Interventions in High-Risk Occupational Cohorts: A Cross-Sectional Demonstration Project

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In 1980, the Workers' Institute for Safety and Health began a demonstration project designed to develop a model program of community-based intervention in three cohorts with different workplace exposures and target cancer sites. Program components included identification, notification, medical surveillance, education, social support services (eg, psychosocial, legal, financial, etc), and evaluation. The three cohorts included (1) the Augusta cohort, a group at risk for bladder cancer due to workplace exposure to β-naphthylamine; (2) the Port Allegany cohort, a group at high risk of cancer associated with a workplace exposure to asbestos; and (3) the Pattern Makers cohort, a group shown to be at increased risk of colorectal cancer. Together, these three projects give a cross-sectional view of possible approaches to educational and medical intervention strategies in diverse situations.

Numerous cohorts of industrial workers have been identified by epidemiological or industrial hygiene investigations as being at high risk of work-related diseases, especially occupational cancers.[1,2] These studies have been conducted by government agencies and investigators in universities, private companies, and labor unions. Generally, the members of these cohorts have not been notified individually about the study results, even where the potential for health protection and disease prevention has been significant. Approaches to notification and intervention for high-risk occupational groups are fraught with methodological, organizational, and economic difficulties that have as yet to be adequately addressed.[3,4]

This paper presents three projects that attempt to demonstrate the kinds of intervention that should occur in groups at high risk of disease. Such programs are not designed as trials but as demonstration projects. The objective of each of these projects is to provide a comprehensive response for each high-risk group.

Current Demonstration Projects

Between 1980 and 1984, three intervention projects in worker notification were conducted by the Workers' Institute for Safety and Health under a grant from the National Cancer Institute. One aim of these projects was to develop a model intervention approach for future implementation in high-risk groups.

From the outset, it was recognized that certain organizational criteria would have to be met if a successful model approach were to be developed. The approach would have to be practical and inexpensive to allow for application by generally nontechnical union personnel within the budgetary constraints under which unions operate. Additionally, it would have to be capable of addressing fundamental flaws observed in previous notification/intervention attempts. As Samuels reported: "Past programs in notification and intervention have been subject to four major deficiencies: failure to use existing networks of communication, particularly those

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of the appropriate labor organizations; reinforcement of attitudes and activities that perpetuate dependence on others to make vital, personal decisions in health maintenance; ignorance of the long-established fact that where behavioral control is justified, it will occur most effectively through peer groups removed from the hostility of the workplace and with family involvement and community support; and failure to enhance the ability of the worker and his family to manage the legal, financial, and psychological problems of lifelong surveillance, intervention, and treatment, and in many cases death."[5]

The three demonstration projects conducted by the Workers' Institute were selected to give a cross-sectional view of possible approaches to notification and intervention situations (Table 1). Program quality and effectiveness were measured in the short term by process indicators and some preliminary behaviors and health outcomes.

Augusta, Georgia, High-Risk Cohort Project

This project was conducted in collaboration with the National Institute for Occupational Safety and Health (NIOSH). It involved 1,094 living, predominantly black, male workers who faced an estimated fourfold increase in relative risk for bladder cancer due to workplace exposure to β-naphthylamine (2-naphthylamine) during the period 1949 to 1972. Occupation is the strongest risk factor established for bladder cancer, and β-naphthylamine is one of the most powerful workplace carcinogens known.[6,7] The plant in Augusta was one of several producing this type of chemical and was identified by NIOSH in the early 1970s.[8]

In 1981, NIOSH sent letters notifying these workers of their risk status and encouraging them to obtain medical advice and to learn the warning signs of bladder cancer. At the same time, a medical screening program was established by NIOSH. A basis of the concept was that early diagnosis followed promptly by appropriate medical therapy might reduce the risk of cancer death.[9] The community-based support aspect of the project was directed by the Workers' Institute. A community steering committee and a community office were established to represent the workers. Educational programs for the workers and their families were held, as were community information meetings. Because of the extensive community organization, an ongoing screening program is likely.

Pattern Makers' League of North America

In early 1980, three independent epidemiological studies indicated that pattern and model makers, most of whom are members of the Pattern Makers' League of North America, might have a doubled risk to mortality from colon and rectal cancers.[10–12] The members of the union (approximately 12,000 active and retired workers) are almost entirely white male, highly skilled, and well paid. They are employed in about 700 workplaces in 27 states and 3 Canadian provinces.

Notification of risk was conducted by the league in consultation with the Workers' Institute through league newsletters and booklets. This nationwide notification was combined with training sessions for the business managers in each union local. A comprehensive cancer prevention and control program was developed by the Workers' Institute that included changes in work design and practices, education, and identification of local medical providers to conduct ongoing, standardized medical surveillance for the target sites of cancer. Again, this effort was based on the concept that early detection of colorectal cancer and treatment of premalignant stages (eg, polyposis) of disease would reduce mortality.[13]

Notable in the effort was the development of negotiated plans with management of several hundred companies for implementation of efforts to reduce potentially hazardous workplace exposures and to provide uniform medical surveillance which was, by and large, conducted by local community physicians. In terms of evaluation and research, this effort represents a unique project in that it probably is the first multicenter intervention program in occupational medicine. It also represents a unique, union-initiated response to an occupational hazard.

Port Allegany, Pennsylvania, Asbestos Health Program

Approximately 1,200 workers, most of whom are members of the Flint Glass Workers' Union in Port

TABLE 1
Comparative Characteristics of Cohorts Notified in Demonstration Projects[3]

Cohort	Location	Comparative Characteristics of Cohorts							
		Size/ Race/Sex	Type of Work	Carcinogen	Target Cancer	Average Period of Exposure	Latency Period	Realtive Risk	Medical Intervention Potential
Augusta chemical workers	Augusta, GA	1,150/70% black/ male	Unskilled, industrial, nonunion, low pay	β-naphthylamine	Bladder	1949–1974	18.6 yr	4–111	Good
Pattern makers	Nationwide	10,000 current, 2,000 former/ all white/male	Skilled, industrial, craft union, high pay	Undetermined	Colon-rectal	Unknown	Unknown	2	Good
Flint glass workers	Port Allegany, PA	1,200/all white/ male	Unskilled, industrial, union, medium pay	Asbestos	Lung	1964–1972	20 yr	10–53	Poor

Allegany, Pennsylvania, have been determined to be at high risk of developing cancers associated with workplace exposure to asbestos at a glass and insulation products plant.[14] This cohort consists almost exclusively of white males who were potentially exposed during the years 1964 to 1972. NIOSH identified the asbestos hazard in 1971 and informed the company and the union. Asbestos insulation production was subsequently halted. After lengthy union-initiated discussions, a nonprofit community program was established. The local governing board of the Port Allegany Asbestos Health Program (PAAHP) includes representation from the union, the company, the medical community, and the clergy. From 1980 to 1984, the Workers' Institute and Mt Sinai School of Medicine, New York, provided advice and consultation. PAAHP provides education and information, maintains an office for scheduling activities and recording results in an ongoing cohort registry, and contracts for periodic medical surveillance. This program has been extended to family members of exposed workers as a result of potential family risk due to secondary exposure. Observers have characterized this program as a model of community collaboration to address a serious work-related health problem (*Business Week*, Sept 7, 1981, pp 248-C).

Methods and Materials

The impacts of various intervention methods are being evaluated in the three identified cohorts. While these intervention projects involve aspects other than screening, the focus here is limited to the screening methods. General descriptions of the screening protocols developed for each of the projects are described below. In addition to the medical procedures listed, information was collected from each program participant on questionnaires constructed to solicit detailed occupational and medical histories, symptomatology, and identified risk factors for the target site of cancer.

Augusta Project

The intervention program in Augusta was designed collaboratively by NIOSH and the Workers' Institute. The screening protocol was developed in consultation with a urologist and in conjunction with researchers and physicians at the Medical College of Georgia in Augusta. It involved a two-phase operation: an initial or primary screening phase to identify all workers suspicious for bladder cancer, and a subsequent diagnostic phase for a definitive determination in those cases that met the criteria for referral in the primary screen. The primary screening consisted of several components:

1. Physical examination, emphasizing the urogenital system;
2. Routine urinalysis, emphasizing hematuria and pyuria;
3. Urine cytology: routine Papanicolaou staining using the method of Bales[15]; and nuclear fluorescence spectrophotometry using the method of Hemstreet and West.[16]

Referral of a program participant for a diagnostic urological evaluation was based on a "positive" finding on any of the following primary screening criteria:

1. **Occupational History.** A "positive" was any person who indicated during questionnaire administration having worked in the BNA Grinding Room (a high-exposure area in the plant) and/or any person identified from company personnel records as having a work assignment in a high-exposure job.
2. **Medical History.** A "positive" was any "yes" answer to stipulated questionnaire items regarding urinary tract, kidney, or bladder problems since Jan 1, 1979; hematuria in the last 2 years; or current dysuria, nocturia, and/or pelvic pain.
3. **Physical Examination.** A "positive" was evidence of bladder neoplasm such as a pelvic mass.
4. **Urine Cytology.** A "positive" was any nonnegative finding (atypical, suspicious, or positive) finding by Papanicolaou cytology (read by a cytopathologist).

Those satisfying the decision criteria were referred to the Urology Section of the Department of Surgery of the Medical College of Georgia for a diagnostic evaluation. This evaluation included the following:

1. Confirmation of urologic history;
2. Repeat urinalysis and urine cytology;
3. Radiological evaluation of urinary tract, if appropriate;
4. Cytologic analysis of bladder washing by Papanicolaou and nuclear fluorescence techniques;
5. Cystoscopy for all subjects with a designated high-risk occupational history, hematuria, current hematuria, or nonnegative cytology unless there was a relevant medical contraindication. (Subjects with pyuria were referred to their own physicians for treatment and were reevaluated for bladder cancer when the pyuria was cured.)
6. Random site biopsies for all subjects who were cystoscoped and who had a nonnegative cytology, unless medically contraindicated.

Pattern Makers Project

Screening of pattern makers focused primarily on colorectal cancers and possible pulmonary obstruction. Precautionary testing was also conducted for urinary tract disease. The protocol was developed in consultation with the Yale University Occupational Medicine Program. It was designed to be consistent with similar efforts that were underway at the General Motors Corporation and the Ford Motor Company. While this project was developed to incorporate many biomedical research questions, the main emphasis was on demonstration of the intervention model and, for the majority of the league members, the medical examinations were carried out by contracting with community physicians who were responsible for the care of the subjects. It was, therefore, recognized that the clinical judgment of the examining physician took precedence over the protocol requirements, and that standard medical contraindications for specific procedures would be observed.

The Figure describes schematically the process of (1) screening, (2) decision criteria for follow-up, and (3) appropriate follow-up action. The screening program included the following:

1. **Physical Examination.** Emphasis on gastrointestinal symptoms, including a digital rectal and prostate examination;
2. **Urinalysis.** For microhematuria;
3. **Lung Function Testing and Chest X-ray Films (Posteroanterior and Lateral).** To examine for pulmonary obstruction;
4. **Complete Blood Count With Differential.**
5. **Stool Hemoccult.** The Smith/Kline testing kit was recommended for standardization of screening results. Instructions were provided for a 7-day prescreening diet to improve reliability of the self-administered specimen collection.
6. **Sigmoidoscopy.** Flexible fiberoptic sigmoidoscopic examination of the sigmoid and descending colon (up to 65 cm) after adherence to a special diet and following the intake of two Dulcolax tablets by the subject the previous evening and administration of a 4½ ounce Fleet's enema at the clinical location.

Participating physicians were identified by the Workers' Institute. Contractual relationships were finalized by union representatives, who also administered the program locally. The physicians were selected on the basis of the following criteria:

1. The physicians had the necessary specialized training, equipment, facilities, and experience, particularly in the use of flexible sigmoidoscopic procedures.
2. The physicians were interested in the conduct of large-scale cancer control programs in occupational high-risk groups, with appreciation for the research aims that were involved. They also displayed a willingness to conduct education sessions for groups of subjects in advance of the screening clinic.
3. The physicians' costs were competitive.

Port Allegany

The Port Allegany program was developed despite poor detection and prognosis potential for lung cancer. Experiments in lung cancer detection, either by x-ray film or sputum cytology, to date, have not yielded reduced mortality rates, although some improvement in survival rates has been suggested.[17-19] The lack of effect

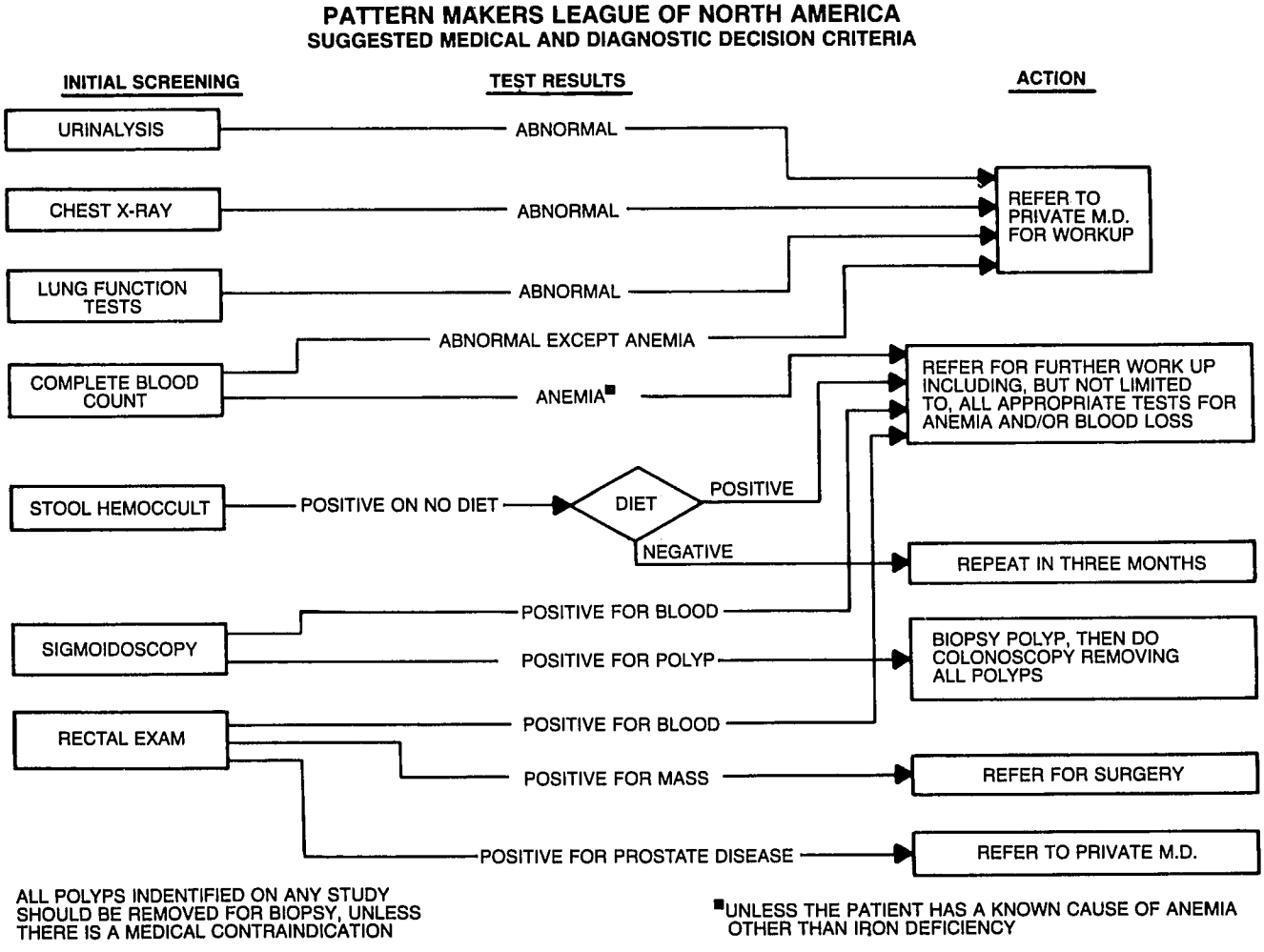

Figure. Pattern Makers' League of North America: suggested medical and diagnostic decision criteria.

has also been reported for occupational high-risk groups.[20,21] In addition to screening, the Port Allegany project has placed major emphasis on smoking cessation education and control of superimposed respiratory infections in persons with reduced lung capacity due to pulmonary obstruction.

Initial examinations were provided to program participants by physicians from the Mt Sinai School of Medicine, New York City. The screening protocol included:

1. **Physical Examination.** Emphasis on chest and gastrointestinal symptoms and included oral and pharyngeal examination;
2. **Chest X-ray Examination (Posteroanterior and Lateral);**
3. **Hematocrit;**
4. **Stool Hemoccult** (Smith/Kline);
5. **Urinalysis;**
6. **Lung Function Testing.** To determine the degree of pulmonary obstruction;
7. **Induced Sputum-Production for Cytology.** To identify cell transformation indicative of neoplastic development.

After the initial examination, participants were assigned to categories with recommendations for the type and frequency of continued surveillance (Table 2). The decision criteria for protocol category placement included ascertainment of the participant's exposure history, smoking status, and medical findings.

Continued surveillance testing is provided by local physicians under contract, and nonnegative findings result in referrals to specialists in the area according to customary referral patterns.

Program Evaluation Parameters

To date, evaluation has been limited to process indicators for a variety of program considerations. This report focuses on the following parameters:

Participation Rates. The primary evaluation measurement of project impact is participation rate in the medial intervention programs. Participation rate was defined as the number of participants, expressed as a percentage of identified eligible program participants who had been located and notified.

Compliance Rates. To evaluate the extent to which the educational messages penetrated the target populations, rates of compliance with key program components were evaluated: (1) *Augusta*: participation in diagnostic follow-up evaluation requiring cystoscopy; (2) *Pattern makers*: compliance with the 7-day special diet for stool guaiac specimen collection required prior to screening; (3) *Port Allegany*: smoking cessation rates.

Additionally, this report will summarize some of the preliminary medical findings from these projects. Other reports are being prepared to give details, and some of these are presented in this symposium publication.

Results

These projects were in the implementation phase from 1980 until 1984. Presented below are results from the first rounds of the screening programs.

Participation Rates

In the Augusta project, at the time of notification (1981), 1,094 members of the cohort were believed to be alive with approximately 75% living within a 50-mile radius of Augusta. After repeated mailings, however, no more than 849 could be found. Of those, 611 cohort members were located within the Augusta catchment area (within 50 miles of the city) with 238 designated as "out-of-towners." Of those identified, 93% of the Augusta residents and 77% of the out-of-towners have participated, for an overall participation rate of 88% (Table 3).

TABLE 2
Port Allegany Project: Surveillance Protocol[15]

	Chest Examination and Symptom Review	Gastrointestinal Symptoms Review	Chest X-ray Film	Spirometry	Sputum Cytology	Stool Hemocult	Hematocrit and Urine
	Frequency of Procedure in No. of Months						
Never Smoked							
Less than 20 yr from onset of asbestos exposure	12	—	12	12	—	—	—
More than 20 yr from onset of asbestos exposure	12	12	12	12	12	6	6
Smokers and Ex-smokers							
Less than 15 yr from onset of asbestos exposure	12	—	12	12	12	—	—
15–20 yr from onset of asbestos exposure	12	—	12	12	6	—	—
More than 20 yr from onset of asbestos exposure	12	12	4	12	4	4	4

TABLE 3
Augusta Project Notification and Participation Rates

Total No. in cohort	1,385
No. assumed decreased prior to notification	272 (20%)
No. with no address available	19 (1%)
No. lost to follow-up*	245 (18%)
No. assumed alive and notified	849 (61%)

Geographic Distribution	In Area	Out of Area	Total
No. assumed to be notified	611	238	849
No. participating (% of those notified)	566 (93%)	138 (77%)	749 (88%)

* Notification letters returned as undeliverable.

The success in terms of achieving the participation goal is tempered by the high number of workers lost to follow-up: 187 members of the cohort believed to be located in the Augusta catchment area and another 58 likely out-of-towners were unaccounted for, in spite of intensively tracking addresses through available population registries. Thus, of the defined assumed eligible population of 1,094, a total of 245 or 22.5% were lost to follow-up, which should be considered unsatisfactory.

For the pattern makers, data from select locations where the first baseline medical screenings were performed are presented in Table 4. After union negotiations, the workers received tests through their employers and/or at clinics organized under contract with the union. The clinic programs were paid for through employer/union insurance funds. Although these workers obtained free tests, the majority of them (87%) typically had to take the tests on their own time, and at a central location which in some cases meant extra travel. Offsetting these costs and inconveniences was the "seal of approval" provided to the program by having been organized and controlled by the union (Table 4).

The screening programs got underway at the end of 1981, and the first were completed in late 1982. Participation rates were disappointing in that an average of 48% of the union's members completed the screening program. This result may be accounted for, at least in part, by the economic depression that hit this industry and was particularly severe in 1982. In December of 1980, the unemployment rate among the union's members was 3%. In December 1981, 26% were unemployed, and by December 1982, a staggering 53% of the members were out of work. Many unemployed pattern makers became ineligible for the medical coverage that supported this program.

In Port Allegany, the medical program was offered in 1978, 1979, and 1981 by field medical teams from Mt Sinai School of Medicine, New York City. By mid-1982, medical services became offered by specially trained community physicians in the Port Allegany area. As can be seen from Table 5, notification rates are similar to those obtained in Augusta, with 854 members of the cohort located and notified. Of those notified, 80% of those living in the Port Allegany catchment area (within 30 miles of the town) have participated. Of those outside the catchment area, 46% have also participated, for an overall participation rate of 70%. What characterizes the Port Allegany program at this time is a well-structured and organized approach that is likely to lead to increased participation, particularly as the program focuses its attention on the population outside the catchment area.

Compliance

Of 566 workers from the Augusta catchment area who had completed the primary screening during the first year, 374 were referred for follow-up urological diagnosis with cystoscopy. By 1984, 273 of the referred workers had completed the second stage, for a compliance rate of 73%. However, to achieve this result, a massive outreach campaign was required, which probably went beyond the level of effort that could reasonably be expected if such projects were routine.

For pattern makers, the major compliance indicator was adherence to the special diet during a 7-day period prior to the medical screening. An overall compliance rate of 94% was self-reported by participants in the

TABLE 4
Pattern Makers Project: Preliminary Participation Rates: Select Locations

Clinic	Eligible Population	No. of Participants	Participation Rate	Cancer*	Polyps
Battle Creek, MI	35	20	57%	0	0
Creston, IA	14	14	100%	0	2
Columbus, OH	35	17	49%	1	1
Detroit, MI	603	320	53%	2	59
Ford-Cleveland, OH	143	90	63%	1	15
Ford-Detroit, MI	218	109	50%	0	6
Grand Rapids, MI	63	50	79%	1	4
Indianapolis, IN	103	28	27%	0	10
Los Angeles, CA	124	41	33%	0	3
Lansing, MI	12	3	25%	0	1
Milwaukee, WI	325	175	54%	0	36
Saginaw, MI	108	52	48%	0	8
South Bend, IN	148	40	27%	0	1
St Paul, MN	48	29	61%	1	4
Toledo, OH	68	24	35%	0	0
Warren, MI	1,084	501	46%	6	69
Total	**3,131**	**1,513**	**48%†**	**12**	**219**

* Pathology includes cancer, carcinoma-in situ and carcinoid.
† Average participation rate.

TABLE 5
Port Allegany Project Notification and Participation Rates

Total no. in cohort	1,186
No. assumed deceased prior to notification	100 (8%)
No. with no address available	232 (20%)
No. alive and notified	854 (72%)

Geographic Distribution	In Area	Out of Area	Total
No. notified	597	257	854
No. participating (% of those notified)	475 (80%)	119 (46%)	594 (70%)

select locations that first completed the screening process (Table 6). These remarkable data have generally been confirmed by the examining physicians, as well as by a recent analysis of results from the stool guaiac testing. However, results warrant further confirmation, and place in question the validity of this indicator as a sensitive evaluation parameter for compliance (Table 6).

In Port Allegany, smoking cessation was identified as a key compliance indicator. All data collected were self-reported. Smoking status was ascertained for each program participant during the initial screening. Of 355 workers examined in 1979, 35% indicated they were current smokers, and 43% indicated they were ex-smokers. To what extent this was influenced by previous publicity about asbestos hazards at the plant, which began in the local newspapers in the late 1960s, is unknown and needs to be investigated.

During reexamination of the workers (n = 179) by local physicians during the period 1982 to 1983, smoking status information was again collected. These data would indicate that 30% of the participants in the program continue to smoke—a smoking prevalence somewhat below the rate of smoking in the general blue-collar US population.[22]

A telephone interview survey conducted in 1984 (among participants and nonparticipants) obtained comparable results. This indicates a smoking prevalence among randomly selected participants in the Port Allegany Asbestos Program (N = 206) of 30%. Among nonparticipating cohort members (n = 92), 47% report that they are current smokers. Of greater interest, perhaps, are responses from ex-smokers (n = 96) who were asked: "Did contact with asbestos cause you to stop smoking?" Twenty-five percent said "yes." These self-reported data are being reexamined and evaluated.

Medical Findings

Results in these cohorts have been summarized for the target sites of cancer where a definitive diagnosis existed.

In the Augusta cohort, a total of 15 cases of bladder cancer have been confirmed. Three of these cases were ascertained from death certificates. Seven cases were found to have been diagnosed among living cohort members prior to the start-up of this program. So far, a total of five cases have been identified as a result of the screening program. In addition, about 22 cohort members have been identified to have nonnegative cytology results or positive nuclear fluorescence results, and these have been placed in a special risk category.

Among pattern makers, a total of 12 cases of malignant disease of the large bowel and rectum have been confirmed to date among the 1,513 subjects who have completed the examination (Table 4). Also as a result of the screening, 219 pattern makers were found to have colorectal polyps, placing them in a special risk category for future monitoring.

In Port Allegany, the earliest exposure appears to have occurred in 1964. With a latency period of 20 years, the earliest cancer cases are just beginning to present themselves, with the first case of lung cancer detected through the program in 1983. Case findings will continue.

TABLE 6
Pattern Makers Project: Special Diet Compliance: Select Locations

Clinic	No. Examined	No. Compiled	Compliance Rate
Battle Creek, MI	20	14	70%
Creston, IA	14	14	100%
Columbus, OH	17	17	100%
Detroit, MI	320	295	92%
Ford-Cleveland, OH	90	90	100%
Ford-Detroit, MI	109	105	96%
Grand Rapids, MI	50	50	100%
Indianapolis, IN	28	24	86%
Los Angeles, CA	41	40	98%
Lansing, MI	3	3	100%
Milwaukee, WI	175	173	99%
Saginaw, MI	52	48	92%
South Bend, IN	40	40	100%
St Paul, MN	29	27	93%
Toledo, OH	24	23	96%
Warren, MI	501	463	92%
Total	**1,513**	**1,426**	**94%***

* Average compliance rate.

Discussion

The year 1982 brought the worst recession that this nation has seen since the 1930s. In the basic manufacturing industries, this recession became a serious economic depression. Thus, 1982 was a bad year to implement large-scale cancer control programs for industrial workers. Although subject to further analysis, this economic factor helps to explain the unsatisfactory participation rates among pattern makers—an occupation severely hurt by unemployment.

The high rate of participants lost to follow-up seen in Augusta and Port Allegany is another problem that warrants further investigation. It appears that most population registries and data files (including the Social Security Administration and state motor vehicle agencies) do not adequately encompass transient populations of low to medium income. The Augusta project does, however, demonstrate the feasibility of establishing intervention programs under the worst of circumstances, that is, in a community highly polarized by racial discrimination, poverty, and substantial lack of understanding of toxic hazards.

Smoking cessation in the Port Allegany population is interesting and should be investigated further. The self-reported results that knowledge about asbestos exposure led to substantial smoking cessation might indicate that under certain circumstances the act of notification by itself leads to significant changes in health-seeking behavior. At this time, we do not have data on the impact of the strong personal counseling given by the examining physicians to each clinic participant about the importance of smoking cessation. Therefore, the role

of the physician as health counselor in programs directed at blue-collar workers needs careful evaluation in order to confirm the existing literature that suggests that health professionals through individual counseling may be among the most effective intervenors for so-called "life-style" health risks.[23,24]

The identification of subjects with medical findings indicative of higher risk (eg, nonnegative urinary cytology findings or the presence of colorectal polyps) raises the need for vigorous monitoring, and the potential for additional cancer control measures. In effect, such findings indicate the identification of high-risk *individuals* within high-risk groups. As new cell differentiation methods and biological markers of disease and exposure become available (eg, cell surface antigens), it should become possible to identify high-risk individuals with greater accuracy.

In summary, these demonstration projects show that a great deal of etiological and basic biomedical knowledge can be derived from intervention demonstration projects. In the future, when practical, interventions should include research components. Occupational high-risk groups are unique in this regard for two reasons. First, from industrial hygiene evaluations and previous epidemiological research, a great deal is known about the anticipated dose-response relationship in the population at risk. Therefore, these cohorts allow for the study of highly targeted intervention approaches. Second, because the age and time of onset of exposure are known from personnel and union records, it is possible to conduct research on the efficacy of different intervention methods at different stages of carcinogenesis in the population. As a result, occupational high-risk groups offer opportunities not only to evaluate intervention methods, but also to better understand human carcinogenesis and its control in general.

Conclusions

The three programs reported here demonstrate that notification and intervention programs for high-risk occupational cohorts are feasible within the existing structures of labor-management relations, medical care delivery and community services, and social networks. They also demonstrate that much remains to be learned about our responses to risks carrying relatively low probabilities and chronic disease outcomes with lengthy latency periods.

Addendum

Several reports have been prepared recently that relate to other aspects of this program. On the underlying reasoning, see Samuels.[4,5] On the public health issues surrounding notification, see Schulte and Ringen,[3] and on criteria for notification of workers at high risk, see Schulte.[25] On the social and legal implications, see Ringen and Smith.[26] For risk assessments and for a detailed evaluation of the impact of notification in Augusta, see Schulte et al.[27,28] For a risk assessment of colon cancer in pattern makers based on the screening program reported here, see Hoar et al (this volume). The results of specific screening tests used in some of these projects are discussed in Bang et al (this volume) for colon cancer, and Hemstreet et al (this volume) for bladder cancer. For a discussion of economic considerations arising from these projects, see Ruttenberg and Powers (this volume).

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The Traveler's Home

. . . Sometimes a legend can provide the key to identity. The original Wandering Jew was a cobbler who had a store some 2,000 years ago on Jerusalem's Via Dolorosa. The Friday of the Crucifixion, he watched along with everyone else as Jesus dragged the cross up the long street to Calvary. It was his misfortune, perhaps, that Jesus asked to rest against his storefront. The cobbler refused, so Jesus condemned him to eternal wandering with never a place to rest.

The story is Christian, of course, not Jewish, and has served for centuries as a focus for anti-Semitism. . . .

Sometimes it seems that I have incorporated the legend of the Wandering Jew, as though I am fated never to find simple content as generations have done in this house on Puget Sound, never to settle down in the simple assurance that this is my place, where I belong.

. . . I am due to go back to New York in a few days. That will be my base for now but not my home; it lacks the intimacy of home. It will be hard to leave a place as beautiful as this house on the water, but then, I've discovered that a Wandering Jew never does leave. Not really. Home is not a house but a sense of place and state of mind, so that the places I love travel with me, in my mind, wherever I go. And I come back to them again and again like a migratory bird to its nest, renewing the intimacy.

Perhaps the real irony is that those who invented the legend of the Wandering Jew never imagined that it could be not only a burden but also a blessing. The landscapes of my life are scattered around the world, true, but wherever I find the sense of place, the place becomes part of me, and I part of it. If I am poor in permanence, I am rich in intimacy. That is the choice I make. For the time being.

—From "Hers" by Lesley Hazleton in *The New York Times*, May 29, 1986.