when you go to sleep?

No......................................... 0
Yes........................................ 1
Other..................................... 2

20a. On a scale from 1-5, tell me how willing you are to turn off the heater just before going to sleep

Not willing Somewhat willing Maybe Willing Strongly Willing
1 2 3 4 5

21. Do you usually check the color of the flame in your heater?

No......................................... 0
Yes........................................ 1
Other..................................... 2

21a. On a scale from 1-5, tell me how willing would you be to check the color of the flame in the heater

Not willing Somewhat willing Maybe Willing Strongly Willing
1 2 3 4 5

22. Do you usually have a technician check your heater before the start of the winter season?

No......................................... 0
Yes........................................ 1
Other..................................... 2
22a. On a scale from 1-5, how willing would you be of calling a technician to check your heater at the beginning of the winter season

<table>
<thead>
<tr>
<th>Not willing</th>
<th>Somewhat willing</th>
<th>Maybe</th>
<th>Willing</th>
<th>Strongly Willing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

23. Have you ever used the stove to heat your home?

- No........................................ 0
- Yes....................................... 1
- Other.................................... 2

24. Have you ever used braseros to heat your home?

- No........................................ 0
- Yes....................................... 1
- Other.................................... 2

25. When you find any problem in your neighborhood or community, related to safety or environmental issues, what federal/local agency would you go to in order to solve this problem?

- Don't know........................... 0
- Protección Civil.................... 1
- Fire Department.................... 2
- Red Cross............................. 3
- Police.................................... 4
- Other..................................... 5 Specify: _________________________

26. Do you have a carbon monoxide alarm installed in your home?

- No........................................ 0
- Yes....................................... 1
- Other.................................... 2

**As researchers in this project, we are not interested in selling heaters or carbon monoxide alarms, but we would like to now your opinion on the price of these products...**

27. How much do you think a carbon monoxide alarm costs?

- 0-100 pesos......................... 1
- 101-200 pesos....................... 2
- 201-300 pesos....................... 3
- 301 or more pesos............... 4

28. If the price of a carbon monoxide alarm is $200 pesos, would you be willing to buy one?

- No........................................ 0 → How about in payments? No.............0
- Yes....................................... 1

29. Could you give me an amount representing what you think it costs to use and maintain a carbon monoxide alarm?

- Don't know........................... 0
30. On a scale from 1-5, with 1 representing “no help” and 5 representing “very helpful,” how much do you think a carbon monoxide alarm would help you in protecting your family?

<table>
<thead>
<tr>
<th>No help</th>
<th>Little help</th>
<th>Somewhat helpful</th>
<th>Helpful</th>
<th>Very helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

31. Do you know how to use a carbon monoxide alarm?

No......................................... 0 → Would you like to learn how to use one? No....0 Yes...1
Yes........................................ 1 → What has been your experience is using a CO alarm?

- Easy to use......................... 1
- Complicated....................... 2
- Other................................. 3
  Specify: ___________________________________________________________________________

32. Do you know someone who has and uses a carbon monoxide alarm?

No......................................... 0
Yes....................................... 1

33. What do you think of the people that use a carbon monoxide alarm in their home?
_________________________________________________________________________________
_________________________________________________________________________________

34. What do you think of the people that do not use a carbon monoxide alarm in their home?
_________________________________________________________________________________
_________________________________________________________________________________

35. How much do you think a heater with an oxygen depletion sensor costs?

| 0-100 pesos....................... 1 |
| 101-200 pesos.................... 2 |
| 201-300 pesos.................... 3 |
| 301 or more pesos............. 4 |

36. If the cost of a heater with an oxygen depletion sensor is $1000, would you be willing to buy it?

No......................................... 0 → How about in payments? No............0 Yes...........1
Yes........................................ 1

37. Could you give me an amount representing what you think it costs to use and maintain a heater with an oxygen depletion sensor?

Don’t know................................ 0
1-25 pesos............................. 1
26-50 pesos........................... 2
51 or more pesos.................... 3
38. On a scale from 1-5, with 1 representing “no help” and 5 “very helpful,” how much do you think a carbon monoxide alarm would help you in protecting your family?

<table>
<thead>
<tr>
<th>No help</th>
<th>Little help</th>
<th>Somewhat helpful</th>
<th>Helpful</th>
<th>Very helpful</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

39. Do you know how to use a heater with an oxygen depletion sensor?

| No……………………………………… 0 → Would you like to learn how to use one? No….0 Yes...1
Yes…………………………………… 1 → What has been your experience is using a CO alarm?
Easy to use……………………….. 1
Complicated……………………….. 2
Other………………………………… 3

Specify: __________________________

40. Do you know someone who uses a heater with an oxygen depletion sensor?

| No……………………………………… 0
Yes…………………………………… 1

41. What do you think of the people that use a heater with an oxygen depletion sensor?

____________________________________________________________________________________

42. What do you think of the people that do not use a carbon monoxide alarm in their home?

____________________________________________________________________________________

43. Is there something you would like to add?

____________________________________________________________________________________

The following questions are for statistical analysis only; remember that all the information provided by you will be kept confidential

44. Colonia: ______________________________

45. Age: ________

46. Gender:
   F…………………….1
   M…………………… 2

47. Studies level:
   Elementary…………. 1
   Middle School………. 2
   High School………… 3
   College……………… 4
   Other: __________________

48. Occupation (Specify career and/or workplace): ______________________________
49. Birth place: __________________________________________________________

50. For how long have you lived in Juárez? ________________________________

51. Your house is:

   Self-constructed............ 1
   Infonavit........................ 2
   Other............................ 3 Specify: ____________________________

   THANK YOU!
Pre/Post reading the comic book questionnaire

Número de Identificación: ______

Iniciales del Entrevistador ______
Fecha (Día/Mes/Año) ______

Cuestionario 1- Antes

Evaluación de conocimientos

1. ¿Qué es el monóxido de carbono?
   Polvo................................. 1
   Humo................................. 2
   Gas...................................... 3
   Otro................................. 4 Especifique: __________________________
   No se................................. 0

2. ¿Cuándo aparece o se genera el monóxido de carbono?
   Cuando algo se quema.............. 1
   Otro................................... 2 Especifique: __________________________
   No se................................. 0

3. ¿Me podría decir de cuales aparatos se puede generar/soltar el monóxido de carbono?
   Calentones de gas................... 1
   Calentones de leña................. 2
   Calentones eléctricos.............. 3
   Calefacción........................... 4
   Estufa de gas........................ 5
   Estufa de leña....................... 6
   Estufa eléctrica..................... 7
   Asador................................. 8
   Otro................................. 9 Especifique: __________________________
   No se................................. 0
4. ¿De qué manera se puede detectar el monóxido de carbono?

- Alarma de humo........................................... 1
- Alarma de monóxido de carbono................. 2
- Olor............................................................... 3
- Otro............................................................... 4
- No se............................................................. 0

Especifique: ________________

5. En escala del 1-3, con 1 representando “no me ayudaría” y 3 representando “si me ayudaría”, ¿qué tanto cree usted que una alarma de monóxido de carbono le ayudaría a proteger a su familia?

- No me ayudaría............. 1
- Tal vez......................... 2
- Si me ayudaría............... 3
- No se............................. 0

6. ¿Sabe usar una alarma de monóxido de carbono?

- No......................................... 0
- Si.......................................... 1

7. ¿Cuánto cree que cueste una alarma para detectar el monóxido de carbono?

- 0-100 pesos......................... 1
- 101-200 pesos...................... 2
- 201-300 pesos...................... 3
- 301 o más pesos................... 4
- Otro....................................... 5
- No Se..................................... 0

Especifique: ________________

8. ¿En qué lugar puede adquirir/comprar las alarmas de monóxido de carbono?

- Supermercado................................. 1
- Ferreterías (e.g. Home Depot)............. 2
- Otro...................................................... 3
- No se............................................... 0

Especifique: ________________
9. En escala del 1-3, con 1 representando “no me ayudaría” y 3 representando “si me ayudaría”, ¿qué tanto cree usted que un calentón con sensor de oxígeno le ayudaría a proteger a su familia?

No me ayudaría..................... 1  
Tal vez................................. 2  
Si me ayudaría...................... 3  
No se..................................... 0

10. En escala del 1-3, con 1 representando “no estaría dispuesto” y 3 representando “si estoy dispuesto”, ¿qué tan dispuesto está usted a instalar una alarma de monóxido de carbono?

No estoy dispuesto.............. 1  
Tal vez................................. 2  
Si estoy dispuesto............... 3  
No aplica............................. 0

11. En escala del 1-3, con 1 representando “no estaría dispuesto” y 3 representando “si estoy dispuesto”, ¿qué tan dispuesto está usted a apagar su calentón antes de irse a dormir?

No estoy dispuesto.............. 1  
Tal vez................................. 2  
Si estoy dispuesto............... 3  
No aplica............................. 0

12. En escala del 1-3, con 1 representando “no estaría dispuesto” y 3 representando “si estoy dispuesto”, ¿qué tan dispuesto está usted a utilizar mangueras de metal?

No estoy dispuesto.............. 1  
Tal vez................................. 2  
Si estoy dispuesto............... 3  
No aplica............................. 0

13. En escala del 1-3, con 1 representando “no estaría dispuesto” y 3 representando “si estoy dispuesto”, ¿qué tan dispuesto está usted a abrir 2 ventanas cuando los calentones están prendidos?

No estoy dispuesto.............. 1  
Tal vez................................. 2  
Si estoy dispuesto............... 3  
No aplica............................. 0
14. En escala del 1-3, con 1 representando “no estaría dispuesto” y 3 representando “si estoy dispuesto”, ¿qué tan dispuesto está usted a cambiar su calentón por uno que tenga un sensor de oxígeno?

No estoy dispuesto............... 1  
Tal vez.......................... 2  
Si estoy dispuesto............... 3  
No aplica.......................... 0  

15. ¿Puede el monóxido de carbono causar....? (Mencionar opciones)

   a. Sueño           No.....0     Si.....1     No sabe.....3  
   b. Dolor de cabeza No.....0     Si.....1     No sabe.....3  
   c. Náusea          No.....0     Si.....1     No sabe.....3  
   d. Desmayo         No.....0     Si.....1     No sabe.....3  
   e. Convulsiones    No.....0     Si.....1     No sabe.....3  
   f. Envenenamiento  No.....0     Si.....1     No sabe.....3  
   g. Muerte          No.....0     Si.....1     No sabe.....3  

Número de Identificación:______

Cuestionario 1- Después

Evaluación de conocimientos

1. ¿Qué es el monóxido de carbono?

<table>
<thead>
<tr>
<th>Opción</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polvo</td>
<td>1</td>
</tr>
<tr>
<td>Humo</td>
<td>2</td>
</tr>
<tr>
<td>Gas</td>
<td>3</td>
</tr>
<tr>
<td>Otro</td>
<td>4</td>
</tr>
</tbody>
</table>

Especifique: __________________________

2. ¿Cuándo aparece o se genera el monóxido de carbono?

<table>
<thead>
<tr>
<th>Opción</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuando algo se quema</td>
<td>1</td>
</tr>
<tr>
<td>Otro</td>
<td>2</td>
</tr>
</tbody>
</table>

Especifique: __________________________

3. ¿Me podría decir de cuales aparatos se puede generar/soltar el monóxido de carbono?

<table>
<thead>
<tr>
<th>Aparato</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calentones de gas</td>
<td>1</td>
</tr>
<tr>
<td>Calentones de leña</td>
<td>2</td>
</tr>
<tr>
<td>Calentones eléctricos</td>
<td>3</td>
</tr>
<tr>
<td>Calefacción</td>
<td>4</td>
</tr>
<tr>
<td>Estufa de gas</td>
<td>5</td>
</tr>
<tr>
<td>Estufa de leña</td>
<td>6</td>
</tr>
<tr>
<td>Estufa eléctrica</td>
<td>7</td>
</tr>
<tr>
<td>Asador</td>
<td>8</td>
</tr>
<tr>
<td>Otro</td>
<td>9</td>
</tr>
</tbody>
</table>

Especifique: __________________________

4. ¿De qué manera se puede detectar el monóxido de carbono?

<table>
<thead>
<tr>
<th>Método</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarma de humo</td>
<td>1</td>
</tr>
<tr>
<td>Alarma de monóxido de carbono</td>
<td>2</td>
</tr>
<tr>
<td>Olor</td>
<td>3</td>
</tr>
<tr>
<td>Otro</td>
<td>4</td>
</tr>
</tbody>
</table>

Especifique: __________________________
5. En escala del 1-3, con 1 representando “no me ayudaría” y 3 representando “si me ayudaría”, ¿qué tanto cree usted que una alarma de monóxido de carbono le ayudaría a proteger a su familia?

<table>
<thead>
<tr>
<th>Respuesta</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>No me ayudaría</td>
<td>1</td>
</tr>
<tr>
<td>Tal vez</td>
<td>2</td>
</tr>
<tr>
<td>Si me ayudaría</td>
<td>3</td>
</tr>
<tr>
<td>No se</td>
<td>0</td>
</tr>
</tbody>
</table>

6. ¿Sabe usar una alarma de monóxido de carbono?

<table>
<thead>
<tr>
<th>Respuesta</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>0</td>
</tr>
<tr>
<td>Si</td>
<td>1</td>
</tr>
</tbody>
</table>

7. ¿Cuánto cree que cueste una alarma para detectar el monóxido de carbono?

<table>
<thead>
<tr>
<th>Precio</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-100 pesos</td>
<td>1</td>
</tr>
<tr>
<td>101-200 pesos</td>
<td>2</td>
</tr>
<tr>
<td>201-300 pesos</td>
<td>3</td>
</tr>
<tr>
<td>301 o más pesos</td>
<td>4</td>
</tr>
<tr>
<td>Otro</td>
<td>5</td>
</tr>
<tr>
<td>Especifique: ___________</td>
<td></td>
</tr>
<tr>
<td>No Se</td>
<td>0</td>
</tr>
</tbody>
</table>

8. ¿En qué lugar puede adquirir/comprar las alarmas de monóxido de carbono?

<table>
<thead>
<tr>
<th>Lugar</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supermercado</td>
<td>1</td>
</tr>
<tr>
<td>Ferreterías (e.g. Home Depot)</td>
<td>2</td>
</tr>
<tr>
<td>Otro</td>
<td>3</td>
</tr>
<tr>
<td>Especifique: _______________</td>
<td></td>
</tr>
<tr>
<td>No se</td>
<td>0</td>
</tr>
</tbody>
</table>

9. En escala del 1-3, con 1 representando “no me ayudaría” y 3 representando “si me ayudaría”, ¿qué tanto cree usted que un calentón con sensor de oxígeno le ayudaría a proteger a su familia?

<table>
<thead>
<tr>
<th>Respuesta</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>No me ayudaría</td>
<td>1</td>
</tr>
<tr>
<td>Tal vez</td>
<td>2</td>
</tr>
<tr>
<td>Si me ayudaría</td>
<td>3</td>
</tr>
<tr>
<td>No se</td>
<td>0</td>
</tr>
</tbody>
</table>
10. En escala del 1-3, con 1 representando “no estaría dispuesto” y 3 representando “si estoy dispuesto”, ¿qué tan dispuesto está usted a instalar una alarma de monóxido de carbono?

<table>
<thead>
<tr>
<th>Opción</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>No estoy dispuesto..........</td>
<td>1</td>
</tr>
<tr>
<td>Tal vez</td>
<td>2</td>
</tr>
<tr>
<td>Si estoy dispuesto..........</td>
<td>3</td>
</tr>
<tr>
<td>No aplica</td>
<td>0</td>
</tr>
</tbody>
</table>

11. En escala del 1-3, con 1 representando “no estaría dispuesto” y 3 representando “si estoy dispuesto”, ¿qué tan dispuesto está usted a apagar su calentón antes de irse a dormir?

<table>
<thead>
<tr>
<th>Opción</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>No estoy dispuesto..........</td>
<td>1</td>
</tr>
<tr>
<td>Tal vez</td>
<td>2</td>
</tr>
<tr>
<td>Si estoy dispuesto..........</td>
<td>3</td>
</tr>
<tr>
<td>No aplica</td>
<td>0</td>
</tr>
</tbody>
</table>

12. En escala del 1-3, con 1 representando “no estaría dispuesto” y 3 representando “si estoy dispuesto”, ¿qué tan dispuesto está usted a utilizar mangueras de metal?

<table>
<thead>
<tr>
<th>Opción</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>No estoy dispuesto..........</td>
<td>1</td>
</tr>
<tr>
<td>Tal vez</td>
<td>2</td>
</tr>
<tr>
<td>Si estoy dispuesto..........</td>
<td>3</td>
</tr>
<tr>
<td>No aplica</td>
<td>0</td>
</tr>
</tbody>
</table>

13. En escala del 1-3, con 1 representando “no estaría dispuesto” y 3 representando “si estoy dispuesto”, ¿qué tan dispuesto está usted a abrir 2 ventanas cuando los calentones están prendidos?

<table>
<thead>
<tr>
<th>Opción</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>No estoy dispuesto..........</td>
<td>1</td>
</tr>
<tr>
<td>Tal vez</td>
<td>2</td>
</tr>
<tr>
<td>Si estoy dispuesto..........</td>
<td>3</td>
</tr>
<tr>
<td>No aplica</td>
<td>0</td>
</tr>
</tbody>
</table>

14. En escala del 1-3, con 1 representando “no estaría dispuesto” y 3 representando “si estoy dispuesto”, ¿qué tan dispuesto está usted a cambiar su calentón por uno que tenga un sensor de oxígeno?

<table>
<thead>
<tr>
<th>Opción</th>
<th>Puntuación</th>
</tr>
</thead>
<tbody>
<tr>
<td>No estoy dispuesto..........</td>
<td>1</td>
</tr>
<tr>
<td>Tal vez</td>
<td>2</td>
</tr>
<tr>
<td>Si estoy dispuesto..........</td>
<td>3</td>
</tr>
<tr>
<td>No aplica</td>
<td>0</td>
</tr>
</tbody>
</table>
15. ¿Puede el monóxido de carbono causar....? (Mencionar opciones)

   a. Sueño                   No.....0  Si.....1  No sabe.....3
   b. Dolor de cabeza        No.....0  Si.....1  No sabe.....3
   c. Náusea                 No.....0  Si.... 1  No sabe.....3
   d. Desmayo                No.....0  Si.... 1  No sabe.....3
   e. Convulsiones           No.....0  Si.... 1  No sabe.....3
   f. Envenenamiento         No.....0  Si.... 1  No sabe.....3
   g. Muerte                 No.....0  Si.... 1  No sabe.....3

Cuestionario 2

Evaluación sobre el formato

16. El librito cómico ¿le pareció fácil de leer?

   No......................................... 0
   Si.......................................... 1

17. La historia le pareció, (dar opciones)

   Muy corta......................... 0
   Adecuada............................ 2
   Muy larga............................ 1

18. Los personajes de la historia, ¿le parecieron reales?

   No......................................... 0
   Si.......................................... 1

19. Las situaciones de la historia, ¿le parecieron reales?

   No......................................... 0
   Si.......................................... 1

20. La información que se da en el la historia le pareció (mencionar opciones)

   Muy fácil de entender........... 0
   Bien..................................... 1
   Muy difícil de entender......... 2
21. La información que se da en el la historia (mencionar opciones)

No la sabía......................... 0
Ya la sabía......................... 1

22. ¿Cuánto siente que aprendió después de leer la historia? (mencionar opciones)

Muy poco.............................. 0
Más o menos.......................... 1
Mucho............................ 2

Evaluación sobre el contenido

23. De las recomendaciones que se dan en la última página, ¿cuáles son las que ya practica? (Encerrar el número de la recomendación)

Ninguna........................................................ 0
Instale una alarma para detectar el monóxido de carbono............................ 1
Use calentones en buenas condiciones con mangueras de metal y cheque la flama.......................................................... 2
Abra 2 ventanas unos 3 cm. siempre que los calentones estén encendidos......... 3
Apague todos los calentones antes de irse a dormir............................................ 4
Si es posible, cambie sus calentones por los nuevos modelos que tienen sensor de oxígeno.................................................... 5

24. De las recomendaciones que se dan en la última página, ¿cuáles son las que no conocía y piensa seguir después de leer la historieta? (Encerrar el número de la recomendación)

Ninguna........................................................ 0
Instale una alarma para detectar el monóxido de carbono............................ 1
Use calentones en buenas condiciones con mangueras de metal y cheque la flama.......................................................... 2
Abra 2 ventanas unos 3 cm. siempre que los calentones estén encendidos......... 3
Apague todos los calentones antes de irse a dormir............................................ 4
Si es posible, cambie sus calentones por los nuevos modelos que tienen sensor de oxígeno................................. 5

25. De las recomendaciones que se dan en la última página, ¿cuáles son las que no piensa adoptar/seguir? (Encerrar el número de la recomendación)

Instale una alarma para detectar el monóxido de carbono................................. 1
Use calentones en buenas condiciones con mangueras de metal y cheque la flama................................................................. 2
Abra 2 ventanas unos 3 cm. siempre que los calentones estén encendidos......... 3
Apague todos los calentones antes de irse a dormir........................................ 4
Si es posible, cambie sus calentones por los nuevos modelos que tienen sensor de oxígeno.................................................. 5

26. ¿Cuál fue el mensaje que se le quedó más grabado después de leer la historieta?

_____________________________________________________________________

_____________________________________________________________________

Las siguientes preguntas son para análisis estadístico únicamente, recuerde que toda la información que nos proporcione se mantiene completamente confidencial.

27. Colonia: ____________________________________________________________

28. Edad: _______________

29. Sexo:
   F. .................1
   M. .................2

30. Grado de escolaridad alcanzado: ________________________________

31. Ocupación (Especifique profesión y/o lugar de trabajo):
32. Lugar de origen:

33. ¿Cuánto tiempo tiene viviendo en Juárez?

¡Muchas gracias!
Appendix 2. Mental model

Mental Model: Indoor Carbon monoxide exposure

Formation of CO

- Gasoline
- Kerosene
- Wood
- Gas LP
  - Butane gas
  - Natural gas

Interacts with heater type

When carbon in fuel is not burned completely

Sources of CO

- CO Indoor emissions
- Wood/charcoal burning
- Braceros
- Grills
- Unvented space heaters
- Gas heater
- Wood heater
- Other gas appliances
- Gas dryer
- Furnaces
- Stoves

CO in the human body

- Total CO in living area
- CO is inhaled
- Combines with hemoglobin in blood forming COHb
- Disrupts the flow of oxygen

Exposure to CO

Symptoms for CO Poisoning

- Mild exposure
  - Headache
  - Nausea
  - Flu-like symptoms

- Moderate exposure
  - Severe throbbing headache
  - Drowsiness
  - Confusion
  - Fast heart rate

- Extreme exposure
  - Convulsions
  - Cardiorespiratory failure
  - Unconsciousness
  - Death

Health Effects

- Poor vision
- Difficulty performing tasks
- Reduced ability to work/learn
- Behavioral impairment

Behavioral Factors

- User behavior
  - Get a heater with an oxygen depletion sensor
  - For gas heaters: make sure the flame is blue
  - Do not use plastic tubing to connect your gas cylinder to the heater
  - Turn off heaters before going to sleep
  - Outdoor temperature

- Product warning labels
  - Level of knowledge of user
  - Media information/warnings

- Sealing house, but do not use heater
- Install a CO alarm
- Have a certified technician check your fuel burning appliances at least once a year

- House safety
  - Do not use the stove for heating
  - Do not use grills, braceros, indoors
  - Keep 2 windows open
  - Make sure fuel-burning appliances are properly vented

- Air exchange rate
  - Do not seal windows/doors

* Yellow boxes identify gaps between expert model and lay people models
Causa el monóxido 167 muertes en 12 años

Pedro Sanchez Briones
EL DIARIO

En los últimos 12 años ha habido 167 muertes y mil 387 intoxicaciones por monóxido de carbono en Ciudad Juárez, revelaron autoridades.

Estas muertes e intoxicaciones son particularmente trágicas, ya que se pueden prevenir, concluyó un grupo de investigadores de varias universidades, que estudiaron el problema.

Tras lo detectado, recomiendan a la comunidad tener una alarma de monóxido de carbono si el ciudadano tiene cualquier aparato que queme combustible como calefones o estufas que usan lucha, gas de tanques, gas natural, o coquección.

Muchas personas pierden accidentalmente que pueden olor a ver el monóxido de carbono.

"La alarma de monóxido de carbono es la única forma de saber si el usted o su familia se están intoxicando con monóxido de carbono", indica un reporte elaborado por Patrick Gourian, profesor de Environmental Engineering Drexel University, Philadelph, así como Frank G. Pérez, de la Universidad de Texas en El Paso y Gilberto Velásquez, de la Universidad Autónoma de Ciudad Juárez.

Los investigadores recomiendan revisar si el calefot tiene un sensor de oxígeno. Si no lo tiene, cambiar el calefot por uno que si lo tenga.

"En nuestros estudios, las casas que usaron el calefot modelo FM210 tuvieron niveles de monóxido de carbono más altos que otras casas", indicaron por medio de un comunicado de prensa.

Agregaron que nunca se pueda un calefot o estufa sin ventilación si se va a dormir o se siente muy cansado. El monóxido de carbono hace que la gente sienta sueño y tal vez nunca despierte.

Explicaron que una alarma de monóxido de carbono cuesta menos de 200 pesos, y es esencial para todos los que tengan cualquier aparato que queme combustible.

En tanto, un calefot con sensor de oxígeno cuesta alrededor de mil 000 pesos.

"Las tres recomendaciones pueden y deben hacerse antes de que llegue la época más fría del invierno. En estas fechas del año en que la gente usa sus ahorros para las compras navideñas, recuerde que el mejor regalo es proteger su salud y la de su familia", concluyeron.

psanchez@diario.com.mx
Appendix 4. UTEP'S NOVA Magazine Spring 2007

Comic book no laughing matter

A group of health and communications researchers from the border area has created a Spanish-language comic book to educate the public about the dangers of carbon monoxide.

"El Asesino Invisible" (The Invisible Assassin) is a 12-page, full-color comic book about a woman who helps a friend learn the importance of buying and using a carbon monoxide detector.

Funded by a grant from the Center for Border Health Research of the Paso del Norte Health Foundation, the comic book is being distributed free in Ciudad Juárez, Mexico. In the past 12 years, 167 Juarense have been killed by carbon monoxide poisoning. More than 1,350 have become ill, researchers say.

Frank G. Pérez, an assistant professor of communication and Chicano Studies at UTEP, led a team of researchers on the project, which also studied area residents' knowledge of carbon monoxide safety.
Attachment 1. Comic Book