

# Response to a Program of Screening for Cervical Cancer

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PREVENTION of disease and reduction of disability are universal goals of public health toward which considerable progress has been made in some areas and for some diseases. Unfortunately, this is not true of cancers of most sites, even though much effort has gone into developing techniques to uncover early, silent, and mostly curable cancers among apparently well people. An example of such a

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*The study was supported in part by graduate training grant CD-1-01-1-T1 from the Bureau of State Services and general research support grant FR-05445, from the Division of Research Facilities and Resources, Public Health Service; grant IN-11G from the American Cancer Society; and research career award No. K6-HE21,670 to Dr. Comstock from the Service's National Heart Institute.*

technique is the cytological examination of exfoliated cells (the Papanicolaou smear) for the diagnosis of early cervical cancer. However, even with this simple procedure, motivating women to come for examination remains a problem.

A new device for cervical cytological examination is the Davis cytopipette which is essentially an irrigation smear method to detect cancer of the cervix (1). The cancer detection kit, which includes the cytopipette and instructions, is mailed to women for use at home as a simple douching procedure. The kit is then mailed back to the laboratory where a smear is prepared and examined. In effect, this brings the screening examination to the woman rather than requiring her to make the initial move of going to the physician's office for a conventional Papanicolaou smear.

During 1963 this technique was used in a mass screening program for the detection of cervical cancer in Washington County, Md. This study was undertaken to (a) evaluate the effectiveness of the project in terms of acceptability of the pipette by the women to whom it was sent and (b) identify characteristics which differentiated women who used the pipette from those who did not.

## Material and Methods

According to the 1960 census, Washington County, Md., had a population of 91,219. The county includes Hagerstown (nearly 36,000 population), its surrounding suburbs, and sev-

eral small towns scattered throughout the rural districts. The county's population is more rural (55 percent) than urban, compared to 27 percent rural in Maryland State and 30 percent in the United States. The proportion of nonwhite persons (3 percent) is much smaller than the State (17 percent) and the United States as a whole (12 percent). Migration in and out of the county is estimated to be low. There are about 95 physicians in the area, including specialists in various branches of medicine. A general hospital and a hospital for chronic diseases serve the whole community.

The cytological screening program in Washington County was conducted by Dr. Hugh J. Davis of the department of obstetrics and gynecology, Johns Hopkins University School of Medicine. The program was supported by the Maryland Division, American Cancer Society, and was carried out in cooperation with the Washington County Medical Society, the county unit of the American Cancer Society, and the National Cancer Institute, Public Health Service.

Names and addresses of women in the appropriate age group were obtained from household rosters of the rural Washington County election districts surveyed in the period 1958 to 1963 by the National Cancer Institute. Because this survey was done district by district and summer by summer, the lists were 5 years old in some areas and current in others. Detection kits were mailed to 3,324 women on the lists at no cost to them.

In the 8-month period during which the screening program was conducted, 10 articles about the irrigation smear and cervical cancer control were published in magazines and local newspapers. Seven of these articles were concentrated in a 6-week period following the start of the survey in mid-December 1962. In addition, a few radio spot announcements were made by members of the medical society during the first week of the survey.

Reliance on a mailed pipette in this screening program should have minimized some causes of nonparticipation, such as cost, inconvenient time or place, or physician's time and attitude, noted in other surveys (2). Nonresponse in this program presumably resulted mainly from the women's own characteristics and attitudes.

During the summer of 1963 a private census of Washington County was conducted by the Johns Hopkins School of Hygiene and Public Health, the National Cancer Institute, and the Washington County Health Department. In addition to the usual demographic data, information was obtained on education, marital history, church attendance, smoking habits, and housing characteristics. Names of women on the mailing lists were matched against the census records, thereby permitting identification of women residing in the county at the time of the census and within the age range 30 through 45 years. As an initial step in the analysis of participation in the screening program, rates of participation were determined according to pertinent characteristics available from the 1963 census as well as from the earlier survey conducted by the Institute.

The derivation of the study group from the original mailing lists is shown in the following text table.

<i>Derivation of the study group</i>	<i>Number</i>
Names on National Cancer Institute mailing list.....	3, 324
Not in study area.....	100
Nonwhite .....	8
Not identified in 1963 census.....	482
Number remaining identified in the census, 30-45 years old, in study area.....	2, 734
Kits returned unused because of medical reasons or unknown current address.....	122
Expected respondents.....	2, 612
Actual respondents.....	1, 970
Nonrespondents .....	642

Of the 2,612 white women aged 30 through 45 years in the appropriate election districts who were expected to participate in the program, 1,970 did and 642 did not.

Two years after the survey, a study was made of the factors associated with response to the screening program. This study was done by interviewing all nonrespondents and every third respondent. A precoded schedule of questions was administered at home to the selected women to obtain information concerning their physical condition, history of major illnesses, medical examination, attitudes toward medicine and the medical profession, knowledge of cancer and its management, and obstetrical history.

A personal interview was chosen rather than a mailed questionnaire, because it was expected

that women who had not responded to the mailed kit would also fail to respond to other contacts through the mail. Carefully trained, mature women from Washington County conducted the interviews. Interviews were completed with 88 percent of the nonrespondents and 96 percent of the respondents' sample (table 1).

The sample of respondents proved to be similar to the total group of respondents with respect to age, education, and marital status. For both the sample of respondents and the nonrespondents, those who could not be interviewed were a little more likely to be younger, single, and better educated than those who were interviewed. Bias resulting from failure to obtain interviews from everyone is likely to be minimal, however, because the persons who were not interviewed comprised a small proportion of the group selected for study, and differences from those who were interviewed were slight.

## Results

*Response rates based on census and survey information.* Of the 2,612 women expected to respond to the screening program, 1,970 used and returned the kits, giving a crude response rate of 75 percent. The 642 women who did not use and return the kits were classed as nonrespondents.

The kits were mailed to the women from Baltimore in the order in which addresses were received from the National Cancer Institute, namely by groups of Washington County election districts, a method dictated by the filing system used by the Institute in the study of Washington County.

The response rates in the different election districts ranged from 96 to 56 percent. The variation of response was not associated with any demonstrable differences in the characteristics of the population of the election districts, but it was related to whether the mailings occurred early or late in the survey period. An average response rate of 96 percent at the start of the program coincided with the period of concentrated publicity in newspapers and periodicals. For later mailings, the response rate fell to about 55 percent.

Even within the limited age range of 30 through 45 years, the finding of others that response to an examination tended to be better

among younger women was confirmed (3). Of those aged 30-34, 81 percent used the kit, but only 70 percent of the women aged 40-45 did so. The differences were still marked after adjustment for other factors such as education and marital status.

Currently married women showed a significantly higher response rate than divorced, separated, or single women (table 2). This finding has also been reported from other cervical cytology programs (4).

The response rate for widowed women was slightly lower than the rate for currently married women. The difference in these rates was not statistically significant, and in any case could largely be accounted for by the variation of response rates with age, widowed women being older.

The low response rate among single, and among divorced or separated women remains a matter for speculation. Among the single women a number were possibly unfamiliar with, or perhaps even objected to, intravaginal proce-

**Table 1. Response to the interview, by percent**

Response to interview	Respondents (N=656) <sup>1</sup>	Non-respondents (N=642)
Total.....	100.0	100.0
Interviewed.....	96.2	88.0
Moved.....	2.4	5.0
Refused (2 trials).....	.9	4.2
Deceased.....	-----	1.1
Unable to answer questions.....	.1	1.1
Could not be found at home (3 trials).....	.3	.6

<sup>1</sup> One-third systematic sample of respondents.

**Table 2. Response rate by marital status**

Marital status	Number	Respondents	Response rate (percent)
Total.....	<sup>1</sup> 2,612	1,970	75.4
Married.....	2,399	1,850	77.1
Widowed.....	49	34	69.4
Divorced or separated.....	55	28	50.9
Single (never married).....	103	54	52.4

<sup>1</sup> Of the 6 women who did not give their marital status, 4 were respondents.

**Table 3. Response rate by grade of school completed**

Grades of school completed	Number	Respondents	Response rate (percent)
Total.....	2, 612	1, 970	75. 4
1-8.....	739	506	68. 5
9-11.....	665	508	76. 4
12.....	892	716	80. 2
13 or more.....	270	214	79. 3
Unstated.....	46	26	56. 4

**Table 4. Response rate by income of household**

Income of household per year	Number	Respondents	Response rate (percent)
Total.....	2, 612	1, 970	75. 4
Less than \$2,000....	66	40	60. 6
\$2,000-\$3,999.....	355	245	69. 0
\$4,000-\$5,999.....	516	404	78. 3
\$6,000-\$7,999.....	174	137	78. 7
\$8,000 and over.....	91	68	74. 7
Unstated <sup>1</sup> .....	1, 410	1, 076	76. 3

<sup>1</sup> Information not requested for most of these.

dures. Among those who were divorced or separated, some may have had problems which overshadowed any interest in participation in the screening program. Number of marriages or age at first marriage was not related to response rates among the ever-married group.

The results shown in table 3 also agree with findings in the literature that persons on a higher educational level respond better to health surveys (5). The number of grades completed, besides being a measure of knowledge, is also an indicator of socioeconomic status and a way of life.

For some rural areas, the total annual income of the household was available from the National Cancer Institute records. The marked decrease in response rates among women in lower income groups is shown in table 4. This observation confirms the findings of others that lower income groups are less likely to cooperate in health programs (6). In addition, an association between family income and participation in the survey might be anticipated because other

studies have demonstrated a positive correlation between the number of years of school completed and average income (7).

Another socioeconomic index examined was the occupation of the husband as stated in the National Cancer Institute records. Wives of professional workers had the highest response rates, while farm wives and those whose husbands were unemployed had the lowest rates (table 5). This finding reflects the association with both education and income. To some extent, poor education, low cash income, and farmwork are correlated attributes. Furthermore, it should be pointed out that for each of these attributes (tables 3-5), there is a point above which response rates do not improve appreciably. Generally speaking, poor response rates are associated only with the lowest categories of these three indicators of socioeconomic status.

There was little difference in response rates between Roman Catholics and Protestants, or between the Protestant sects represented in this area. Too few Jewish women reside in the study area to allow any conclusions regarding their participation. A significantly lower participation rate (54 percent) was observed among those who designated themselves as atheists or belonging to no religious denomination. This was unchanged after adjustment for differences in educational level.

Among the Christians there was a striking correlation between the frequency of church attendance and response to the program. Those

**Table 5. Response rate by occupation of husband**

Occupation of husband	Number	Respondents	Response rate (percent)
Total.....	2, 399	1, 850	77. 1
Professionals, technicians, and managers....	313	251	80. 2
Clerical and sales workers.....	218	172	78. 9
Craftsmen and foremen.....	628	480	76. 4
Operative and service workers.....	472	369	78. 2
Laborers, except farm and mine.....	226	177	78. 3
Farmers and farm laborers.....	253	180	71. 2
Unemployed.....	13	8	61. 5
Unstated.....	276	213	77. 2

who attended church at least once a week had the highest response rate (81 percent), while those who never attended religious services showed a response rate of only 60 percent.

For these women, smoking was limited to cigarettes only. No difference in participation was observed between present smokers and those who had never smoked, but women who had stopped smoking showed a somewhat higher rate of response. Response to the program was not associated with the age at which these women started smoking or with the number of cigarettes smoked per day.

*Comparison of respondents and nonrespondents.* The second phase of the study was aimed at getting more information about both respondents and nonrespondents by personal interviews. Elements of special interest were general health; criteria for seeking medical care, routine health examination, knowledge of and attitudes toward cancer, previous contact with cancer patients, and participation in group activities.

Among those interviewed less than 1 percent of the respondents and 12 percent of the nonrespondents said they had not received the kits (table 6). Another 10 percent of the nonrespondents claimed to have used the kit. We did not believe that the mailing system, with return postage guaranteed, could have failed this often, although some failures and clerical errors must have occurred. Probably some nonrespondents did not wish to admit that they had not used the pipettes. In any case, both these groups of nonrespondents are probably a mixture of users and nonusers, with the exact proportion of each group indeterminate.

**Table 6. Receipt and use of cancer detection kit, by respondents and nonrespondents**

Statements	Respondents		Nonrespondents	
	Number	Percent	Number	Percent
Total.....	631	100.0	565	100.0
Kit not received..	4	.6	70	12.4
Kit received.....	627	99.4	495	87.6
Kit used.....	620	98.3	56	10.0
Legitimate non-use.....	6	1.0	160	28.3
Reason for non-use not given..	0	-----	7	1.2
Refusal.....	1	.1	272	48.1

**Table 7. Distribution of respondents, legitimate nonrespondents, and refusals by assessment of their own health, in percentages**

Felt most of the time—	Respondents (N=631)	Legitimate nonrespondents (N=293)	Refusals (N=272)
Total.....	100.0	100.0	100.0
Healthy and free of disease.....	50.7	47.8	60.3
Had slight complaint every now and then..	29.3	31.8	23.9
Had major illness <sup>1</sup> .....	20.0	20.2	15.8
Did not know.....	-----	.2	-----

<sup>1</sup> Diseases inquired about were heart disease, high blood pressure, diabetes, tuberculosis, gall bladder disease, stomach ulcer, thyroid trouble, arthritis or rheumatism, allergy, epilepsy, tumors (benign or malignant), and kidney disease.

A large group of nonrespondents claimed to have had what are considered legitimate reasons for nonresponse, namely pregnancy, previous hysterectomy, or a recent cytological examination. Whether these women would have been respondents or nonrespondents if actually put to the test is uncertain. If all of this group are considered as proper exclusions from the study, the overall response rate would be increased from 75 to 86 percent.

For analysis of the interview information, three categories of interviewees were defined. All 631 persons initially considered to be respondents retained this classification, in spite of the few discrepancies between study records and subsequent histories. The initial group of nonrespondents was subdivided into two groups. The 272 women who said that they had received the kits but did not wish to use them were classified as "refusals," even though this term implies a greater degree of negative reaction to the screening program than may be appropriate. The remaining 293 nonrespondents are called "legitimate nonrespondents," although we recognized that this term gave all persons in an uncertain category the benefit of the doubt regarding their motivation.

Respondents and nonrespondents differed in their thoughts and feelings about their general

health. About half of all groups said they thought about their health fairly often. Eight percent of respondents and about 20 percent of both groups of nonrespondents stated they hardly ever or never thought about their health. However, only the refusals showed a higher proportion of women who felt healthy and free of disease (table 7).

Similarly, refusals were less likely to give a history of having had a major illness in the last 2 years and had least often consulted a physician about their illnesses. Symptoms related to the female genital organs were reported by 29 percent of both respondents and nonrespondents with legitimate cause but by less than 10 percent of refusals.

This difference was mostly accounted for by the symptoms of cervical inflammation and discharge. Whether the refusals really had lower rates of cervicitis and discharge, or were less aware of the condition than the other two groups could not be verified from the data. Nevertheless, the fact that they also had lower rates of major illnesses not likely to be ignored indicates that persons with illnesses tended to respond better.

When other factors relating to medical care were examined, the results showed that a greater proportion of respondents and nonrespondents with legitimate cause had had diagnostic X-ray examination over the abdominal and pelvic regions and more frequently had had abdominal and pelvic surgery than the group of refusals. Although complainers may come more often to the surgeon's knife than noncomplainers, the lower rate of surgical operations among the refusals again suggests that they were, in fact, a healthier group.

The frequency of complete physical examinations varied markedly among the three groups. The median number of such examinations in 5 years was less than one for respondents, more than two for women with a legitimate reason for not responding, and zero for the refusals. We were not surprised that women classed as legitimate nonrespondents had been examined more frequently, because their reasons for not responding—pregnancy, hysterectomy, and recent cytological examination—are all closely linked with medical care and, hopefully, with thorough examinations. We noted that the proportion of

refusals who had had no complete physical examination within 5 years was essentially the same as those who said their health was excellent.

The use of contraceptive devices was reported by 54 percent of the respondents, by 31 percent of legitimate nonrespondents, and by 37 percent of refusals. After adjustment for differences in marital status, a significant difference was still present. The use of contraceptive devices, as expected, was found to be positively correlated with education. However, at each educational level, more respondents than nonrespondents used contraceptives. The difference was most marked for the use of mechanical contraceptives, douches, jellies, and suppositories. Familiarity with these intravaginal procedures may have made the use of the cervical irrigation pipette more acceptable.

More respondents and legitimate nonrespondents had relatives or friends who had ever had cancer. However, the fate of the cancer patients did not seem to make any important difference in response. Also, what these women knew, or thought they knew, about cancer was investigated. They were asked to check the seven widely publicized danger signals among 14 different symptoms. In this instance, 56 percent of each group of nonrespondents, and 68 percent of the respondents could identify six or more of the danger signals. This difference was still present after adjustment for educational level.

The first part of the study demonstrated the importance of certain behavioral factors that might influence response or nonresponse, such as church attendance and smoking. A factor thought to be of particular interest in this respect concerned the social activities of the persons studied. Membership in at least one social, religious, or other organization was reported for 45 percent of the respondents, 37 percent of the legitimate nonrespondents, and by only 30 percent of the refusals. However, in all three groups, among those who did belong to an organization, there was no significant difference in the frequency of attendance. The finding that a high proportion of nonrespondents cannot be reached through community organizations suggests that a more personal approach should be tried to persuade them to participate in health programs.

Another behavioral characteristic, related to potentially life-saving preventive health measures, is the use of seat belts in automobiles. About 40 percent of each group stated that they had never been in a car with seat belts. Among the remainder about a third of the respondents and legitimate nonrespondents usually used seat belts, and an equal proportion never used them. Only a sixth of the refusals usually used seat belts, and nearly 60 percent said they never used them. This result, together with the higher proportion of respondents among ex-smokers, indicates that motivation toward preventive measures may be nonspecific.

All interviewees were asked why they thought some women did not accept cervical cytological examinations. Fear that cancer might be discovered was mentioned by nearly 60 percent, while 22 percent thought that negligence was the principal factor. Modesty or the embarrassment of a physical examination by a physician was stated to be the reason by 11 percent. Only 2 percent stated that the test could not really detect early cancer, and less than 2 percent thought that nothing could be done for cancer even if detected early.

In accounting for their own nonresponsive behavior, different reasons were given by the 272 women classified as refusals. Almost 30 percent of these women felt that because they were healthy, the test was not necessary for them; another 30 percent attributed their nonresponse to negligence. Twelve percent did not know how to use the pipette or were afraid of not using it properly.

The excellent cooperation of the local physicians was shown by the fact that only six women in the whole group stated that they were advised by their doctors not to take the test. A few rather bizarre reasons were given for not participating, and three women said they did not believe in the test. The remainder of the group (approximately 25 percent) did not have any reason for nonresponse or refused to answer the question.

## Discussion

A number of differences were noted between respondents, legitimate nonrespondents, and refusals. The refusals tended to be older, to have less education, and to rank lower on a number

of socioeconomic scales. They were also more likely to be unmarried and, if married, more likely to have large families. Persons with a legitimate reason for not responding most nearly resembled the respondents with respect to these characteristics.

All indices used to measure health indicated that the refusals were healthier than the respondents and the legitimate nonrespondents. We noted that respondents and legitimate nonrespondents had more illnesses, more cervicitis and cervical discharge, more routine physical examinations, more X-ray examinations over the abdominal and pelvic regions, and more abdominal and pelvic surgery than the refusals. However, having a family physician and seeking medical advice on suspecting serious illness did not differentiate the women with respect to their response.

Little or no association was found between response to the program and beliefs about various aspects of cancer, its cause, hereditary background, and possible diagnostic, therapeutic, and preventive procedures. Respondents knew more of the well-publicized seven danger signals of cancer than nonrespondents regardless of their educational level. Nevertheless, it was clear that a sizable proportion of nonrespondents could identify all of the cancer signs and still did not use the pipette.

Certain patterns of behavior were highly associated with response in the survey. Frequency of religious service attendance and membership in social and religious organizations were found to be positively correlated with participation in the program. Similarly, women who had stopped smoking and those who usually used seat belts in automobiles were more likely to participate.

There was a marked association between publicity and participation. Response rates were very high in the districts screened during the period with considerable publicity and fell without discernible reason after the publicity ceased. Indeed, it appeared that adequate publicity could reduce nonresponse in a rural and small-town population to the point where home visits to the nonrespondents would become feasible. Such visits might well be made by nonprofessional personnel specially trained for this task, perhaps even volunteers.

**Table 8. Cervical cancer diagnosed at Washington County Hospital, Hagerstown, Md., 1960-67**

Year	Total	Classification at diagnosis		Papanicolaou smear preceding diagnostic procedures		
		In situ	Invasive	Yes	No	Unknown
1960---	32	12	20	3	29	0
1961---	28	7	21	2	26	0
1962---	24	6	18	8	13	3
1963---	54	40	14	34	20	0
1964---	59	36	23	33	22	4
1965---	61	52	9	51	4	6
1966---	53	46	7	45	7	1
1967---	39	32	7	32	4	3

These workers could certainly reduce non-response attributable to not knowing how to use the pipette. They should also have a favorable influence on women who had failed to respond because of fear and on those who had been lulled into a sense of security by their apparent good health. The importance of securing examinations of the present nonparticipants is emphasized by finding that they have characteristics associated with higher than average rates of cervical cancer (8, 9).

Cytological screening for cervical cancer does detect the disease in its early stages, and the Davis cytopipette is a method which can bring this procedure to every woman at a minimal cost. The gradient in the response rate to the Davis cytopipette according to the husband's occupational class was much less than that to the Papanicolaou smear in Alameda County, Calif. (8). Perhaps this relatively better response among women in the lower socioeconomic groups was related both to the convenience and to the lack of expense attached to the present survey. Because cervical cancer is more common among women of low socioeconomic status, any procedure that brings their participation rate up to that of the higher socioeconomic groups will disproportionately increase the effectiveness of cytological screening. Consistently high response rates to periodic cytological screening could conceivably reduce mortality from cancer of the cervix to the vanishing point.

Records of the Washington County Hospital, which has the only laboratory capable of han-

dling cytology in the county, showed a marked increase in the number of cytological tests ordered by private physicians in the years following the survey. A corresponding increase in the numbers of diagnosed cases of cervical cancer occurred. This increase is shown in table 8 for the years 1960 through 1967, a period in which the total population increased only slightly.

Before 1963, the diagnosis of in situ cancer of the cervix was most often made by chance. Since then, the search for such cases has been vigorously pursued. This vigilance is reflected in the striking reversal in the ratio of in situ lesions to invasive cancers. The ratio was roughly 1:2 in the 3 years before the screening programs, 2:1 in the next 2 years, and 6:1 in the succeeding 3 years.

The proportion of cases in which cytological examination of exfoliated cervical cells led to definitive diagnostic procedures also followed the same general pattern. Furthermore, we believe that interest in cytological screening aroused by the 1963 survey program led to the enlargement of the cytological section of the local hospital laboratory. It has thus been possible for physicians to use cytological tests in examining more patients who, it is hoped, are also more aware of the importance of the test in detecting early cervical cancer in asymptomatic women.

### Summary

In 1963, a cervical cytological screening program was initiated in rural Washington County, Md. Pipettes for self-use were mailed to 2,612 white women, 30 to 45 years of age; 75 percent of them used the pipettes. When interviewed, about half the 652 nonrespondents claimed to have had valid reasons for failure to respond.

Nonrespondents tended to be older, unmarried, and in the lowest socioeconomic groups. They were less concerned about their health, had fewer symptoms, and were less likely to take other health-protective steps such as giving up smoking or using seat belts. Nonrespondents were less likely to attend church frequently or to belong to social organizations.

In this population, publicity was associated with a very high level of response, leading to

speculation that adequate publicity might reduce nonresponse so much that it would be feasible and profitable to make home visits to inform and persuade the relatively few initial nonrespondents.

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## Heart Disease and Beer Drinking

A research program to study the increasing evidence of serious heart disease among chronic beer drinkers has been established at the University of Minnesota by the award of a grant from the National Institute of Mental Health, Public Health Service.

At the Minneapolis Veterans' Hospital, 85-90 percent of the patients with primary myocardial disease have been chronic beer drinkers. Most of these patients develop alcoholic cardiomyopathy, or alcoholic heart failure.

Major aims of the research are to see if alcohol produces a depletion of necessary elements found in the heart such as magnesium, potassium, and zinc; changes the level of protein, actomyosin, and collagen in the heart; and affects the heart muscle in other ways.

Researchers have already shown that heart failure symptoms associated with chronic alcoholics include difficulty in breathing, rapidly beating heart, swollen legs, fatigue, and weakness. Heavy drinking seems often to be the one similarity of some patients who succumb to myocardial disease suddenly, yet show no evidence of other types of heart disease such as atherosclerosis, valvular disease, anemia, or severe malnutrition.

A \$52,685 grant will support the project for the first year. The Institute plans 2 additional years of support subject to annual review.