

Reducing low-income women and children's exposure to environmental tobacco smoke - a pilot project

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Abstract

Smoking rates in the state of Michigan are higher than in the rest of the nation (25.6 percent versus 23.5 percent nationally), and among adults with no more than 12 years of formal education, rates are even higher (30.6 percent). Exposure to environmental tobacco smoke (ETS) in the homes of these smokers could pose a major health problem for non-smokers, particularly children.

In this pilot project we investigated whether an educational intervention would improve knowledge, attitudes, and preventive efforts with respect to exposure to environmental tobacco smoke (ETS) among low-income women who are participants in a Cooperative Extension Family and Consumer Sciences program. The effectiveness of the intervention was assessed through use of a pretest and posttest format. Comparison of pretest and posttest results revealed significant improvement in the women's knowledge, attitudes, and preventive efforts with regard to exposure of themselves and their children to ETS. We were extremely encouraged by the results, which suggest that incorporating ETS education into Cooperative Extension programs can facilitate healthier behaviors and lifestyles for low-income women and their children, thus helping to reduce disease and save lives.

Keywords: environmental tobacco smoke, ETS, smoking, intervention, knowledge, attitudes, preventive efforts

Introduction

Healthy People, Healthy Communities is a national initiative for the Cooperative Extension System. One of the goals of this initiative is to "educate and empower individuals and families to

adopt healthy behaviors and lifestyles." Through this goal, Extension professionals are encouraged to provide salient, research-based health education to clientele.

The Healthy People, Healthy Communities national initiative was particularly relevant to Michigan State University Extension because the rates of smoking in the state of Michigan are higher than in the rest of the nation (25.6 percent versus 23.5 percent nationally), and among adults with no more than 12 years of formal education, rates are even higher (30.6 percent) (Centers for Disease Control 1998). These statistics are alarming, as exposure to environmental tobacco smoke (ETS) in these homes could pose a major health problem for non-smokers, particularly children of smokers.

The United States Environmental Protection Agency (EPA) has concluded that widespread exposure to environmental tobacco smoke (ETS) represents a serious and substantial health risk. Thus, the EPA has classified ETS as a Group A carcinogen, a classification which is reserved for those compounds or mixtures which have been shown to cause cancer in humans (EPA 1993). Based on this information, a decision was made to pilot test a program to encourage parents to reduce their own and their children's exposure to ETS.

In this pilot project we investigated whether an educational intervention would improve knowledge, attitudes, and preventive efforts with respect to exposure to environmental tobacco smoke (ETS) among low-income women who are participants in a Cooperative Extension Family and Consumer Sciences program. The specific aims of the project were

- to assess with a pretest the women's knowledge, attitudes, and preventive efforts regarding exposure to ETS
- to develop and implement an educational health promotion intervention with the intent of improving the women's knowledge base, attitudes, and preventive behaviors regarding exposure to ETS, as well as reducing exposure to ETS for their children
- to assess the effectiveness of the health promotion intervention with a posttest assessment.

A substantial body of epidemiological evidence suggests that long-term exposure to ETS increases the risk for developing various cancers, particularly lung cancer (Zaridze et al. 1998; Fontham et al. 1994; Stockwell et al. 1992; Repace and Lowrey 1987). Miller et al. (1994) found that women smokers died of lung cancer at a rate nine times greater than non-smokers exposed to ETS and 42 times greater than non-smokers not exposed to ETS.

Also associated with exposure to ETS are ischemic heart disease (Steenland et al. 1996; Law, Morris, and Wald 1997), stroke and peripheral vascular disease (National Health and Medical Research Council 1995) as well as respiratory disease (EPA 1993). Glantz and Parmley (1991) assert that exposure to ETS is the third leading cause of premature death and disability in the United States.

The adverse effects of smoking by pregnant women during the course of pregnancy and delivery as well as post natal development have been thoroughly investigated (Johnston 1981; Rantakallio 1978; Naeye and Peters 1984). Smoking during pregnancy not only affects birth weight, but impairs the subsequent growth of these children. In addition, a relationship between smoking by the mother during pregnancy and cancer risk in the offspring has been identified (Stjernfeld et al. 1986), although it has not been clearly differentiated whether smoke exposure during pregnancy or passive smoking of the neonate infant is responsible for some of these effects.

Children are indeed the passive victims of the effects of tobacco smoke from their surrounding environments. Parental smoking and smoking by other household members have been associated with respiratory infections, decreased lung function, middle ear effusions, and learning disabilities in children and infants (Stockwell et al. 1992; Repace and Lowrey 1987; Trichopolous 1992). An increased severity of symptoms has also been noted for children with asthma (Hicks 1995; Frischer et al. 1992).

Methods

Sample: The sample for this pilot project consisted of 207 low-income women residing in seven counties located in the state of Michigan who participated in an MSUE Cooperative Extension program where they received education in the area of parenting. Low-income in this context means the women had incomes below the official poverty level and were receiving some type of public financial assistance. For a family of three, the poverty level is defined as \$12,278 per year. The seven counties were selected to include a representative mix of urban, suburban, and rural communities. The women were contacted by MSUE instructors and invited to participate in the project.

Pre- and posttest instruments: A structured, written questionnaire assessing knowledge of the health effects of exposure to ETS, attitudes towards exposure to ETS, and preventive efforts taken to avoid or minimize exposure to ETS was designed, based on an earlier version which had been used by the principal investigator in two previous studies (Kurtz, Johnson, and Ross-Lee 1992; Kurtz et al. 1996).

- The component on "knowledge" included a series of questions based on findings reported in the literature on the adverse health effects associated with ETS (e.g., "Smoking by a

pregnant woman during pregnancy can have harmful effects on the unborn child;" "Smoke from a burning cigarette contains dangerous chemicals").

- The "attitude" component assessed personal feelings toward ETS (e.g., "I don't like to breathe smoke from other people's cigarettes;" "I don't want my children to smoke;" "I have the right to ask other people not to smoke in my presence").
- The segment on "preventive efforts" presented questions on efforts undertaken by the women when exposed to tobacco smoke in their immediate environment (e.g., "I ask people not to smoke near me;" "I teach my children that breathing smoke from other people's cigarettes is harmful to them;" "When I am in a car or bus, I ask people around me not to smoke").

A five-point response scale (1 = strongly agree, 2 = agree, 3 = undecided, 4 = disagree, 5 = strongly disagree) was affixed to each question in the knowledge, attitudes, and preventive efforts sections. The pretest and posttest were identical, except that the pretest also elicited demographic information including age, gender, ethnicity, income, education, employment, marital/partner status and number of children in the home, as well as the smoking status of the spouse/partner or any other adults living in the home.

Intervention curriculum: A health education intervention curriculum was developed, based on scientific facts regarding the adverse health effects of ETS, and making use of existing educational materials on exposure to ETS such as

- "Raising Tobacco-Proof Kids" from the Michigan Department of Community Health, Community Action Kit
- "Protecting Children from Exposure to Secondhand Smoke" from the EPA
- "Raising Tobacco Proof Kids," American Cancer Society, and
- "Smoke Free for Baby and Me," Bureau of Child and Family Services, Michigan Department of Public Health.

The intervention curriculum was driven by three foci: education regarding the adverse health effects of ETS, improving attitudes toward exposure to ETS, and empowerment towards assertive, preventive behaviors regarding exposure to ETS. It consisted of a concise four-part series with components addressing the following:

- "Tobacco: a dangerous drug for everyone"

- "Children and second hand smoke"
- "Protecting yourself and your family from second hand smoke"
- "Stand up for your right for clean air"

For each module, visuals and educational props were developed to buttress the teaching materials. The curriculum also included time for participants to plan for ways to reduce their own and their family's exposure to ETS and allowed for participants to sign a pledge to continue to protect themselves and their children from exposure to ETS. Finally, the intervention and the pre- and posttest assessment instruments were tested on a small group of women, and the materials were subsequently revised and finalized.

To ensure uniformity of presentation of the intervention curriculum, MSUE instructors were trained and subsequently implemented the pretest, intervention, and posttest instruments. MSUE instructors typically have a high school diploma and are peers to the target population. The instructors are supervised by Extension educators who usually have a master's degree.

MSUE offers core programs in a variety of areas related to Family and Consumer Sciences, such as parenting, food and nutrition, breastfeeding support, and money management. Local community agencies often refer underserved, at-risk audiences into these programs. Participation is usually voluntary and free of charge. The classes are taught in the context of home visits, one-on-one sessions, or group sessions.

MSUE instructors taught the intervention curriculum as a supplement to an MSUE core program. The four segments were each 15 minutes long and taught at the end of MSUE core program classes. The posttest was administered to the participants approximately 30 days after the delivery of the intervention. The pilot project design and instrumentation, including informed consent procedures, were approved by the University Committee for Research Involving Human Subjects (IRB #01-847).

Measures and analyses: As an initial step, paired t-tests were computed for each of the individual pre- and posttest items relating to knowledge, attitudes, and preventive efforts regarding exposure to ETS.

Composite measures were then constructed for knowledge (9 items), attitudes (10 items), and preventive efforts (17 items) by grouping the individual questions in each category. In each case the composite measure was computed as the average response for the items in the group, thus yielding a range of possible scores of 1-5.

In view of the positive wording of the individual questions, lower numerical scores on the composite measures correspond to greater knowledge of the health effects of exposure to ETS, attitudes reflecting greater concern about their exposure to ETS, and more assertive efforts taken to limit their exposure to ETS.

Paired t-tests were then employed to test for differences in pre- and posttest scores on the composite knowledge, attitudes, and preventive efforts. Descriptive statistics were computed for all demographic and scale variables.

Finally, analysis of variance was used to test the degree to which pre- and posttest scores on knowledge, attitudes, or preventive efforts were dependent on demographic variables such as age, smoking status, presence of another smoker in the home, presence of children in the home, educational level, whether employed outside the home, whether living with a spouse or partner, and ethnicity.

Results

The average age of the respondents was 30.6 years; 30.4 percent were smokers and 69.1 percent were nonsmokers. Forty-nine per cent of the women were employed outside the home, 61 percent lived with a spouse or partner, and in 18.9 percent of cases there was a regular smoker in the home other than the woman respondent. Other demographic data as well as descriptive statistics for knowledge, attitudes and preventive efforts are presented in Table 1.

Table 1. Pretest means and standard deviations for knowledge, attitudes, and preventive efforts according to ethnicity, monthly income, education, smoking status, employment status, spouse/partner status, home environment, and all respondents (N=207)

		N	Percent	Knowledge*		Attitudes*		Efforts*	
				Mean	SD	Mean	SD	Mean	SD
Ethnicity	Caucasian	121	58.7	1.36	0.46	1.67	0.61	2.19	0.82
	Hispanic	19	9.2	1.30	0.34	1.46	0.51	2.11	0.79
	African American	44	21.4	1.43	0.40	1.65	0.53	1.95	.068
	Native American	8	3.9	1.24	0.34	1.44	0.47	1.61	0.55
	Asian	8	3.9	1.60	0.58	1.36	0.53	1.99	0.96
	Other	8	2.9	1.65	0.69	1.90	0.74	2.22	0.92
Monthly Income	0 - \$799	40	20.5	1.47	0.43	1.79	0.64	2.23	0.86

	\$800 - \$999	25	12.8	1.53	0.50	1.93	0.56	2.36	0.77
	\$1000 - \$1200	31	15.9	1.43	0.49	1.71	0.65	2.08	0.91
	More than \$1200	99	50.8	1.33	0.43	1.47	0.52	2.01	0.73
Smoking status	Smoker	63	30.4	1.60	0.53	2.09	0.59	2.73	0.67
	Nonsmoker	143	69.1	1.29	0.37	1.43	0.46	1.82	0.67
Education	No high school degree	33	16.2	1.36	0.36	1.73	0.61	2.05	0.84
	High school degree	59	28.9	1.59	0.51	1.80	0.61	2.27	0.83
	Some college	50	24.5	1.40	0.46	1.66	0.55	2.23	0.76
	College degree	51	25.0	1.23	0.36	1.41	0.55	1.88	0.73
	Advanced degree	11	5.4	1.12	0.26	1.33	0.39	1.74	0.63
Employed outside home	Yes	101	49.0	1.36	0.41	1.61	0.60	2.06	0.80
	No	105	51.0	1.41	0.48	1.65	0.58	2.13	0.79
Living with spouse/partner	Yes	125	61.0	1.38	0.47	1.59	0.60	2.11	0.77
	No	80	38.6	1.41	0.41	1.70	0.55	2.10	0.82
Other smokers in the home	Yes	38	18.6	1.49	0.48	1.92	0.58	2.47	0.77
	No	166	81.4	1.36	0.44	1.57	0.57	2.01	0.77
Children in the home	Yes	176	96.7	1.38	0.45	1.65	0.61	2.14	0.82
	No	6	3.3	1.50	0.61	1.48	0.53	1.67	0.62
All respondents		207	100.0	1.39	0.45	1.63	0.59	2.10	.079

* Range for knowledge, attitudes, and efforts 1 - 5 (1 = best, 5 = worst).

Paired t-tests on the individual questions revealed significant improvement on 31 of the 39 items. Key knowledge items that showed significant improvement were “Living for a long time with a person who smokes may increase my risk for lung cancer” (pretest = 1.48, posttest = 1.28, $p < 0.001$) and “Children of smoking parents have more respiratory illnesses than children of nonsmoking parents” (pretest = 1.63, posttest = 1.29, $p < 0.001$).

Important attitude items that showed significant improvement were “I don’t like to have anyone smoke in my home” (pretest = 1.70, posttest = 1.50, $p = 0.002$) and “I don’t want my children to be exposed to other people’s cigarette smoke” (pretest = 1.35, posttest = 1.23, $p = 0.003$).

Preventive efforts scores were improved for items such as “I tell others not to smoke in my home” (pretest = 1.83, posttest = 1.60, $p = 0.014$) and “I remove my children when someone smokes” (pretest = 1.89, posttest = 1.58, $p < 0.001$). On the negative side, there was no improvement on the item “I tell my spouse/partner not to smoke in front of the children” (pretest = 1.46, posttest = 1.51, $p = 0.222$).

The paired t-tests on the composite knowledge, attitude, and preventive efforts scales revealed that the women’s scores were significantly improved at the posttest (Table 2).

Table 2. Paired samples t-test for differences in pre- and posttest means (N=207)

	Pretest Mean*	Posttest Mean*	t-Value	Significance
Knowledge	1.39	1.22	6.30	0.000
Attitudes	1.63	1.47	5.10	0.000
Preventive efforts	2.10	1.80	6.97	0.000

* Range for knowledge, attitudes, and efforts 1 - 5 (1 = best, 5 = worst).

The analysis of variance revealed that women who were nonsmokers had better pretest knowledge ($F = 12.82$, $p < 0.001$), attitude ($F = 11.75$, $p < 0.001$), and preventive efforts scores ($F = 22.46$, $p < 0.001$) than those who were smokers, while at the posttest, nonsmokers had better attitude ($F = 18.65$, $p < 0.001$) and preventive efforts scores ($F = 28.48$, $p < 0.001$) than smokers. There were no differences in pre- or posttest scores on knowledge, attitudes, or preventive efforts according to the remaining demographic variables.

Discussion

The smoking rate for the women in this project (30.4 percent) was higher than the 1998 average for women in the state of Michigan (24.8 percent). Smoking rates also varied considerably by educational attainment, with rates of 30.3 percent for those with no high school degree, 50.8 percent for those with a high school degree, 32.0 percent for those with some college, and 18.9 percent for those with a college degree. Corresponding rates for all women in the state of Michigan were 34.2 percent for those with less than 12 years of education, 30.6 percent for those with 12 years of education, and 18.5 percent for those with more than 12 years of education (Centers for Disease Control 1998). These statistics are not at all surprising, as smoking nationwide is positively associated with younger age, lower income, reduced educational achievement, and disadvantaged neighborhood environment (Bergen and Caporaso 1999).

In 18.6 percent of the households there was an adult smoker in the home other than the woman respondent, and there were children living in 96.7 percent of the homes. Thus, there was significant exposure of these women and their children to tobacco smoke in a high percentage of the homes. This is particularly concerning in light of the fact that research has shown that consistent and prolonged exposure to ETS can have serious health consequences, such as a higher risk for lung cancer, heart disease, and respiratory diseases, and the disease burden of passive smoking is disproportionately borne by children (Al-Delaimy et al. 1999).

As mentioned earlier, posttest scores showed significant improvement on 31 of the 39 individual questions. At the same time, it was disappointing to note that there was no post intervention improvement on the item "I tell my spouse/partner not to smoke in front of the children." This preventive behavior would seem to be quite important in assuring a smoke free environment in the home, particularly as it pertains to children. One could conjecture that the women may find it more difficult to be assertive with a spouse or partner, an intimate member of the family, than with others outside the family. At the same time, it should be mentioned that, although there was no improvement on this item, the mean score was already good at the pretest (1.46). Nevertheless this points in the direction that consideration should be given to including the spouse or partner when presenting educational interventions on smoking.

The very good news was that overall, the knowledge, attitudes, and preventive efforts scores of these women did improve significantly between pretest and posttest. It would be important to follow up longitudinally to see whether these positive changes in knowledge, attitudes, and preventive behaviors persist over time.

Low-income women and children have historically been a neglected population with respect to health education and health promotion. The results of this pilot project appear to show that the educational intervention, which was specifically tailored to this group of low-income women, did in fact impact their knowledge, attitudes, and preventive behaviors with respect to exposure of themselves and their children to environmental tobacco smoke. However, we may not draw this conclusion with complete certainty, as we were not allowed at the time to include a control group in the pilot project design. We have received permission to follow up the current pilot project with a large-scale study, funded partially by the EPA, that will include provisions for a control group as well as longitudinal follow-up to determine whether the changes suggested by the pilot study are real and persist over time.

Our participating Extension educators and instructors were uniformly enthusiastic about the program, and felt it to be a very worthwhile addition to the services they offer their constituents. The results of this pilot project lead us to suggest that building ETS education into Cooperative Extension programs can facilitate healthier behaviors and lifestyles for low-income women and their children. ETS education is a natural fit for Cooperative Extension staff because this

population is routinely reached with other types of education, and most importantly, adding ETS education as an additional topic to the agenda will help reduce disease and save lives.

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References

Al-Delaimy, W., D. Luo, A. Woodward, and P. Hoden-Chapman. 1999. Smoking hygiene: a study of attitudes to passive smoking. *New Zealand Medical Journal* 112: 33-6.

Bergen, A.W., and N. Caporaso. 1999. Cigarette smoking. *Journal of the National Cancer Institute* 91(6): 1365-72.

Centers for Disease Control. 1998. The Office on Smoking and Health (OSH). 1998. State & National Tobacco Control Highlights. On-line:

<http://www.cdc.gov/nccdphp/osh/statehi/statehi.htm>.

Fontham, E.T., P. Correa, P. Reynolds, A. Wu-Williams, P.A. Buffler, R.S. Greenberg, V.W. Chen, T. Alterman, P. Boyd, D.F. Austin, et al. 1994. Environmental tobacco smoke and lung cancer in non-smoking women. *Journal of the American Medical Association* 271: 1752-59.

Frischer, T., J. Kuehr, W. Karmaus, R. Barth, and E. Hermann-Kunz. 1992. Maternal smoking in early childhood: a risk factor for bronchial responsiveness to exercise in primary-school children. *Journal of Pediatrics* 121(1): 17-22.

- Glantz, S.A., and W.W. Parmley. 1991. Passive smoking and heart disease: epidemiology, physiology, and biochemistry. *Circulation* 83(1): 1-12.
- Hicks, J.N. 1995. Secondary tobacco smoke and preventive and protective measures. *Laryngoscope* 105: 1287-9.
- Johnston, C. 1981. Cigarette Smoking and the outcome of human pregnancies: a status report on the consequences. *Clinical Toxicology* 18: 189-209.
- Kurtz, M.E., S.M. Johnson, J.C. Kurtz, and E. Beverly. 1996. Exposure to environmental tobacco smoke--perceptions of African American children and adolescents. *Preventive Medicine* 25:3: 245-53.
- Kurtz, M.E., S.M. Johnson, and B. Ross-Lee. 1992. Passive smoking: directions for health education among Malaysian college students. *International Journal of Health Services* 22(3): 555-65.
- Law, M.R., J.K. Morris, and N.J. Wald. 1997. Environmental tobacco smoke exposure and ischemic heart disease: an evaluation of the evidence. *British Medical Journal* 315: 973-80.
- Miller, G.H., J.A. Golish, C.E. Cox, and D.C. Chacko. 1994. Women and lung cancer: a comparison of active and passive smokers with non-exposed non-smokers. *Cancer Detection and Prevention* 18(6): 421-430.
- Naeye, R.L., and E.C. Peters. 1984. Mental Development of children whose mothers smoked during pregnancy. *Obstetrics and Gynecology* 64: 601-607.
- National Health and Medical Research Council. 1995. The health effects of passive smoking, Passive smoking working party, Canberra.
- Rantakallio, P. 1978. Relationship of maternal smoking to morbidity and mortality of the child up to the age of five. *Acta Paediatrica Scandinavia* 67: 621.
- Repace, J.L., and A.H. Lowrey. 1987. Predicting the lung cancer risk of domestic passive smoking. *American Review of Respiratory Diseases* 135: 1308.
- Steenland, K., M. Thun, C. Lally, and C. Heath. 1996. Environmental tobacco smoke and coronary heart disease in the American Cancer Society CPS-II cohort. *Circulation* 94: 622-8.

Stjernfeldt, M., J. Ludvigsson, K. Berglund, and J. Lindsten. 1986. Maternal smoking during pregnancy and risk of childhood cancer. *Lancet* 2: 1350-1352.

Stockwell, H.G., A.L. Goldman, G.H. Lyman, C.I. Noss, A.W. Armstrong, P.A. Pinkham, E.C. Candelora, and M.R. Brusa. 1992. Environmental tobacco smoke and lung cancer risk in non-smoking women. *Journal of the National Cancer Institute* 84:18: 1417-22.

Trichopolous, D., F. Mollo, L. Tomatis, K. Katsouyanni, L. Lipworth, L. Delsedime, A. Kalandidi, A. Karakatsani, E. Riboli, and R. Saracci. 1992. Active and passive smoking and pathological indicators of lung cancer risk in an autopsy study. *Journal of the American Medical Association* 268: 1697-701.

United States Environmental Protection Agency. 1993. Respiratory health effects of passive smoking, fact sheet: research and development (RD-689), air and radiation (6203J), p. 1-4.

Zaridze, D., D. Maximovitch, G. Zemlyanaya, Z.N. Aitakov, and P. Boffetta. 1998. Exposure to environmental tobacco smoke and risk of lung cancer in non-smoking women from Moscow, Russia. *International Journal of Cancer* 75(3): 335-8.