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Introduction

It has been asserted, (see for example, Donaldson [8], British Medical Journal [9]), that widespread use of cytologic screening can prevent mortality from cancer of the uterine cervix. The truth of this assertion depends upon three main factors: on the probability that cases of invasive cervical cancer are preceded by an earlier, less malignant stage (called carcinoma in situ); on the probability that the screening test (the Pap smear) can detect cases of carcinoma in situ; and on the probability that a woman will be screened, and screened repeatedly, for this disease.

This paper examines the third factor. We ask what factors influence whether and how often a woman will be screened. After having determined these factors, we can suggest how they should affect the efficient design of a screening program.

Types of Screening Programs

At least four different kinds of screening programs have been tried. One such kind has been to undertake screening on a door to door basis by using the Davis pipet (Maynard et al. [12]). This type of cytotest is a self-administered one, its advantage being that it can be used by women at home. The success of such programs, though, has not been overwhelmingly convincing. In the Rhode Island study reported in Maynard et al. [12] only 42.2% of the women approached provided specimens. The other 58.8% either refused or could not be tested because of pregnancy, having given birth within the last six weeks, having had a Pap smear taken within six months, because of menstruation, or having had sexual intercourse or a douche within the last twenty-four hours.

Having the test done in this manner by the patient herself presents some disadvantages, and leads to a higher rate of doubtful results. A later extension of the Rhode Island study showed that of 417 women tested, forty-nine (or 11.7%) revealed unsatisfactory results. This was owing to either a lack of cells in the specimen or to the use of the wrong orifice, that is, the urethra or rectum. A further disadvantage is that other screening tests (i.e. screening for breast cancer) cannot be done at the same time, thus making it impossible to share the cost among several different activities.

Another means of facilitating participation has been to use mobile cancer detection units (Strax [15], Whitfield [18]). The advantage here is that a mobile unit can be taken near the homes of non-participating women. Nevertheless, in such programs women of the lower social classes and higher ages still make up the group least likely to be screened. The reason for this may be that these women are not sufficiently self-motivated to enter such a specialized preventive health care unit. They often require the personal prompting and persuasion of an accepted medical authority before undergoing the test.

In various other programs special invitations are sent to women encouraging them to come and have a smear taken. Such a program has been set up in Malmö, Sweden (Bjerre [2]). Initially 9,058 women were invited by mail of which 7,046 responded and were screened. In some instances two or three additional letters were required, or even a phone call, for those who did not respond the first time. An average of 502 days after their first examination, 7,045 were reinvited for a second smear. Only 5,927 made the effort to be rescreened. One must assume that future rescreenings would attract even fewer of the original invitees.

"Automatic" Screening

A final type of program we shall consider is one which does not recruit patients, who must voluntarily present themselves at places of screening, but recruits physicians, who are asked to cooperate in wider-scale screening efforts. The organizational tactics employed here are, should a woman enter the medical care system for whatever health reason, her doctor will automatically suggest the smear to her, and, if she accepts, subsequently take it. This method of screening, which has been termed "automatic" screening (Christopherson [5]), requires nothing more of the doctor than for him to sit back and wait for screenees to come to him.

This form of screening program avoids the major difficulties of the other types of programs. First, the screening test is done in a medical environment, and therefore can be combined with other tests. Second, the woman is in direct contact with her doctor, who can therefore bring his professional persuasion to bear. Finally, the woman has come to the physician for her own reasons, and need not be persuaded to attend at someone else's convenience.

Most Pap smears are obtained in this way, at least in the USA, Canada, and Great Britain. Sansom et al. [14] report that 60.9% of women in Manchester, England, received the test as part of another examination, and a further 9.2% were asked by the doctor or clinic to accept the test. Kegeles et al. [10], in a survey of cervical cancer detection in the USA, report a qualitatively similar situation, as do Worth et al. [19] for British Columbia.

The success of automatic screening seems to involve the following prerequisites. It can only be effective first, if women visit physicians' offices or hospital clinics routinely; second, if they are willing to accept the smear once it is offered; and third, if physicians who are visited routinely actually offer and take cervical tests.

An examination of the first point, the utilization of general health care services, has shown in several studies both in the USA and abroad that all women of screening age make contact with the medical care system with nearly the same frequency, and with fair regularity (see Tables 1 and 2; Bice et al. [1], Cartwright [4], Danchik [7], Monteiro [13]).

Table 1. Number of physician visits per person per year, by selected characteristics: United States, selected years.

Characteristic	July 1963-June 1964	July 1966-June 1967	1969	1971	1973
All persons[1]...	4.5	4.3	4.3	4.9	5.0
Sex					
Male	4.0	3.8	3.7	4.3	4.3
Female	5.1	4.8	4.7	5.5	5.6
Age					
Under 5 years	5.5	5.7	5.7	6.8	6.5
5-14 years	2.8	2.7	2.8	3.3	3.4
15-24 years	4.3	4.0	3.7	4.5	4.5
25-34 years	4.7	4.4	4.4	5.1	5.3
35-44 years	4.4	4.3	4.1	4.5	4.9
45-54 years	4.8	4.3	4.3	5.1	5.4
55-64 years	5.3	5.1	5.1	5.9	5.5
65-74 years	6.3	6.0	6.1	6.4	6.5
75 years and over	7.3	6.0	6.2	7.2	6.6
Color					
White	4.7	4.5	4.4	5.0	5.1
All other	3.3	3.1	3.5	4.4	4.5
Family income					
Less than $3,000	4.3	4.6	4.8	6.2	6.0
$3,000-$4,999	4.5	4.1	4.5	5.1	5.5
$5,000-$6,999	4.5	4.2	3.9	4.6	4.9
$7,000-$9,999	4.7	4.3	4.1	4.8	4.8
$10,000-$14,999	4.8	4.5	4.2	4.7	4.9
$15,000 or more	5.8	4.8	4.5	5.1	5.1

Source: Danchik [7].

[1]Includes unknown family income and education.

Table 2. Percent distribution of persons by time interval since last physician visit, according to selected characteristics: United States, 1971.

Characteristic	Time interval since last visit							
	Total population	Less than 6 months	6-11 months	1-2 years	2-4 years	5 years or more	Never	Unknown
	Percent distribution							
All persons[1] ...	100.0	56.5	15.8	11.7	10.4	4.1	0.3	1.1
Sex								
Male	100.0	52.3	16.7	12.7	12.1	4.7	0.3	1.2
Female	100.0	60.5	15.0	10.9	8.7	3.6	0.3	1.0
Age								
Under 5 years	100.0	74.9	12.2	7.2	3.0	*	1.1	1.5
5-14 years	100.0	46.4	19.1	17.0	12.4	3.5	0.4	1.3
15-24 years	100.0	55.7	16.9	12.6	10.2	3.1	0.3	1.3
25-34 years	100.0	58.2	16.8	11.5	9.7	2.6	*	1.0
35-44 years	100.0	53.4	17.4	11.9	11.6	4.5	*	1.1
45-54 years	100.0	54.9	15.6	10.7	11.6	6.1	*	1.0
55-64 years	100.0	57.9	13.3	9.0	11.9	7.0	*	0.8
65-74 years	100.0	62.8	10.7	7.5	10.8	7.5	*	0.6
75 years and over ...	100.0	68.3	8.8	6.7	8.1	7.4	*	*
Color								
White	100.0	57.3	16.0	11.5	10.1	3.9	0.2	1.0
All other	100.0	50.9	14.7	13.7	12.7	5.5	0.8	1.7
Family income								
Less than $3,000.....	100.0	59.6	12.2	9.6	10.6	6.4	0.6	1.0
$3,000-$4,999	100.0	55.4	13.6	11.2	12.4	5.8	0.5	1.0
$5,000-$6,999	100.0	54.5	15.5	12.5	11.9	4.4	0.3	1.0
$7,000-$9,999	100.0	56.1	16.2	12.4	10.3	3.8	0.2	1.0
$10,000-$14,999	100.0	57.1	17.3	11.8	9.7	3.0	0.1	0.9
$15,000 or more	100.0	58.5	17.6	11.5	8.8	2.7	*	0.8

Source: Danchik [7].

Note: Data are based on household interview noninstitutionalized population.

[1]Includes unknown family income and education.

A difference which does exist between the health behavior of varying income groups lies in the source of medical care sought. The national percentages in Table 3 for the USA show that people in the lowest income bracket utilize hospital services twice as much as those in the highest (15.1% versus 7.6% respectively). In urban areas this percentage mark will probably be even higher for the indigent. Therefore, to screen these women would require the appropriate facilities and personnel in hospitals. The success of a hospital-based screening program has been described by Christopherson and Parker [6], where every woman who came to the hospital's out-patient department was offered a cytotest.

The second prerequisite concerns whether women will accept a Pap smear once it is made available to them. Although we know that most women will not go out of their way and make a special visit to be tested, we can still argue that they will not refuse a smear against their doctor's advice.

Yet, certain qualifications must be made here. Wakefield and Barić [17] report on the unwillingness of women to submit to a vaginal examination and cervical smear when unprepared and visiting the doctor for some other ailment. Christopherson and Parker [6], on the other hand, write that only three or four patients a year declined to have a Pap smear as they entered the out-patient clinics of Louisville's general hospital.

Despite Wakefield and Barić raising doubts about the role and persuasive power of doctors in cervical cancer screening programs, we nevertheless maintain that when encouraged by their doctor, few women, no matter of what age or income level, will in fact refuse the test.

Reason for Low Attendance Rates Among the Old and Poor

Our contention in explaining the diverging participation rates between demographic groups hinges on whether private physicians are regularly offering smears to their patients as a preventive health measure. As we know, in nearly all programs it is the aged and indigent who are screened least frequently (Tables 4 and 5). This is largely owing to the fact that the doctors of poorer women have neither the time nor appropriate help to actively take part in a widescale screening effort. Bullough [3], for example, reports that in the economically depressed Watts-Willowbrook area of Los Angeles, there were only sixty-three physicians per 100,000 inhabitants. This compares with 186 physicians per 100,000 inhabitants in the whole of Los Angeles county.

Table 3. Percent distribution of physician visits by place of visit, according to selected characteristics: United States, 1971.

Characteristic	Place of visit						
	Total	Office (including prepaid group)	Home	Hospital clinic or emergency room	Company or industry health unit	Telephone	Other and unknown
	Percent distribution						
All persons[1]...	100.0	69.6	1.7	10.2	1.0	13.3	4.2
Male	100.0	68.3	1.6	11.2	2.0	12.3	4.7
Female	100.0	70.5	1.8	9.5	0.3	14.0	3.8
Age							
Under 5 years	100.0	60.1	*	10.2	*	23.8	5.3
5-14 years	100.0	62.9	0.9	12.2	*	18.6	5.5
15-24 years	100.0	67.6	*	12.9	1.3	10.4	7.4
25-34 years	100.0	72.2	*	9.4	1.8	12.3	3.8
35-44 years	100.0	74.3	*	9.5	2.1	11.0	2.2
45-54 years	100.0	72.7	1.9	10.8	1.3	11.1	2.2
55-64 years	100.0	74.9	1.7	9.3	1.5	9.1	3.5
65-74 years	100.0	76.6	3.9	7.9	*	9.2	2.4
75 years and over	100.0	71.0	11.3	4.5	*	10.7	2.4
Color							
White	100.0	70.5	1.8	8.8	0.9	14.3	3.7
All other	100.0	62.4	1.1	21.2	1.5	5.5	8.3
Family income							
Less than $3,000 ..	100.0	64.8	3.4	15.1	*	9.4	6.9
$3,000-$4,999	100.0	67.3	2.3	13.4	*	11.6	5.1
$5,000-$6,999	100.0	70.6	1.2	11.3	0.9	11.4	4.6
$7,000-$9,999	100.0	68.8	1.0	10.9	1.3	14.3	3.8
$10,000-$14,999 ...	100.0	71.4	1.3	7.0	1.5	15.3	3.5
$15,000 or more ...	100.0	71.2	1.9	7.6	0.8	15.6	2.8

Source: Danchik [7].

Note: Data are based on household interviews of the civilian, noninstitutionalized population.

[1] Includes unknown family income and education.

Table 4. Percent of 884 Negro and white women who reported having had one or more cervical tests for cancer, by age groups.

Age group (years)	Total		White		Negro	
	Number interviewed	Percent who had test	Number interviewed	Percent who had test	Number interviewed	Percent who had test
21-34	230	38.3	202	40.1	24	25.0
35-44	192	57.2	172	60.4	17	29.4
45-54	148	43.9	120	47.6	20	15.0
55-64	130	34.6	121	35.6	8	25.0
65 and over	136	5.9	120	6.7	10	0
Total	836[1)]	37.8	741[1)]	39.9	79[1)]	20.3

[1]Forty-two women could not be classified as having obtained tests, and six could not be classified by age; eight could not be classified by race, and eight were both nonwhite and non-Negro.

Source: Kegeles [10].

Table 5. Percent of 787 respondents obtaining one or more cervical tests for cancer by total family income.

Income		Percent tested
Total	787	.....
$10,000 or more	121	63.6
$6,000 to $9,999.....	209	51.6
$3,000 to $5,999	262	32.9
Less than $3,000	195	15.9

Wakefield [16] reports that physicians of mainly lower income patients find it difficult or even impossible to screen because of their larger caseloads and the mass of ailments that are daily brought to their offices. Other significant correlations that are brought out in this study are that these doctors are more likely to be in practice alone, not employ a receptionist or ancillary help, and be older physicians than average, all factors which indicate an unwillingness or inability to regularly take cervical smears.

It could be argued that a reason why physicians do not screen is that they simply lack the facilities and equipment to do so. There are data to indicate this is not the case. Wakefield [16] found that about 72% of the doctors he questioned thought their present surgery facilities were adequate for taking smears and a further 11% said their premises could be converted to enable screening without heavy cost.

Use of Non-Physician Screening Personnel in Private Practices

Up to now, we have proposed that the most economic and efficient way to screen for cervical cancer is on an automatic basis. Unfortunately, screening in this manner presents us with one major snag--by relying primarily on private physicians to perform the test we discover that some doctors, more often those treating poorer and older women, are for various reasons unable to consistently take Pap smears.

As an alternative to relying exclusively upon private doctors, we suggest that non-physician personnel specially trained in performing cytological examinations be inserted into the program, that is, into those practices where screening does not occur. The notion of using non-professionals in screening operations is not a novel one and has been successfully implemented in hospital based cancer detection programs (see Martin [11]). Whether this idea can in reality be made to work in private practices depends on it being attractive to the physician who does not have the time or interest to screen by himself.

Some doctors, no doubt, will feel it to be an imposition to have a screening person working at their side in the same medical surroundings and will therefore refuse an assistant. But each individual situation need not necessarily require the introduction of a new person in a doctor's office. Often his personal nurse, if he employs one, can be satisfactorily instructed in taking cytological tests. In these circumstances, one could imagine that the policy of the screening program would be to cover a proportional part of the nurses salary according to the time the nurse spends obtaining smears and their number. This screening paramedic continues to fulfil

duties as nurse but is, at the same time, made responsible for taking smears. Furthermore, those physicians who do not already have ancillary help may be more inclined to take on such a screening paramedic, if they know that the paramedic will be partially paid from an external source and also perform other supportive tasks.

Summary

Initially, we examined the organizational aspects of four types of cervical cancer screening programs. The one that seemed to promise most success in providing protection for all demographic groups of women was one we called "automatic" screening. This involves the screening of women whenever they enter the medical care system, irrespective of the health care needed. The problem we subsequently came up against, though, was that doctors treating lower income and older age patients did not regularly take cervical smears. The main reason for this lay in their larger caseloads which prevented them from screening. The solution we proposed was the wider use of non-physician screening personnel in private practices. To make this idea attractive and acceptable to non-screening physicians, we suggested that a screening paramedic fulfill other supportive tasks for the doctor and a proportion of the salary be covered by the program.

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