

Improving Air Pollution Education Confidence
Levels in Health Care Personnel Who Care For
Americans Living in Mexico City: A Practice
Improvement Project.



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Sarajevo, Bosnia



Sarajevo's air pollution problem



- ☞ Sits in a valley surrounded by mountains.
- ☞ Cold winters.
- ☞ Ukraine gas crisis in 2009 increased the use of coal and wood for heat.

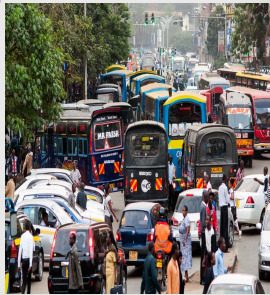


Nairobi, Kenya



Nairobi's air pollution problem

- ☞ Dense population (over 3.5 million/ 6.5 including suburbs).
- ☞ No real oversight in emissions.
- ☞ Extreme poverty.



Nairobi Slums



Peshawar, Pakistan



Peshawar's air pollution problem

- ☞ Heavy, hectic traffic.
- ☞ Vehicles are generally older with poor emissions.
- ☞ Waste burning.
- ☞ Explosions/fires?
- ☞ Dirty.

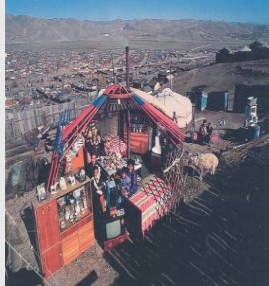


Ulaanbaatar, Mongolia



Ulaanbaatar's air pollution problem

- ☞ Coal is the major source of heat, especially in the ger communities.
- ☞ Extremely long and cold winters -25 to -45.
- ☞ Heavy traffic with many older vehicles.



Mongolians in landfill



Background

- ☞ It is estimated by the WHO that 1 out of every 8 deaths is attributed to dirty air (2014).
- ☞ WHO states air pollution accounts for 40% of heart disease, 40% strokes, 11 % of COPD, and 3% of acute lower respiratory infections in children (2014).



☞ Air pollution can contain ground level ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, lead, and *particulate matter* (www.epa.gov, 2018).

What is particulate matter?

☞ Particulate matter can be classified as coarse or fine. Sources of **coarse dust particles (PM_{10})** include crushing or grinding operations and dust stirred up by vehicles on roads (www.airnow.gov, 2018).

☞ **Fine particles ($PM_{2.5}$)** can only be seen with an electron microscope. Fine particles are produced from all types of combustion, including motor vehicles, power plants, residential wood burning, forest fires, agricultural burning, and some industrial processes (www.airnow.gov, 2018).

Why is PM 2.5 harmful?



PM 2.5 passes through the filtration of the nose hair and is capable of carrying toxins that can reach the end of the respiratory tract with airflow and accumulate there damaging other parts of the body through air exchange in the lungs (Xing, Xu, Shi, & Lian, 2016).

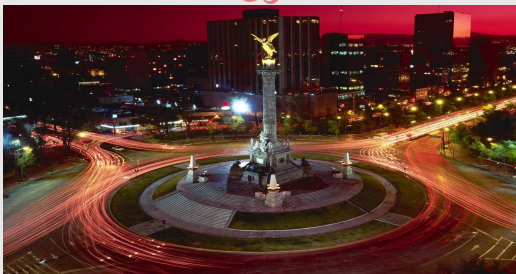
Research Findings

- ☞ In 1977, UCLA found a link between low birth weight and air pollution.
- ☞ In 1992, the Children's Health Study found reduced lung function and increased cough and bronchitis in young children and teens chronically exposed to high levels of air pollution.
- ☞ In 2013, the MESA study suggested higher long-term PM 2.5 concentrations were associated with increased intima-medial thickness and that greater reductions of PM 2.5 were related to lower intima-medial thickness.
- ☞ In 2014, Wilker et al. linked long-term exposure to ambient air pollution to structural changes in the brain.

Air Pollution is Harmful



Mexico City-The Local Problem



Mexico City Air Pollution

- ☞ In the 1990's the United Nations declared Mexico City as one of the world's most polluted cities (Izquierdo, 2016).
- ☞ Since that time various programs were implemented to reduce harmful emissions.
- ☞ These programs resulted in modernizing the use of the public transportation system and encouraging the use of bicycles. With these programs the air pollution problem greatly improved.
- ☞ And then.....the population grew (and grew).

Mexico City Traffic

- ☞ Because Mexico City sits at such a high altitude, the atmospheric oxygen levels caused incomplete fuel combustion in engines leading to higher emissions of harmful particles (Izquierdo, 2016).
- ☞ Further, intense sunlight enhanced the effect of these harmful particles as the smog prevents the sun from heating the atmosphere enough to penetrate the inversion layer, meaning the smog was trapped (Izquierdo, 2016).
- ☞ Vehicle presence increased at a rate of 3.8 percent annually (Izquierdo, 2016).

Intended Improvement

- ☞ Mexico City, as well as other cities in Mexico, battles to control their air pollution problem. Because of the increased news attention, expatriates were becoming increasingly aware of the potential dangers of living in an environment with poor air quality but lacked knowledge on air pollution as a whole.
- ☞ Health care personnel needed to become more knowledgeable about the causes of air pollution, the potential health consequences, and methods to reduce exposure.

Overarching Goal/Study Question



- ☞ The overarching goal of the practice improvement project was to increase air pollution knowledge in health care personnel caring for U.S. citizens living in Mexico City.
- ☞ The project aimed to improve the confidence levels of health care personnel in their ability to provide air pollution education. Doing so should increase the amount of education that is provided and thus better inform Americans in measures to reduce exposure.

Project Outcome Objectives #1 and #2



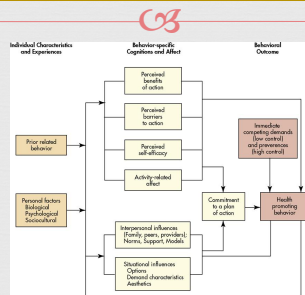
- ☞ 1). Participants would demonstrate a 50% increase in knowledge, from baseline, regarding air pollution causes, health hazards, and methods to reduce exposure after attending the air pollution education program.
- ☞ 2). The participants would report a 50% increase in confidence, from baseline, in the ability to promote behavior change in patients to reduce air pollution exposure after attending the air pollution education program.

Project Objectives #3 and #4



- ☞ 3). At least 75% of the participants will report an increase in the number of patients with whom they discuss air pollution health hazards and methods to reduce exposure during the 60 days after attending the air pollution education program.
- ☞ 4). The participants, led by the PD, will develop a plan a sustain air pollution exposure reduction in their community.

Pender's Health Promotion Model



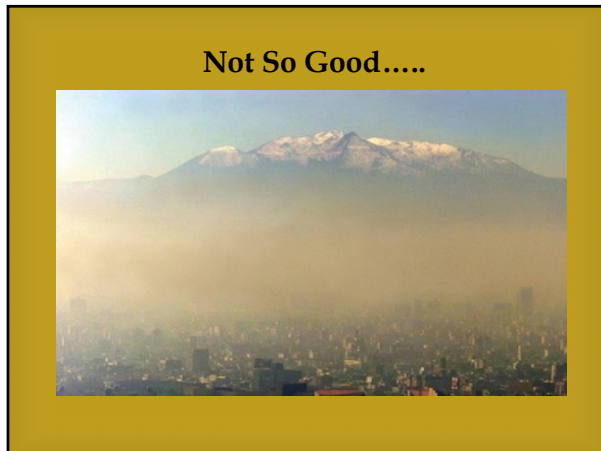
HPM

- ☞ The model can be used to evaluate cognitive-perceptual factors and modifying factors to predict health behaviors and is competence or approach oriented (Pender et al., 2011).
- ☞ The HPM has a sensible design that facilitates identification of characteristics, including previously related behavior and personal factors (biological, psychological, and sociological) that could become barriers to change.
- ☞ The HPM is based on social-cognitive theory and expectancy theory.

Why the HPM is good choice as a framework

- ☞ The HPM provides a structure to tailor interventions based on characteristics unique to that person. Expatriates reside in foreign lands for a variety of reasons, and their barriers to change may be different than the average US citizen.
- ☞ The model has been used in studies outside the United States with success. In Iran, the model was used in a study to predict the quality of life in female students (Mohamadian, Eftekhari, Rahimi, Mohamad, Shojaezade, & Montazeri, 2011). In India, the model was used in a study to assess knowledge levels of mothers regarding the prevention and management of chicken pox (Joseph & Matthew, 2013).





Sample Population

❧

- ❧ The sample population included Mexican and American health care personnel that provide care to U.S. citizens living in Mexico City. N=9. Seventeen were invited to participate.
- ❧ All participants were fluent in English.
- ❧ All participants attended an air pollution education program.
- ❧ Nurses and physicians were invited.

Study Design



☞ The design of the practice improvement project was quasi-experimental, one-group, non-randomized.

Intervention



- ☞ Prior to an air pollution education presentation, all participants were asked to complete an on-line questionnaire. The questionnaire was anonymous with the only identifying factor being, "are you a nurse or physician."
- ☞ The questionnaires were structured using concepts from Pender's Health Promotion Model. Focusing in particular on knowledge and confidence.

Air Pollution Education



- ☞ The participants attended a 1 hour lunch presentation led by the project director.
- ☞ The presentation included a PowerPoint/lecture that covered basic instruction on air pollution, current research regarding negative health outcomes, and an introduction to Pender's Health Promotion Model.
- ☞ Educational tools including brochures, pamphlets, and wallet cards were provided to the participants.
- ☞ Time was granted for questions and further dialogue.

Tools Used



GOOD	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk.
MODERATE	51 to 100	Air quality is okay. Some pollutants may present a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
UNHEALTHY FOR SENSITIVE GROUPS	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely affected.
UNHEALTHY	151 to 200	Everyone may experience health effects and members of sensitive groups may experience more serious health effects.
VERY UNHEALTHY	201 to 300	Health warnings of emergency conditions. The entire population is more likely to be affected.
HAZARDOUS	301 to 500	Health alert: everyone may experience some serious health effects.

RESOURCES TO CHECK
REAL TIME AIR POLLUTION
<http://aqicn.org/city/mexico-city/>
https://airnow.gov/index.cfm?actions=airnow.local_state&stateid=54

Post Presentation



- ☞ One week post education a second questionnaire was sent electronically to the participants.
- ☞ The PD provided ongoing coaching throughout the project period. Research articles concerning air pollution were sent electronically to participants on multiple occasions.
- ☞ A short article regarding air pollution, written by the PD, was placed in the community newsletter.
- ☞ Two bulletin boards were placed outside of the medical office to pique community interest. Daily Air Quality data were posted.

Bulletin Board



Final Survey



- 60 days after the air pollution presentation a final survey was sent to the participants. Of the nine health care personnel that attended the air pollution presentation, eight responded.

Methods of Evaluation



- 3 surveys: pre-education (20 questions), one week post education (21 questions), and sixty days post education (24 questions).
- Surveys were identical with four exceptions. The **one week post-education survey** additionally asked, "did you attend the air pollution presentation?" and "did you complete the pre-education survey." This survey also omitted asking about the frequency of providing air pollution education. The **sixty days post-education survey** also asked about attendance and the pre-education survey. And, in addition, feedback was requested concerning barriers and facilitators in providing air pollution education.
- The survey was anonymous and online using Survey Monkey.

9 Knowledge Focused Items



- Based on content of education session.
- Related to Project Outcome Objective 1.
- Likert scale strongly agree to strongly disagree for half then reversed to strongly disagree to strongly agree.
- Sample question:** I am able to interpret information on current air quality provided in my community.

8 Confidence Focused Items



- ☞ Based on content of education session.
- ☞ Related to Project Outcome Objective 2.
- ☞ Likert scale 0 not confident to 10 very confident.
- ☞ **Sample question:** I am confident in my ability to help my patients identify their own perceived benefits to implementing new health practices regarding protecting themselves and their families from air pollution.

2 Action Items Related to Project Outcome Objective 3 and 4



- ☞ Related to project outcome objective 3 and 4.
- ☞ Question 1). I have made attempts to learn more about air pollution in the last two weeks. 0=Never 1-4 times 5-9 times 10 or more times.
- ☞ Question 2). In the past 60 days, how often have you provided patient education regarding air pollution? 0=Never 1-4 times 5-9 times 10 or more times

☞ Aggregate data were analyzed for this quality improvement project.

Analysis of Evaluation Data



- ☞ Since the surveys were anonymous there was no way to track individual improvement.
- ☞ Because the group was small, the question asking if you were a nurse or a physician now seems unnecessary. Although, one physician did not complete the first survey and one nurse did not complete the last.

Survey Response Breakdown



- ☞ Pre-education survey: 8 participants responded
- ☞ 1st Post-education survey: 9 participants responded
- ☞ 2nd Post-education survey: 8 participants responded.

Methods of Data Analysis



To assess a 50% or greater increase in knowledge or confidence levels the following steps were taken:

For knowledge: SD/D/U responses were grouped together and A/SA responses were grouped together.

Percentages were then calculated to determine what a 50% increase was because the first survey had 8 responses, the second 9, and the last 8.

For the confidence items a range, means, and medians were calculated. The means determined whether or not a 50% increase was obtained.

Results



☞ Of the seven air pollution knowledge questions asked, **four** met the benchmark of a 50% increase in knowledge.

☞ Of the two health promotion knowledge questions, **both** met the benchmark of a 50% increase.

Air Pollution Knowledge: >50% increase seen in....



☞ ability to interpret information on current air quality.

☞ ability to describe the long-term health consequences.

☞ ability to explain to patients methods that can be used to decrease their exposure to air pollution when living in an air-polluted environment.

☞ knowing where to obtain patient/education materials regarding air pollution.

Health Promotion Knowledge: >50% increase seen in...



☞ The ability to describe the difference between having the knowledge/skills needed to perform a behavior and having the self-efficacy to perform the behavior.

☞ The ability to identify interpersonal influences regarding whether or not a patient will engage in health promotion behavior.

Air Pollution Knowledge: < 50% of Participants Had an Increase in These Items

- ☞ Ability to state the major causes of air pollution (starting knowledge was 87.5%).
- ☞ Ability to access information on current air quality in the community (starting knowledge was 62.5%).
- ☞ Ability to describe the short-term health consequences of living in an air-polluted environment (starting knowledge was 62.5%).

Results in Confidence

- ☞ Of the six items directly related to confidence levels, **four** items met the benchmark.
- ☞ Of the two items related to confidence in developing an air pollution education plan for practice and community, **both** met the benchmark.

Confidence:>50 % increase seen in...

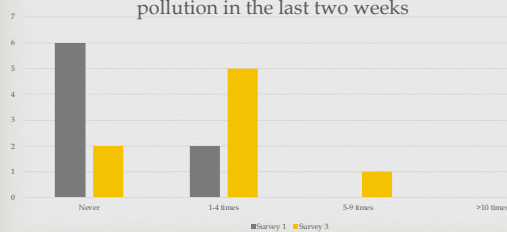
- ☞ ability to help patients identify their own perceived benefits of implementing new health practice regarding protecting themselves and their families from air pollution.
- ☞ ability to address perceived barriers that may prevent my patients from implementing new health practices regarding protecting themselves and their families from air pollution.
- ☞ ability to recognize potential barriers that may prohibit my patients from learning about air pollution.
- ☞ ability to be a role model of behaviors to reduce exposure to air pollution.

Confidence: <50% of Participants had an increase in...

- ☞ The ability to promote a sense of self-efficacy in my patients with regard to protecting themselves and their families from air pollution.
- ☞ The ability to help patients make a commitment to a plan of action to protect themselves.

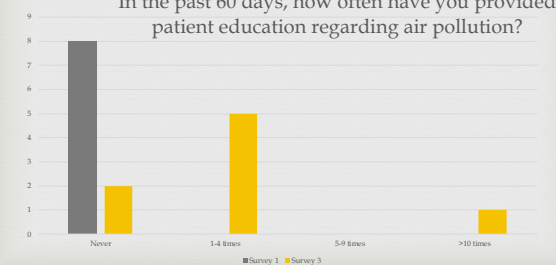
Action Item-Learning

I have made attempts to learn more about air pollution in the last two weeks



Action Item-Providing Patient Education

In the past 60 days, how often have you provided patient education regarding air pollution?



Results-Community Plan



- ☞ Daily air quality data postings outside the medical unit.
- ☞ Newcomers briefing to cover air pollution precautions and methods to reducing exposure.
- ☞ Wallet cards to be passed out to all newcomers.
- ☞ Consider campaign to purchase air quality monitor for their place of employment.

Challenges



- ☞ 9-19-2017 Large earthquake hit Mexico City and many parts, in particular the hospitals, were overwhelmed. May have prevented local participants from attending.
- ☞ Traffic constraints and the 1 hour lunch presentation.
- ☞ Air quality data on and off during during study period.
- ☞ One physician did not take the first survey, one nurse did not take the last.

Limitations



- ☞ Small project. N= 9
- ☞ Known colleagues, several I supervise directly.

Implication for Practice



- ☞ Providing air pollution education, coaching, and reinforcement of the material increased the health providers knowledge level. The methods used can be applied in other health promotion projects.
- ☞ Instruction on Pender's Health Promotion Model provided the health care providers with a simple framework to increase their confidence levels in teaching their patients about air pollution. Pender's Health Promotion Model can be applied to any desired change in health behavior.

Recommendations



- ☞ The project can be adapted to fit any country that grapples with air pollution issues. To truly test the project for statistical significance the sample size would need to be much larger.

Sustaining Change



- ☞ As the PD departs Mexico City this summer it will be difficult to maintain interest unless a champion is established.
- ☞ In addition, the participants leadership will change. If leadership is not supportive of the medical unit's efforts regarding air pollution it may become difficult to continue community education at least on a larger scale.

Conclusions

The health care providers have a self-reported better understanding of air pollution and a method they can utilize to promote the health of their patients. The Air Pollution Project was successful in increasing patient education.



Questions?



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