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A Cost-Effectiveness Analysis of Self-Help Smoking Cessation Methods for Pregnant Women

RICHARD A. WINDSOR, PhD, MPH
KENNETH E. WARNER, PhD
GARY R. CUTTER, PhD

Dr. Windsor is Professor and Chair, Department of Health Behavior, School of Public Health, University of Alabama at Birmingham, AL 35224. Dr. Warner is Professor and Chair, Department of Public Health Policy and Administration, School of Public Health, University of Michigan, Ann Arbor. Dr. Cutter is Professor and Director, Division of Biometry, Department of Epidemiology, School of Public Health, University of Alabama at Birmingham.

Tearsheet requests to Dr. Windsor.

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Synopsis

Estimates of the cost effectiveness and cost benefit of health promotion-health education methods for pregnant smokers designed to increase birth weight are not available. This paper presents the results of a cost-effectiveness analysis from a recently completed randomized trial to evaluate the effectiveness of self-help smoking cessation methods for pregnant women in public health maternity clinics. The study population—309 pregnant smokers from 3 prenatal clinics—were randomly assigned, during their first clinic visit, to 1 of 3 groups: (a) group 1 received the standard clinic information and advice to quit smoking, (b) group 2 received the standard clinic information and advice to quit plus the manual "Freedom From Smoking in 20 Days" by the American Lung Association, and (c) group 3 received the standard clinic information and advice to quit plus the pregnancy-specific manual "A Pregnant Woman's Self-Help Guide to Quit Smoking."

The quit rates by the end of pregnancy were 2 percent for group 1, 6 percent for group 2, and 14 percent for group 3. Analyses also indicated that the method used for group 3 was the most cost effective: group 3 achieved smoking cessation at less than half the cost experienced by the other two groups.

Although additional studies are needed concerning the behavioral impact, cost effectiveness, and cost benefit of self-help health education methods for smoking cessation, the methods tested in this trial are promising as solutions to part of the problem of low birth weight among infants of smoking mothers in the United States.

THE 1985 Institute of Medicine's report "Preventing Low Birthweight" identified smoking during pregnancy as a contributing factor in 20–40 percent of low birth weights among infants of women receiving public assistance in the United States. A major recommendation of the report was to consider the issues of relative costs and benefits in formulating public health policy about health education methods designed to increase birth weight. Lack of adequate data prevented the committee from estimating the additional public expenditure required to finance the recommended public health education program. The Institute of Medicine's report and a recent review of the intervention research literature concluded that estimates of the cost effectiveness and cost benefit of health promotion and education methods to increase birth weight are not available (*1,2*).

Our paper presents the results of a cost-effectiveness analysis derived from a recently completed randomized trial to evaluate the effectiveness of self-help smoking cessation methods for pregnant women in public health maternity clinics. The research methods, self-help interventions, and results have been discussed in detail elsewhere (*3,4*). Cost-effectiveness analysis refers in this paper to the comparative evaluation of the costs and behavioral impact of three cessation methods for pregnant smokers used in the randomized trial. These analyses were performed to provide decision makers, such as directors of maternal and child health and public health education programs, with information to evaluate cessation methods; the goal was to maximize the effective use of available resources.

Methods

A randomized pretest-posttest design was used in the trial (*5*). At the time of their first clinic visit, pregnant smokers—a total of 309 women from 3 prenatal clinics—were assigned to 1 of 3 groups. Baseline comparability of the three groups was confirmed (*3*). Group 1, the standard information control group, received information in a nonfocused interaction on smoking and pregnancy, requiring about 5 minutes during the first prenatal visit. Group 2 received the standard clinic information on smoking plus a copy of "Freedom From Smoking in 20 Days," a manual published by the American Lung Association (ALA) (*6*). Group 3 received the standard clinic information plus the pregnancy-specific self-help manual "A Pregnant Woman's Self-Help Guide to Quit Smoking" (*7*).

The Pregnant Woman's Guide went through extensive internal and external review before it was given to group 3. All skills were pilot tested with pregnant smokers at each of the clinics. A prototype of the guide was produced representing a standardized smoking cessation method that professionals in prenatal care could use to educate their patients. Three pregnant women who participated in the pilot study of 50 pregnant smokers and who had used the guide to become ex-smokers served as editorial consultants.

Groups 2 and 3 also received an informational packet entitled "Because You Love Your Baby" on the risks of smoking and the benefits of quitting that is disseminated by the ALA. The patient education methods used to teach the use of the self-help manuals for groups 2 and 3 were standardized and presented in approximately 10 minutes at the first prenatal visit by the same woman, a baccalaureate-trained health education specialist. No smoking cessation intervention methods were used with the 309 women after their first visits. Smoking status was confirmed at midpregnancy and end of pregnancy, using patient self-reports and saliva thiocyanate tests with a cutoff value of 100 micrograms per milliliter or less. Women lost to followup were counted as smokers.

Cost analysis. Intervention costs were estimated by identifying associated resources, determining their unit values (prices), multiplying the number of units of each by its price, and summing across all resource categories (*8,9*). The principal resources used were personnel and the self-help educational materials. No costs for the use of facilities were estimated. The cessation methods were applied during normal clinic hours in the three public health facilities and thus did not produce incremental or differential facilities costs. Because almost no supplies were used beyond those used during the normal visits to the clinics, supply costs were treated as zero. The one exception was the supplies needed for the saliva thiocyanate tests. These tests are unlikely to be used in an everyday clinic setting and hence were not considered to be a resource cost associated with self-help methods. From a social perspective, the client's time also was a resource, although it would not be relevant to an agency director dealing with program budgets. For purposes of this analysis, we adopted the perspective of the agency.

Estimating personnel costs. A health education specialist with a bachelor of science was used to teach groups 2 and 3. However, a nurse with a bachelor of science in nursing is the most likely person to provide smoking cessation methods as part of prenatal care. Personnel costs vary from State to State, by type of personnel and by level of training. Based on interviews with personnel unit officials of the health departments of six major cities, we estimated the average wage for health department nurses at $20,000, with fringe benefits totaling an additional 20 percent, for a total personnel cost of $24,000 per nurse per year. Thus, the hourly labor cost per nurse was estimated at $12 (assuming 40 hours per week and 50 workweeks per year).

As noted previously, the time spent at first visit in groups 2 and 3 to educate the women about how to use the self-help guides was on the average about 10 minutes each. Two brief followup nonintervention contacts were conducted to collect saliva samples and self-reports of smoking status. Each followup took an additional 2–3 minutes. Although not designed to be part of the patient education intervention, patients may have perceived the followup contacts to be part of it. Additionally, in practice, prenatal staff are likely to make inquiries about patient smoking status at subsequent clinic encounters. For women in groups 2 and 3 who had quit, a verbal statement of encouragement such as "keep up the good work" was made.

Actual personnel time per client should be counted for a total of approximately 15 minutes for groups 2 or 3. Group 1 required 5 minutes of staff time per client at first visit, with an additional combined 5 minutes for the midpoint and end-of-pregnancy followups. Total personnel time per client in group 1 was about 10 minutes. In all cases, personnel time was valued at the appropriate fraction of the hourly rate defined previously. The cost of each ALA cessation manual to the project in 1983 was $4, and the cost of each Pregnant Woman's Guide was also $4. Thus, the total costs and personnel time were the same for groups 2 and 3.

Results

The end-of-pregnancy quit rates were 2 percent in group 1, 6 percent in group 2, and 14 percent in group 3. A quitter was confirmed by combining patient self-reports of smoking status at followup with their saliva thiocyanate values. The table presents the cost per patient and cost-effectiveness ratios by study groups. The ratios suggest that the pregnancy-specific, tailored self-help methods provided to group 3 patients were more cost effective in encouraging smoking cessation than either the standard smoking cessation information provided to group 1 or the self-help methods for group 2. These estimates suggest that the group 3 methods can achieve smoking cessation at less than half the cost of either of the two alternatives tested. Group 1 methods were the least costly on a per patient basis, but the increase in effectiveness associated with the group 3 methods is sufficiently greater than the increase in the per patient cost of delivery to make this intervention more cost effective. Compared with the group 1 method, group 2's greater effectiveness is not sufficient to compensate for its greater cost.

Cost effectiveness of 3 smoking cessation methods

Method	*Cost per patient*	*Percent who quit*	*Cost-effectiveness*[1]
1. Standard information[2]	$2.08	2	$104.00
2. ALA Manual[3]	$7.13	6	$118.83
3. Pregnant Woman's Guide[4]	$7.13	14	$ 50.93

[1] Cost effectiveness = cost per patient ÷ percent who quit (effectiveness).
[2] Group 1 was given information in a nonfocused interaction on smoking and pregnancy.
[3] Group 2 received standard information plus the "Freedom From Smoking" manual of the American Lung Association.
[4] Group 3 received standard information plus a self-help manual for pregnant women.

Discussion

Analytical assumptions. The reported findings are based on several assumptions about costs and effectiveness. We performed several sensitivity analyses to assess whether the basic conclusions depended on the precise estimates employed in the analysis. Specifically, we addressed the following questions:

• *Is the finding of the greater efficiency of the group 3 (Pregnant Woman's Guide) approach dependent on the precision of its effectiveness?* The guide is more cost effective because it shares the highest cost with the ALA Manual but is more effective (14 percent versus 6 percent). There is, however, a substantial margin for the guide to be less effective than observed without losing its cost effectiveness. The observed quit rate could be halved, and the guide would remain the most cost effective of the three methods. We conclude,

'Because the 2 percent control group quit rate observed in this study is comparable to other reported quit rates (2–4 percent) for pregnant smokers after initiating prenatal care, perhaps only 20,000–40,000 of the annual cohort of approximately 1 million pregnant smokers are being motivated to quit by informational approaches after initiating prenatal care.'

therefore, that the superiority of the pregnancy-specific method is not likely to be dependent on the precision of the estimate of its effectiveness. The guide will remain preferred to the ALA Manual as long as its effectiveness is greater, a function of the identical cost. The guide must be 3.4 times more effective to maintain superiority over the standard informational approach. The 1988 cost of the guide of $4 versus the cost of $7 for the "new" ALA Manual (1986) for pregnant smokers makes the guide even more cost effective because of its significantly lower cost.

- *Is the cost effectiveness of the group 3 methods dependent on the precise estimate of the cost of staff time, the dominant cost of intervention?* Allowing the hourly rate for labor costs to vary by 20 percent above or below our estimate, equivalent to base annual salaries of $24,000 or $16,000, we find that the pregnancy-specific self-help cessation method substantially dominates the two alternatives even when the high hourly rate is used for the guide and the low hourly rate is used for the two alternatives.
- *Do the cost estimates of the materials significantly affect the findings?* No. The cost of the group 3 methods could be nearly twice that observed, and the third alternative would remain the most cost effective.

Social cost versus accounting cost. From a social perspective, the value of patients' time could be included as a resource cost. From an agency perspective—the perspective adopted in the analysis presented—clients' time is not a resource upon which departmental funds must be expended. Hence, it is not a program budget component. It may be useful, however, to consider briefly how inclusion of the value of the patients' time might affect our analysis. As in the case of personnel, only the incremental time required by the interventions represents an intervention cost. Time expended by patients traveling to clinics and waiting to be seen by the health professionals is not a relevant cost, because patients already incur these costs for regular periodic clinic exams. In this context, incremental clinic time spent by patients is identical to that of the staff.

For patients in groups 2 and 3, however, there is an additional incremental cost, namely, the time to read and use the self-help packages. If this extra time totals about 1 hour (7 days × 8–10 minutes), patients in groups 2 and 3 will spend 75 minutes on the intervention. Patients in group 1, by contrast, will devote only the additional 10 minutes also experienced by staff. If we value patients' time at $3.35 per hour (minimum hourly wage), the value of each patient's time required for group 1 methods is about $.56 (0.166 per hour × $3.35), while that required for group 2 and 3 interventions is $4.19 (1.25 per hour × $3.35). This adds 27 percent ($.56 ÷ $2.08) to the per patient cost for group 1 and 59 percent ($4.19 ÷ $7.13) to the cost of groups 2 and 3 methods; cost-effectiveness ratios increase similarly. Under these circumstances, the group 3 methods remain the most cost effective and group 2 the least cost effective.

Program and policy implications. A clear responsibility exists to provide efficient and effective methods to pregnant women to help them quit smoking. Increased attention is also needed to assist maternal and child health programs in the planning, management, and evaluation of smoking cessation programs for pregnant smokers (*10*). A comprehensive review of the literature (*2,4,10–19*) and this analysis indicate that simple verbal statements about risk are ineffective and inefficient. These data, and data from other studies, suggest that the typical informational content and methods of prenatal care education in the United States related to smoking need to be significantly revised. It should include specific smoking cessation and maintenance methods to help the pregnant woman become and remain a nonsmoker. If a public health department expects to achieve a quit rate greater than 2–3 percent, increases in resources and time will have to be allocated.

Personnel costs associated with the provision of effective cessation methods can be absorbed by most ongoing prenatal education programs with small allocations of personnel time. Training re-

quirements for nurses to use self-help methods are also modest. Initial inservice training and periodic training for new prenatal care nurses on how to teach the use of self-help methods as part of prenatal education would take approximately 2 hours, resulting in a training cost of $24 per nurse (at $12 per hour). This cost, however, would be spread out over a year for counseling all pregnant smokers. An additional cost of approximately $.24 per patient would be incurred if 100 pregnant smokers were counseled. Training time and costs, therefore, could double from 2 to 4 hours ($24 to $48) and only increase the cost for 100 patients counseled to about $.50 each. Although not tested in this study, it is also likely that the $.24 to $.48 cost per patient would be reduced, because almost all prenatal care education programs would provide this type of patient education as part of a small group. Additionally, in cases where there was little staff turnover, the cost would be further reduced in proportion to the number of pregnant smokers counseled. Total training costs would be very low.

Because the 2 percent control group quit rate observed in this study (*3*) is comparable to other reported quit rates (2–4 percent) for pregnant smokers after initiating prenatal care (*11,16–18*), perhaps only 20,000–40,000 of the annual cohort of approximately 1 million pregnant smokers are being motivated to quit by information approaches after initiating prenatal care. If the pregnancy-specific self-help methods and corresponding 14 percent quit-smoking rate observed in this trial could be applied to this cohort, there might be 140,000 quitters. This estimate is likely to be conservative, however, because more affluent and educated pregnant smokers who are provided cessation methods exhibit quit rates of approximately 25 percent (*14,18*).

The estimated cost of prenatal care, including delivery and postpartum care for a normal delivery, is approximately $2,000–$3,000, while the cost of neonatal delivery in Level II or Level III hospitals using low to medium estimates is approximately $14,000–$20,000 (*1*). Although estimating clinical outcomes and cost-benefit ratios were not purposes of this trial, we note that if this type of self-help method were used, additional direct costs might be avoided due to reduced hospitalization and morbidity related to increased birth weight. Applying the cost estimates from the table to the 1 million pregnant smokers who deliver each year, the total cost for universal application of self-help methods would be approximately $7 million. The total investment across the 50 States, therefore, would be small, an insignificant proportion of the total private or public sector costs associated with low birth weight. Although additional rigorous behavioral impact and cost-effectiveness studies are needed, the self-help health education methods tested in this trial (*3*) and other methods (*14,19*) show promise as solutions to part of the problem of improving the health and well-being of the next generation of pregnant women and their infants and children in the United States (*1*).

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Health Problems and Use of Services at Two Urban American Indian Clinics

TIMOTHY L. TAYLOR, PhD, MPH

Dr. Taylor is Assistant Professor and Special Assistant for the Native American MPH Program of the Department of Health Administration, College of Public Health, University of Oklahoma Health Sciences Center, P.O. Box 26901, Oklahoma City, OK 73190.

Tearsheet requests to Dr. Taylor.

Synopsis

The use of primary health care services by urban American Indians and their health problems were compared with national and regional data compiled by the Indian Health Service, Bureau of the Census, Office of Technology Assessment, and the National Center for Health Statistics. A survey of medical records was conducted at urban Indian health clinics, one located in Oklahoma City, OK, and the other in Wichita, KS. Health records of 500 patients from each clinic were reviewed. Information was gathered concerning reasons for visit, diagnoses, and number of physician visits. In addition, predisposing variables and enabling variables from each patient's registration form were reviewed.

According to the data collected in the survey, the clientele of these urban Indian clinics have annual incomes well below the average income of the general population and the overall American Indian population in these cities. Their lack of health insurance and low education levels were also evident. Use of primary health services was below that of the general population, and lower, but relatively close, to use levels of American Indians residing in rural Oklahoma and Kansas. Information on health problems indicated high levels of diabetes mellitus and hypertension among the middle-age groups, and high levels of use by young women for prenatal care and contraception.

The absence of systematically collected and comprehensive health and health care use information about urban American Indians, who now comprise more than half the U.S. American Indian population, and the limitations in the available information leave important questions unanswered. There are indications that large segments of urban Indian populations have difficulty obtaining primary and preventive health care services due to their general socioeconomic condition and the absence of the Indian Health Service in many urban areas.

THERE ARE MORE AMERICAN Indians residing in urban areas of the United States than in all other locations combined. According to the 1980 census, 54 percent of the total American Indian population in the United States, estimated to be 1.4 million, resides in cities. Less than 24 percent of the American Indian population lives on reservations. The remainder of the Indian population is located in a variety of settings that are predominately rural, including Alaska Native villages (2.8 per-