

from population to population according to race and ethnicity, income and education, insurance status, and rural or urban residency, among other characteristics.^{11,12} Furthermore, the costs of intervention will also vary according to these characteristics. Some populations are likely to require more intensive and costly interventions than others. Therefore, no particular method of screening promotion is likely to be equally effective or cost-effective for all populations. Unfortunately, few studies have examined whether the C/E of promotion interventions varies according to contextual factors. These issues should be investigated more thoroughly and reported in CEAs whenever possible.

The development and use of screening promotion interventions designed specifically to reach individuals in groups that face a common barrier to screening may lead to identification of interventions that are also more effective and cost-effective for specific populations.

Some individuals may remain noncompliant with cancer screening recommendations despite having routine contact with the health care system. CEA can be used to identify the most efficient means of recruiting these individuals into screening programs. For example, in the previously discussed study conducted by Taplin et al.,⁵² the reminder call was notably more effective than a postcard among women who had not received previous mammograms. This finding inspired the authors to estimate the marginal C/E of the same interventions for women who had not received a previous mammogram (specifically, \$70 for the postcard and \$100 for the reminder call); per woman scheduled although these costs are higher than those estimated for women who had received a previous mammogram, they represent the costs of promoting mammography to a group of special importance if the goal of screening is to reduce breast cancer mortality.

Efforts to provide intensive screening and to promote screening use among high-risk populations may be cost effective even if these efforts are more costly than similar efforts targeting persons at average risk, because the rates of cancer incidence in such groups are higher. This is true, however, only if both promotion and screening are effective in these high-risk groups and if the increased C/E of screening in a high-risk population (or the improved effectiveness of efforts to promote screening to such groups based on their high-risk status) outweighs the additional costs associated with identifying and targeting high-risk individuals. Such costs can be substantial.

Lesson 7: One Must Consider Long-Term Effects To Determine the True C/E of Screening Promotion Programs

To interpret the results of the CTMP study described in Lesson 4,⁶⁸ assumptions were made regarding the frequency with which the promotion effort had to be repeated over a woman's lifetime to maintain the observed gain in screening use. In CEAs, the uncertainty surrounding such assumptions is accounted for using sensitivity analyses that quantify the effects of changes in assumptions. Sensitivity analyses can highlight the importance of specific parameters in understanding the C/E of screening and of screening promotion programs. In this case, the CEA model was very sensitive to changes in assumptions regarding the need to repeat the program. If the intervention worked as designed, women recruited to undergo mammography would be expected to continue to use mammography regularly without further intervention. Therefore, the promotion costs would be incurred only once in a woman's life. The effects of most screening promotion interventions, however, tend to be short lived. If the promotion program had to be repeated every few years to maintain the observed effects, the cost per year of life saved associated with the program would be much higher, easily exceeding the upper limit of what is commonly considered to be cost effective.

Long-term follow-up studies that examine the effects of community-based screening promotion efforts are likely to be large, difficult, and expensive. However, such studies may be necessary to understand potentially important effects of screening promotion, particularly when sensitivity analyses suggest that they substantially affect results and conclusions.

OTHER ISSUES

Does Promotion Always Add to the Cost of Screening?

Both screening and the promotion of screening programs can be costly.⁵² Although the interpretation of how much expense is worthwhile varies, promotion of a screening program adds to the costs of the program. In theory, however, promotion programs might actually lower the marginal cost (i.e., the cost per individual) of screening if promotion increases demand to the level at which economies of scale can be realized in the production of screening services. To our knowledge, the effect of screening promotion programs on the marginal cost of screening has not been documented in the literature.

How Should Equity and Fairness be Considered in Screening Promotion?

The ultimate users of C/E studies are policymakers. Efficiency of resource allocation, however, is not nec-

essarily their only, or even their primary, concern. Decision-makers must also take other issues into account, including issues of equity, distributional justice, individual preferences for specific procedures and policies, feasibility of implementation, and emotional reactions and responses associated with specific diseases. Distributional justice (i.e., equitable distribution of costs and benefits) is a particularly important issue. Decision-makers will frequently have to consider whether it is appropriate to invest more in the promotion of screening for certain populations, given that 1) promotion is essential to ensure the use of screening by members of those groups and 2) screening is essential to ensure equitable health outcomes.

Private individuals also make daily decisions regarding their personal resources and their interest in health care interventions, including cancer screening and related procedures. The many concerns of decision-makers suggest that cost per year of life saved and cost per QALYS are unlikely to ever be the primary measures used to determine appropriate health care resource use and expenditure. Policymakers for various federal and private organizations, in conjunction with the public, ultimately decide how society allocates resources for health care and health promotion. Researchers examining the C/E of screening and interventions aimed at screening promotion can only hope that the data they provide will prove useful to decision-makers in developing rational policies that maximize public health in ways that are consistent with public values.

CONCLUSIONS

CEA can be a valuable tool for understanding the relative merits of various interventions, such as cancer screening, aimed at promoting health and preventing disease. In the context of cancer screening, CEA is particularly useful for helping to identify screening strategies that may be worthy of promotional efforts. In addition, CEA can highlight the various costs of screening and promotion programs, including not only financial costs but also opportunity costs and potentially important QOL effects. Furthermore, costs included in CEA calculations may correspond to barriers to potential program implementation; thus, interventions may be easier to execute if they are designed to be cost effective.

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Promoting Cancer Screening: Lessons Learned and Future Directions for Research and Practice

Supplement to Cancer

A Perspective from Countries Using Organized Screening Programs

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Cancer screening may be offered to a population opportunistically, as part of an organized program, or as some combination of the preceding two options. Organized screening is distinguished from opportunistic screening primarily on the basis of how invitations to screening are extended. In organized screening, invitations are issued from centralized population registers. In opportunistic screening, however, due to the lack of central registers, invitations to screening depend on the individual's decision or on encounters with health care providers. The current article outlines key differences between organized and opportunistic screening. In the current study, literature searches were performed using PubMed and MEDLINE. Additional data were assembled from interviews with health officials in the five countries investigated and from the authors' personal files. Opportunistic screening was found to be distinguishable from organized screening on the basis of whether screening invitations were issued from centralized population registers. Organized screening programs also assumed centralized responsibility for other key elements of screening, such as eligibility requirements, quality assurance, follow-up, and evaluation. Organized programs focused on reducing mortality and morbidity at the level of the population rather than at the level of the individual. Thus, programs did not necessarily offer the most sensitive screening test for a particular cancer, and tests sometimes were offered at suboptimal intervals with respect to individual-level protection. Nonetheless, organized systems paid greater attention to the quality of screening, as measured by factors such as cancer detection rates, tumor characteristics, and false-positive biopsy rates. As a result, participants in organized screening programs received greater protection from the harmful effects associated with screening. In addition, organized programs worked more systematically toward providing value for money in an inevitably resource-limited environment. Although organized and opportunistic models of screening can yield similar uptake rates, organized programs exhibited greater potential ability to reduce cancer incidence and mortality, because of the higher levels of population coverage and centralized commitment to quality and monitoring; were more likely to be cost-effective; and offered greater protection against the harmful effects associated with poor quality or overly frequent screening. *Cancer* 2004;101(5 Suppl):1201-13. © 2004 American Cancer Society.

KEYWORDS: early detection, malignant neoplasms, organized screening, opportunistic screening, population registers, quality assurance.

The majority of research on screening uptake has taken place within the unique culture and context of medical care in the United States, where screening is predominantly opportunistic. Although opportunistic screening occurs in most parts of the world, what varies internationally is the extent to which organized programs have been introduced to supplement or replace it.

Organized screening is primarily distinguished from opportunistic screening in that invitations to screening are issued from population registers in organized screening. However, organized screening programs also have centralized responsibility for other key elements of the process, such as eligibility requirements, quality assurance (QA), follow-up, and evaluation. Although opportunistic screening also pays attention to these issues, the elements are not interrelated or interdependent and vary from center to center. Because the potential benefits of screening are vulnerable to shortcomings at any of the numerous steps in the process, screening that is organized and appropriately funded should have greater potential ability to yield maximum benefit with respect to early cancer detection and prevention.

The current article outlines key characteristics of organized and opportunistic screening and describes their different approaches to enhancing uptake. We identify the lessons that can be learned regarding the advantages and disadvantages of organized programs, the challenges associated with the introduction of organized screening into different health care systems, and aspects of organized programs that can be emulated in countries that cannot easily introduce organized programs.

COMPARING ORGANIZED AND OPPORTUNISTIC SCREENING SYSTEMS

Differences between countries offering organized screening programs and those providing screening on an opportunistic basis are often underpinned by different philosophies of health care provision, which have been characterized as planned versus free-market models.¹ Organized programs, which by definition are planned, are usually based on a public health approach to health care provision, sometimes referred to as *socialized medicine*.

Organized screening programs consist of elements that form a coherent structure offering a standardized system of care, with nationally implemented guidelines defining who should be invited, how frequently they should be screened, and how any screen-detected abnormalities should be followed and treated. Organized programs also monitor the quality of the overall program and its various component parts through QA. QA involves the setting and monitoring of key targets for a number of performance parameters, such as population uptake rates, cancer detection rates, and false-positive and false-negative rates.

Opportunistic screening depends on individual members of the public to request screening or on

their health advisors to recommend screening, because most individuals are not part of a uniform call-recall system. Opportunistic screening involves fewer formal decisions regarding whether to screen, whom to screen, and at what interval screening should be performed. QA may be more variable, and few opportunities exist to monitor the achievements and failures of the service as a whole.

Cancer screening in the U.S. is predominantly opportunistic, except for a few organized programs within certain health care plans. Although some health plan organizations have established quasi-organized systems that include many of the dimensions of national systems found elsewhere (e.g., call-recall measures and monitoring of quality), most screening in the U.S. depends on a confluence of interests between individuals and their primary care providers during health care encounters. Furthermore, individuals who leave a health plan that has a somewhat organized system of screening have no assurance that their new plan will devote similar resources to ensuring that they receive cancer screening. In some instances, centralized reminders are administered by the physician or by the health insurance program, and some health maintenance organizations have created excellent centralized systems. However, most individuals who would benefit from cancer screening do not receive invitations to screening from a central authority.

The existence of high screening rates in the U.S. for several cancers (most notably, those of the cervix and breast) indicate that opportunistic screening can achieve a high level of population coverage, matching or exceeding that of the best organized systems.² Numerous U.S. organizations and government agencies issue guidelines for screening and QA for health care providers. These standards and recommendations contribute to some rationality in the delivery of services. Other quasi-organizational factors also contribute to the finding of relatively high screening rates in the U.S. These factors include the existence of federal and state laws mandating coverage of screening for some cancers, nationally supported programs providing screening to medically underserved populations through state health departments, annual reporting of cancer screening by managed care organizations to the Health Plan Employer Data Information Set, and numerous local programs that work to maximize uptake. Although some population groups in the U.S. are covered by one or more elements of a quasi-organized program, most are not. Unlike in organized systems, a significant percentage of the adult population has no access to screening at all. Because there is no

TABLE 1
Similarities and Differences between Aspects of Organized Screening and Opportunistic Screening

Aspect of screening	Organized screening	Opportunistic screening
Screening method for a particular type of cancer (e.g., FOBT vs. FS)	Fixed: chosen by government/health department	Variable: chosen by individual and individual health care provider
Aim	Reduce cancer incidence/mortality at the population level	Reduce cancer incidence/mortality at the individual level
Sensitivity of test	The most sensitive test may not be chosen for a nationwide program. Sensitivity targets for practitioners and programs are established and monitored to improve test performance	The most sensitive test is usually chosen. Sensitivity at the practitioner and program levels is not generally monitored
Specificity of test	High specificity is important for reducing avoidable costs due to unnecessary workup of false-positive results and associated adverse effects	High specificity is less important at the individual level
Screening interval	Fixed: chosen to maximize population benefit at reasonable cost	Variable: chosen to maximize an individual's protection against cancer morbidity/mortality; usually more frequent than in organized programs
Available financial resources	Limited at the population level in relation to policies of health spending, taking into account all aspects of health care	Limited at the level of the individual, and limited to health plan-level decisions; depends primarily on the finances and insurance status of the individual
Health technology assessment	Must be confirmed to yield more benefit than harm	Efficacy does not necessarily have to be demonstrated
Quality assurance	Set targets have to be met and are monitored. Targets are continually reviewed to ensure that the screening delivered is of the highest quality possible	Targets may be set and may or may not be monitored
Target uptake rates	Specified and monitored; lower rates result in organized efforts for improvement	May or may not be specified (i.e., by health plans or health agencies) or monitored; few opportunities for systematic application for population-based improvement
Persons invited	Fixed: all persons within a specified age range	Variable: persons in contact with health care professionals who recommend screening; persons with particular jobs in which health care coverage may include reimbursement for screening; anyone exposed to direct-to-consumer marketing
Invitation strategy	Active: everyone in the eligible population is invited	Passive: no consistent strategy
Aim for equality of access	Equality of access is built into the organization of the program	Equality of access is desired, but resource allocation limits the potential of outreach efforts
Relation between persons invited and cancer risk	Those invited are not necessarily the persons at highest risk but represent the age group most likely to receive greatest benefit from screening	Those invited are not necessarily the persons at highest risk; this feature may lead to overscreening of low-risk persons and underscreening of high-risk persons
Benefits	Maximized for the population within available resources	Maximized for the individual
Harms	Minimized for the population within available resources	Not necessarily minimized

FOBT: fecal occult blood test; FS: flexible sigmoidoscopy.

central coordination of screening, screening quality—particularly screening specificity—can also be highly variable. Thus, although comparisons of screening in opportunistic and organized settings reveal that each may outperform the other with respect to various elements of screening delivery, only an organized program has the structural features necessary to efficiently deliver high-quality screening to the entire eligible population. Table 1 summarizes the differences between organized and opportunistic screening, and Table 2 summarizes the lessons learned from countries that use organized screening and from those that use opportunistic screening.

LESSONS LEARNED

Lesson 1: Organized Screening Has Greater Potential Ability To Reduce Cancer Incidence and Mortality Due to Higher Achievable Levels of Population Coverage, Follow-Up, and Quality Compared with Opportunistic Screening

The aim of cancer screening is to reduce cancer mortality—and, in some instances, cancer incidence—across the population. High levels of population coverage, high-quality screening, and effective follow-up are required to meet these goals. For many reasons, organized screening is more likely than opportunistic screening is to be successful to this end. An organized call-recall system, with targets for population uptake, typically leads to greater and more regular coverage

TABLE 2
Lessons Learned from Countries Using Organized Screening Programs

Lesson 1: Organized screening has greater potential ability to reduce cancer incidence and mortality due to higher achievable levels of population coverage, follow-up, and quality compared with opportunistic screening.

Lesson 2: Organized screening programs aim to achieve a population-level benefit and a balance of benefits and harms; as a result, organized programs may not provide screening that offers maximum protection to each individual, but does offer them greater protection from harms.

Lesson 3: Equality of access is often a key principle of health care provision in countries with organized screening.

Lesson 4: In organized programs, the opportunity to be screened is determined by health policy and by the adequacy of the call-recall system; in opportunistic screening, the opportunity is determined to a greater extent by individual factors, such as the knowledge and behavior of patient and provider, insurance coverage, and the patient's pattern of encounters with health services.

Lesson 5: Cost of screening as a barrier is largely remedied by organized programs, but limitations in terms of access remain.

Lesson 6: Organized programs do not eliminate socioeconomic and ethnic disparities in the uptake of cancer screening, and each model faces challenges related to informed consent.

Lesson 7: Introducing an organized system of screening presents many challenges related to existing and required infrastructure, resources, vested interest, and public and provider acceptance of centralized health care.

than is achieved by circumstances dependent entirely on individual motivation. In the United Kingdom, for example, 83% of the target population received screening for cervical cancer within the organized program in 1992–1993 (after the program's introduction in 1988), compared with an estimated coverage of 50% in the mid-1980s, when cervical screening was only available through opportunistic programs.^{3,4} Centralized registers also lead to more accurate estimates of screening coverage than are typically available within opportunistic systems and facilitate the identification of underserved groups that can be targeted to enhance participation. Better follow-up of abnormalities detected at screening can be achieved through the use of 'fail-safe' systems. Such systems lead to enhanced patient compliance in association with the diagnosis and treatment of abnormalities and have made an important contribution to reducing mortality within organized programs. In contrast, the follow-up of abnormalities within opportunistic screening systems is often poor, as is illustrated by the low rate of follow-up colonoscopy among individuals with positive fecal occult blood test (FOBT) results in the U.S.⁵

This increased success in achieving population coverage and screening quality is reflected in the guidelines issued by the World Health Organization and the European Union. Both organizations recommend that screening should be provided through organized programs.

Lesson 2: Organized Screening Programs Aim To Achieve a Population-Level Benefit and a Balance of Benefits and Harms; As a Result, Organized Programs May Not Provide Screening That Offers Maximum Protection to Each Individual But Does Offer Them Greater Protection from Harms

A key concern regarding opportunistic screening is the possibility that it could cause more harm than good.⁶

Protection against harmful effects is achieved largely through control of the quality, type, and quantity of screening being offered. Organized screening typically has been subjected to rigorous health technology assessment (HTA) to assess its benefits, cost-effectiveness, and potential harmful side effects. In the United Kingdom, for example, no new screening program can be introduced until the National Screening Committee has reviewed its effectiveness.^{7,8} As a result, the population of the United Kingdom is relatively protected both from the harmful effects of screening interventions of unproven efficacy (for which the associated benefits may not outweigh the harmful effects even if the intervention is well executed) and from poor-quality screening interventions (for which the actual benefits may not outweigh the associated harmful effects). The disadvantage of extensive HTA evaluation is that the requirement of strong evidence for population-level benefit results in a delay in the introduction of new forms of screening in organized systems while efficacy data are being gathered.

Higher test specificity and less frequent screening help to minimize both physical and psychologic harms by reducing unnecessary diagnostic evaluations and overtreatment (e.g., treatment of cervical abnormalities that would regress without intervention) and by reducing the number of false-positive results. A recent comparison of screening mammography in the U.S. and the United Kingdom showed that recall and negative open surgical biopsy rates were twice as high in the U.S.,⁹ illustrating the success that organized programs have achieved in reducing false-positive rates.

Organized public health systems generally have explicitly limited health expenditures. As a result, strong pressures exist to offer value for money.¹⁰ The benefits of screening are weighed in the broader context of whether screening constitutes the best use of

available resources—i.e., how do the returns from spending health funds on screening compare with using the same money on other health technologies? In addition, screening for some cancers may not be prioritized within a country's cancer control program—Switzerland cited this as a reason for not introducing organized cervical screening.

The cost-effectiveness of organized screening is often better than that of opportunistic screening,^{11,12} but this cost-effectiveness is achieved in part by offering screening at a lower frequency or to more restricted age groups compared with opportunistic screening systems. For example, the frequency trial performed by the United Kingdom National Health Service concluded that although annual mammographic screening might detect a small number of additional cancers, it was not cost effective; thus, a 3-year interval was deemed to be acceptable.¹³ Similarly, in England, a decision was made recently to begin cervical screening at age 25 years, rather than at the onset of sexual activity, because the available evidence indicates that earlier screening offers minimal health returns.¹⁴

Eligibility criteria and screening intervals are specified to yield benefits at the population level. Consequently, not all individuals at high risk for cancer or precancerous lesions are automatically included in an organized program, either because of the reduced likelihood that significant 'quality life years' can be saved or because the harms associated with screening could offset any potential benefits.

Although test sensitivity is important, due to finite resources, organized systems do not necessarily offer the most sensitive screening test for a particular cancer if that test is not considered to be cost effective. The use of colonoscopy for colorectal cancer (CRC) screening is one current example. It is probably the most sensitive test, but the improvement in years of life saved compared with flexible sigmoidoscopy makes it unlikely that primary colonoscopy would be introduced in an organized screening program.

There are fewer restrictions on quality, type, and breadth of screening within opportunistic settings. Guidelines may be equally rigorous, but multiple guidelines often exist for the same disease. Issued from different organizations, these guidelines vary in the degree to which they are based on existing evidence, and they can be influenced by the underlying interests of the issuing organization. Some health insurance plans reinforce screening guidelines by not reimbursing the costs of screening performed outside of fixed guidelines with respect to frequency or age range, but if the individual can afford to pay and private health care is available, such screening may

still take place. A recent survey showed that 55% of all women in the U.S. continue to undergo annual cervical screening despite recommendations from many professional medical societies that emphasize biennial or triennial screening.¹⁵ This illustrates that guidelines alone fail to prevent overscreening. On the positive side, opportunistic screening usually provides the most sensitive test available at more frequent screening intervals and with no fixed age limits, thus potentially giving the individual higher levels of protection.

Lesson 3: Equality of Access Is Often a Key Principle of Health Care Provision in Countries with Organized Screening

Equality of access ensures that screening is made available to everyone and that no population subgroup is excluded by virtue of geographic location, socioeconomic status (SES), or ethnic background. This approach may sometimes be at odds with the goal of efficiency, which could maximize cost-effectiveness by neglecting or excluding 'hard-to-reach' groups. In countries such as the United Kingdom, Australia, or Sweden, where equality of access is a central tenet of the philosophy of health care provision, special efforts are made to promote screening in remote areas or in population groups that are less responsive to the routine call-recall process, regardless of their specific levels of risk.¹⁶ In the U.S., there also is considerable concern regarding access for underserved groups, but due to the scarcity of dedicated health care resources for the uninsured and a lack of population registers, the potential for delivery of screening services is limited, and the delivery process itself is challenging.

A fundamental difference between organized screening and opportunistic screening relates to the programmatic commitment to access and outreach that forms the foundation of organized programs. Access to screening has three components: opportunity, affordability, and physical accessibility. In theory, organized programs ought to achieve higher levels of population coverage than opportunistic screening, because barriers to access that are attributable to differences in opportunity and affordability are directly addressed. For example, invitations are issued to all eligible groups, and screening is either free or heavily subsidized. In practice, however, the degree of coverage depends on the quality of the lists used to issue screening invitations, the performance of the system responsible for contacting individuals, and, inevitably, the level of enthusiasm within the eligible population. In countries with organized systems, uptake rarely exceeds 85%, and SES-related inequalities in screening persist in some settings. Therefore, interventions are

still required to encourage participation, and both organized and opportunistic screening systems face similar challenges in maximizing adherence to screening recommendations.

Lesson 4: In Organized Programs, the Opportunity to Be Screened Is Determined by Health Policy and by the Adequacy of the Call-Recall System; In Opportunistic Screening, the Opportunity Is Determined to a Greater Extent by Individual Factors, Such as the Knowledge and Behavior of Patient and Provider, Insurance Coverage, and the Patient's Pattern of Encounters with Health Services

Within organized systems, the availability of screening is determined by screening guidelines and their implementation via an invitation system. Invitation systems require lists of eligible participants, and these lists vary in quality in different countries. Population registers are considered the ideal and exist in Nordic countries such as Sweden; however, most other countries have less complete registries. In Australia, for example, the national breast screening program uses electoral rolls, which are neither up-to-date nor properly representative of some ethnic minority groups. France uses national health insurance lists or insurance lists, and the United Kingdom uses general practitioner (GP) lists, which are often inaccurate, particularly in inner city areas, where the level of population mobility is high.

When organized programs are concerned about screening rates, an obvious starting point is a review of the quality of the lists. In Australia, pilot programs for CRC screening are examining the sufficiency of using the Medicare register (the list of all people eligible for Australia's government-funded universal health insurance program) both as a system for call and recall and as a register of abnormalities and follow-up procedures.

Because organized systems minimize the need for individuals and providers to know, remember, and comply with screening recommendations (either to initiate screening or to be screened regularly), high levels of uptake can be achieved in the presence of relatively low levels of public knowledge regarding screening; such is the case for cervical cancer screening in Sweden.¹⁷

This situation contrasts markedly with opportunistic screening, in which access is determined by the prescribing habits of referring health professionals, an awareness of and desire for screening by the individual, the ability to pay for screening or qualify for a program on the basis of need, and the degree of direct-to-consumer marketing of cancer screening technologies. The patient-provider dyad is central to de-

termining an individual's opportunity to be screened, and uptake can be enhanced by encouraging patients to request screening and by encouraging providers to offer screening. This approach lacks continuity, requires appropriate encounters between patients and providers, and is inherently inefficient in comparison to the direct call-recall method.

Within organized systems, provider endorsement of screening still plays a part in enhancing uptake and is critical in promoting screening in many countries. A recent systematic review of screening interventions concluded that primary care physician endorsement should be included in any new screening program.¹⁸ All screening systems should therefore seek to stimulate enthusiasm regarding advocacy among providers.

Lesson 5: Cost of Screening as a Barrier Is Largely Remedied by Organized Programs, but Limitations in Terms of Access Remain

Within organized systems, screening typically is free, or else individuals are largely reimbursed, so affordability is not a significant barrier to access. This situation contrasts markedly with the situation in the U.S., where a significant proportion of the population does not have health insurance of any kind and many others face substantial deductibles and copayments. However, practical barriers to screening remain an issue in both organized and opportunistic settings. These barriers include geographic factors (distance and transportation), demands on time, and the physical health of the potential participants. In the United Kingdom, the observation of reduced screening rates in London has been attributed to the age distribution of the population, as well as to greater levels of socioeconomic deprivation, diversity, and population mobility. All of these factors are associated with a reduced probability that potential participants are registered with a GP and thus included on invitation lists.^{19,20} In Australia and the United Kingdom, physical access is a barrier to cervical and breast screening attendance in metropolitan and remote locations.²¹⁻²⁷ This barrier occurs despite concerted efforts to ensure equity of access—in the case of breast screening, by implementing fixed, mobile, and relocatable mammographic screening services. Mobile units can help to overcome geographic barriers to screening and are particularly important in countries with areas of low population density. They minimize participants' travel times and distances, and the rate of acceptance of screening invitations is generally higher when these units are used. This higher acceptance rate may be partly attributable to women's preference for visiting a mobile clinic rather than a hospital.²⁸

Access issues in remote locations are often a true

reflection of distance and lack of accessible transport. In inner city locations, the issue may be a perceived lack of access rather than an actual deficiency in this area.²⁹⁻³¹ Poor physical health also has been associated with lower levels of attendance at screening.³²

Lesson 6: Organized Programs Do Not Eliminate Socioeconomic and Ethnic Disparities in the Uptake of Cancer Screening, and Each Model Faces Challenges Related to Informed Consent

Organized systems use letters informing patients of preset appointments, along with reminder letters, as their primary outreach strategy. This approach generally results in the attendance of a significant proportion of the population at screening without the need for additional motivational efforts. In Sweden, a single invitation results in attendance rates of > 80% for mammographic screening, but this success appears to be the exception and is attributed to the finding that Swedish women have very positive attitudes toward mammography.

Introducing call-recall increases uptake but does not usually eliminate the need for behavioral interventions to meet the target of > 70% uptake. In the United Kingdom, the introduction of a call-recall system for cervical screening increased uptake but was unsuccessful in meeting this target, so a payment incentive system for GPs was introduced. This system increased screening coverage in the target population from 61% to 83%,⁴ and Australia now has introduced a similar GP payment system on a pilot basis. Key issues for research in organized systems include the following: 1) the content and apparent source of invitation letters (e.g., the GP, the screening service, or another source); 2) whether timed appointments are offered; 3) whether the test is enclosed in the letter or is to be obtained from a stated location, such as a GP's practice or a health center (in the case of FOBT); and 4) the number of reminders sent to nonattenders. Timed and dated appointments endorsed by the GP have produced higher uptake than have open invitations or invitations from other sources.³³⁻³⁵ Reminder letters and telephone calls dramatically enhance uptake.³⁶ Some health plans in the U.S. issue screening appointments, but only a small percentage of the U.S. population is covered by such arrangements.

Lower SES may be a barrier to participation in screening, even when screening is free or heavily reimbursed. Data from the United Kingdom and Sweden show continuing inequalities in mammographic screening participation, particularly in urban locations.^{31,37-40} In Australia, however, economic disadvantages do not appear to represent a barrier to attendance overall.²² A different pattern emerges for

cervical screening, with socioeconomic disadvantages appearing to influence cervical screening rates in France⁴¹ and the United Kingdom⁴⁰ and in urban (but not rural) areas in Australia.²⁷ No relation between compliance and SES was found in Sweden.^{42,43}

Evidence from randomized controlled trials and pilot CRC screening programs in the United Kingdom and Australia suggests that similar socioeconomic disparities will be evident once such screening is introduced as a nationwide program.⁴⁴⁻⁴⁷ A trial conducted in France, however, indicated that individuals with lower SES were more likely than others to participate in a mass screening trial of FOBT.⁴⁸

Ethnicity-based differences in screening uptake also are evident, although the magnitude of these disparities is difficult to determine, because data on ethnicity are not always collected. Where ethnic differences have been demonstrated, they may be more properly attributable to SES effects, because ethnicity and SES are related in countries such as the United Kingdom and Sweden.^{49,50} Furthermore, organizational factors (e.g., inaccurate screening registers) may exaggerate any ethnicity-based differences. In the United Kingdom, for example, women of Asian descent are often registered more than once due to confusion regarding the order of their names. The recent United Kingdom pilot evaluation of FOBT revealed significantly lower uptake among ethnic minorities after controlling for differences in SES, although the possibility that list inaccuracies contributed to this finding cannot be ruled out.⁴⁴

In Australia, considerable effort has been made in organized mammographic screening programs to recruit women from ethnic minority groups, and few ethnicity-based differences in initial participation rates have been noted.⁵¹⁻⁵³ However, in some urban settings, women from non-English-speaking backgrounds are less likely to return for screening in subsequent rounds, suggesting that the services themselves may not be meeting the needs of women in these cultural groups.⁵⁴ Ethnic background is related to cervical underscreening in Australia,^{55,56} where migrant women⁵⁷ and indigenous ethnic groups have lower rates of cervical screening.^{27,58}

Even in organized screening settings, attitudes, beliefs, and knowledge are consistently associated with screening use. A lack of belief that cancer screening is personally relevant or important,⁵⁵ a patient's perception that he or she is not at risk,^{23,30,31,47,55,59-65} procedural barriers (e.g., embarrassment, discomfort),^{61,66-69} and other negative attitudes regarding screening, such as the belief that screening will not reduce cancer-related morbidity or mortality,^{62,70,71} have all been linked with lower levels of participation.

In contrast, screening rates are consistently higher among those who have a preventive orientation and participate in other preventive activities.^{30-32,59,72}

Interventions addressing barriers to screening vary from the inexpensive, such as health education leaflets, to the intensive, such as one-on-one educational outreach that targets hard-to-reach groups. Opportunities for shared or informed decision-making can overcome these barriers, although this type of counseling is less common in organized screening than in opportunistic screening.

Both organized and opportunistic screening services have recently begun to dedicate more attention to informed decision-making at the individual level. Issues discussed include the possibility of false-positive and false-negative results, as well as the fact that screening for some cancers may lead to treatment for a condition that would not have progressed.⁷³ The National Screening Committee of the United Kingdom, for example, has indicated that changes aimed at achieving fully informed participation in screening should be made⁷⁴ and that some aspects of screening organization, such as screening coverage targets for health authorities and payment incentives for GPs, may require modification. This approach reflects a move away from a philosophy of action by the medical profession based on 'the public good' and toward a philosophy of 'individual autonomy'. Although it is unclear as to what effect informed decision-making would have on screening uptake in organized systems, it might, ironically, reduce the benefits associated with increased screening organization. Experience in the U.S. has indicated that simply discussing the benefits and limitations of screening does not lead to a significant decrease in adherence, although the way in which such information is framed is likely to be crucial. Offering and providing sessions in which informed decision-making is discussed does, however, introduce additional requirements on systems already strained by limited resources.

Lesson 7: Introducing an Organized System of Screening Presents Many Challenges Related to Existing and Required Infrastructure, Resources, Vested Interest, and Public and Provider Acceptance of Centralized Health Care

Organized systems may be easier and cheaper to introduce in countries that have predominantly public rather than private health care systems. The former tend to be relatively more integrated and as a result generally have some organizational infrastructure already in place for identifying the eligible population, monitoring screening uptake and performance (QA), and following up for the treatment of abnormalities.

The lack of any preexisting public health infrastructure has been cited as a barrier to the introduction of organized nationwide mammographic and cervical screening programs in Switzerland. Countries with high levels of preexisting opportunistic screening have the advantage of having some of the necessary service-delivery infrastructure in place. However, it may be difficult to reduce or replace opportunistic screening activities, particularly in settings in which private health care is widely available. As a result, organized programs can fail to reach levels of maximum efficiency and, as is currently the case in France and Switzerland, these programs may have to operate in parallel with opportunistic screening to achieve high levels of population coverage.

Countries in which health care funding is determined regionally rather than centrally may experience difficulties in introducing organized nationwide screening. Guidelines may be issued at the national level, but smaller political units are often responsible for financing health care, and they may be unwilling to make funds available for screening provision. For example, an attempt by the Swiss Cancer League to instate nationwide mammographic screening in 1990 failed because health care funding is managed at a regional (cantonal) level in Switzerland, and a chronic shortage of cantonal finances led some cantons to decide against the implementation of a nationwide program.

Professional and consumer demand for screening varies among and even within countries. Low consumer demand and lack of interest among health professionals can pose significant barriers regardless of the system in place. The problems encountered by five countries attempting to offer organized cancer screening are summarized in Table 3.

CONCLUSIONS

The aim of cancer screening is to reduce cancer mortality. The most effective way of achieving this goal is to provide screening as part of an organized program. Organized programs also provide a more cost-effective service and greater protection from the harms associated with overly frequent or poor-quality screening. However, variations in health care systems, political values, and economic decisions influence the ways in which screening services and systems develop in different countries. Opportunistic screening is practiced in most countries, but organized programs exist only in some. The lack of preexisting infrastructure or the presence of a predominantly private health care culture can represent a barrier to the introduction of organized screening. Nevertheless, some benefits of an organized system—primarily those resulting from

systemization of the chain of events in the screening process—can be gained within opportunistic systems by emulating practices that have helped to enhance both the quality of screening and population coverage within organized systems.

Enhancement of Uptake and Screening Quality

The following lessons regarding the enhancement of uptake and the improvement of screening quality have been learned through the investigation of organized screening programs. Zapka et al.⁷⁵ presented a more general framework for understanding how screening could be improved in countries such as the U.S.

Identify the eligible population

Reliable data for identifying the eligible population and defining screening participants are fundamental to program planning and evaluation. Centralized databases, with linkages to population databases and cancer registries, are ideal. Introduction of call-recall systems and timed appointments on specified dates can measurably enhance screening uptake and contribute to greater adherence to regular screening over the long term. Monitoring of screening uptake can help in the identification of underserved groups and in the evaluation of potential strategies for enhancing compliance.

Increase access to screening

Free or reimbursable screening, follow-up, and treatment in the event of abnormal findings remove some of the most important barriers to screening. Screening uptake can also be enhanced by the use of mobile units when appropriate. Although endorsement of screening by health care practitioners plays a similar facilitative role in both the organized setting and the opportunistic setting, strategies in the United Kingdom, such as incentive payments to primary care physicians, have also increased uptake rates for screening.

Control quality of screening

Organized systems set minimum standards for all aspects of screening (such as uptake, cancer detection rate, false-positive rate, and rate of interval cancers) and aim for continual evaluation and improvement in meeting these standards. The recording and monitoring of data pertaining to these standards at both the local and national levels facilitate the provision of high-quality screening. Among the other important dimensions of quality are personnel-related variables. Adequate numbers of health care professionals are needed to meet demand, and training and experience are necessary to ensure high-quality performance.

Setting minimum standards for personnel also ensures that quality of care is more homogeneous from patient to patient.

Enhance performance and minimize harms

Performance targets and progress monitoring can help to reduce the potential harmful effects of screening. Goals should include test sensitivity, test specificity, and the cancer detection rate, as well as repeat examination rates, benign biopsy rates, and patients' waiting times for test results. In addition, consistent evidence-based guidelines regarding the recommended frequency of screening will help to reduce overscreening and contribute to a decrease in the number of false-positive results and the subsequent unnecessary treatment of abnormalities.

Timely follow-up of abnormalities is a critically important element of a screening program. Systems that incorporate accurate monitoring of adherence to postscreening testing and treatment recommendations and make use of fail-safe systems to ensure follow-up of noncompliant individuals are essential for ensuring the appropriate management of any abnormalities. All test results should be recorded in a single database to ensure adequate follow-up.⁷⁶ Retrospective assessment of past system failures allows continual improvement of screening quality. For example, data on the screening histories of all patients with invasive cancer among those eligible for participation in screening programs provide an opportunity to assess whether these cancers occur among screening participants and can help to identify past failures in the screening system. Review of such data can be performed most readily by linking databases from screening and cancer registries. A computer system that integrates information from all parts of the program is necessary, both for routine monitoring and for the rapid identification of weaknesses within a program.³

Summary

Theoretically, organized screening systems have greater potential ability to reduce cancer-related mortality when compared with opportunistic screening. The simple reason for this is that organized systems oversee the elements of a screening program and ensure that these elements are interrelated and interdependent. Although all the elements of an organized system can exist in an opportunistic screening model, the parts are not interrelated, nor are they part of a common system of oversight. Thus, there is a greater likelihood of variability in performance, simply because performance is not monitored by any single individual or institution. At its best, the opportunistic

TABLE 3
Health Care Organization and Provision of Cancer Screening in Five Countries

Characteristic	Country				
	United Kingdom	Sweden	Australia	France	Switzerland
Health care funding	Finances are raised through general taxation. Breast and cervical screening are free at the point of delivery.	Health care is funded by taxes raised at a regional level and is supplemented by the central government and patient copayments. The degree of copayment required varies across counties. Screening is fully reimbursable in some counties but not in others.	The national health insurance program, Medicare, is funded by the federal government. This can be supplemented with private health insurance. Breast screening is free at the point of delivery, and cervical screening is subject to individual copayment.	Public health insurance is supplemented by patient copayment and private health insurance. Those with income below a certain level are covered by an additional insurance program that effectively entitles them to free health care. Therefore, breast and cervical screening may be subject to copayment, depending on income.	Basic health insurance is mandatory and can be augmented by voluntary supplementary insurance. In some cantons, breast screening requires copayment; in others, it is offered for free.
Invitation lists	GP lists	Population register	Screening registers comprise those who have attended for a prevalent screening. Initial invitations for mammography are issued based on electoral rolls. Recruitment into the cervical screening program is achieved through advertising.	National health insurance program lists	Population register
Country-specific issues/problems	GP lists are often inaccurate, particularly in urban areas. The structure of health care in the United Kingdom has recently become decentralized. Although National Screening Committee guidelines can be implemented nationwide, in practice, there is regional variation.	Some counties provide screening coverage to a smaller age range than others and at less frequent intervals because of staff shortages. In addition, two counties have no records of attendance rates for cervical screening, so national coverage rates cannot be calculated. However, a national register of Pap smears is expected to be fully functioning in 2004. Opportunistic cervical screening is free in some counties; in counties where it is not free, it is less expensive than organized screening. Opportunistic screening is therefore effectively promoted, and as a result, women with lower SES may be less likely to attend screening in an organized program.	Call-recall systems are hampered by the lack of an accurate and publicly accessible population register of citizens. Individuals are not required to register with a unique general practice. BreastScreen has been permitted access to the electoral rolls to invite women for mammographic screening, although the list is not current and underrepresents some ethnic groups. ⁷⁷ There is no call system for cervical screening. State-based registers, used for recall in both breast and cervical screening, contain data on women who received a proximal screen.	Public and private health care operate in parallel; opportunistic mammography and cervical screening are widespread. In 2000, 46% of women invited to attend an organized mammography program for their prevalent screen had already received a mammogram. Thus, screening in France is inefficient, and a shift away from opportunistic screening and toward organized screening is needed to achieve optimal efficiency. ⁷⁸	No real public health infrastructure exists at the national or regional (cantonal) level, making the introduction of organized screening programs more expensive. The federal government does not have the resources or the legitimacy to set up nationwide screening, because funding for health care is managed at the cantonal level. An attempt by the Swiss Cancer League to set up an organized, nationwide mammography program in the 1990s failed due to a shortage of funds at the cantonal level and less favorable attitudes toward mammography in German-speaking cantons. Introduction of an organized system for cervical cancer is not planned, because cervical cancer was not among the four priorities chosen by the national program against cancer.

(continued)

TABLE 3
(continued)

Characteristic	Country				
	United Kingdom	Sweden	Australia	France	Switzerland
Breast screening					
Organization	Organized call-recall, QA	Organized call-recall, QA	Organized call-recall, QA	Organized call-recall, QA	Organized call-recall, QA
Coverage	National coverage of all United Kingdom residents registered with a GP	National coverage of all Swedish residents	National coverage of all individuals who live in Australia and are Australian citizens or have a permanent residency visa	Partial coverage (32 of 102 departments); national coverage, available to all residents of France, is expected in 2004	Partial coverage (3 of 26 cantons); plans for national coverage are due for review in 2007
Opportunistic screening activity	Minimal	Minimal, and only in major cities	Moderate	Widespread	Widespread
Cervical screening					
Organization	Organized call-recall from GP lists, QA	Organized call-recall, QA	No call system; organized recall from Pap test register of women who have received at least one Pap test; QA	Pilot schemes only	Opportunistic only (no plans to introduce nationwide program)
Coverage	National coverage	National coverage	National coverage	Only regional coverage as part of organized program, but national coverage is planned	No organized program
Opportunistic screening activity	Minimal; recently estimated that 4% of women had undergone private cervical screening. ⁷⁹	Widespread, but recorded in most county registers to ensure that those not being screened are invited to attend screening as part of the organized program	Little opportunistic screening; all smears are recorded as occurring within the national program (except for a very small percentage of cases in which women choose not to be included in cervical screening register)	Widespread	Widespread
Colorectal screening					
Coverage	Pilot schemes for FOBT and FS	Pilot schemes for FOBT	Pilot schemes for FOBT	Pilot schemes for FOBT	Feasibility studies; national program within 5 years

FOBT: fecal occult blood test; FS: flexible sigmoidoscopy; GP: general practitioner; QA: quality assurance; SES: socioeconomic status; Pap: Papanicolaou.

model is more expensive, less efficient, and more vulnerable to individual failures. Nonetheless, an organized system with inadequate resources may be as poor as or poorer than its opportunistic counterpart. As outlined in the current article and by other authors in the current supplement, the elements of screening are clear, and realizing the potential of screening requires unwavering attention to the rules, roles, and relations inherent in a system. One of the most important lessons learned from the comparison of organized and opportunistic screening is that the organized delivery of preventive services is the more effective public health approach for reducing cancer mortality.

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表1-1. 欧州5ヶ国のヘルスケア組織とがん検診サービスの提供体制

特性	英国	スウェーデン	オーストラリア	フランス	スイス
ヘルスケアの財源	財源は総合課税による。乳がんと子宮頸がんは分娩時無料	ヘルスケアは地方税資金調達を行い、中央政府と自己負担で補填されている。自己負担の程度は各群にわたって多様である。検診の費用払い戻しに関しては、完全に払い戻し可能な群とそうでない群がある。	国民健康保険プログラムメディケアは、連邦政府によって資金供給される。これは民間の健康保険によって補填可能。乳がん検診は出産時無料、子宮頸がん検診は、自己負担が発生する対象である。	公的ヘルスケアは患者の自己負担と民間の健康保険によって補填される。一定額に収入が満たない場合は、追加保険プログラムによってカバーされる。これは事実上、無料のヘルスケアを受け、乳がん検診の権利を享受している。子宮頸がん検診は収入に応じて自己負担が発生する可能性がある。	基本的な健康保険の加入は強制、任意の補足的保険を享受することが可能。いくつかの州では、乳がん検診は自己負担が発生する；その他の州は無料で提供される。
対象者リスト	GPIリスト	登録人口	がん検診の登録は、一般に行われるスクリーニングの参加者から成る。マンモグラフィの最初の対象者選択は選挙人名簿によって行う。子宮頸がん検診プログラムは広告で募集する。	国民健康保険プログラムリスト	登録人口
各国特有の問題点と課題	GPIリストは不正確なことがよくある。特に都市部。イギリスのヘルスケアの構造は近年、分散的になっている。しかし、National Screening Committeeのガイドラインは、全国的に実施できる。実際のところは、地域格差がある。	一部の群では、検診の対象年齢のレンジを他の群に「比べ小さく設定している。また、人員不足により受診間隔も長くなっている。さらに2つの群では子宮頸がん検診の受診率の記録がないため、国全体としての受診率の算出ができていない。しかし、バニコロ一の塗抹検査の全国登録は、2004年に完全に機能する予定である。任意の子宮頸がん検診はいくつかの群では無料、有料の群では組織的がん検診より安価。そのため、任意がん検診は普及している。その結果、社会経済的地位の低い女性には組織的なプログラムでのがん検診にあまり参加しないと考えられる。	call-recallシステムの障害は、正確さと公的にアクセスできない住民登録の不足である。個人は一つの一般診療科に登録することは強制されていない。BreastScreen はマンモグラフィックスクリーニングを女性に勧めるために選挙人名簿にアクセスすることが許可されている。しかし、リストは現在のものでなく、ある民族は過少に見積もられている。子宮頸がんの検診ではcallシステムがない。乳がん、子宮頸がん双方のがん検診でのリコールは、近接部の検診を受けた女性のデータが含まれている。	ヘルスケアは公的と民間と並行して行われている。任意のマンモグラフィと子宮頸がんの検診は全国的に行われていない。2000年では一般検診で組織的なマンモグラフィプログラムの導入がより費用のかかるものとなっている。連邦政府は、州レベルでヘルスケアの資金を運用しているため、全国的な検診の制度を構築するためのリソースや正当性が見い出せない。1990年代のSwiss Cancer Leagueが試みた組織的な全国的マンモグラフィプログラムは州レベルでの資金不足と州内のドイツ語圏のマンモグラフィに対する姿勢が積極的ではなかったことが原因となり失敗に終わった。	

表1-2. 欧州5ヶ国のヘルスケア組織とがん検診サービスの提供体制(各種がん検診)

特性	英国	スウェーデン	オーストラリア	フランス	スイス
1. 乳がん検診					
組織	組織的 call-recall, quality assurance	組織的 call-recall, quality assurance	組織的 call-recall, quality assurance	組織的 call-recall, quality assurance	組織的 call-recall, quality assurance
カバー範囲	国が、GPIに登録している英国居住者すべてをカバーする。	国が、すべてのスウェーデン居住者すべてをカバーする。	国が、すべてのオーストラリア居住者とオーストラリアの市民権をもつ者または永住権のビザを所有する者をカバーする。	部分的カバー(102の内32department) 2004年にフランス居住者すべてをカバーする予定。	部分的カバー(26州の内3州) 国によるカバーに関して2007年に再検討の予定。
任意がん検診活動	最小限	最小限、主要都市のみ	中程度	全国的	全国的
2. 子宮頸がん検診					
組織	組織的 GPIリストで call-recall, quality assurance	組織的 call-recall, quality assurance	callシステムはない; 少なくとも1回 HPV パンコロンの塗抹検査を受けた女性の塗抹検査登録から組織的 call-recall; quality assurance	パイロット事業のみ	任意がん検診のみ(全国的なプログラム導入の計画はない)
カバー範囲	国のカバー	国のカバー	国のカバー	組織的プログラムの一環として地域的なカバーのみ。国のカバーも企画されている。	組織的なプログラムはない。
任意がん検診活動	最小限: 近年4%の女性が民間の子宮頸がんの検診を受けていると推定された。	全国的、ほとんどの郡で、組織的ながん検診の一環としてがん検診が受けられるように検診を受けていない者を登録簿に記載している。	任意のがん検診は少ない; すべての塗抹検査は国のプログラムの中で行われたこととして記録されている。(子宮頸がん検診の登録に含まれない女性の選択は稀なケースとして除く)	全国的	全国的
3. 大腸がん検診					
カバー範囲	便潜血検査とフレキシブルなS状結腸内視鏡検査に関するパイロット事業	便潜血検査のパイロット事業	便潜血検査のパイロット事業	便潜血検査のパイロット事業	予備調査; 5年以内の国のプログラム

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表 2. がん検診の実施体制

	乳がん	子宮頸がん	大腸がん	前立腺がん	肺がん	胃がん	その他
米 国	○* ¹ 40 歳以上	○ 18 歳以上	○ 50 歳以上	○* ² 50 歳以上	×	×	子宮体がん： 閉経時に出血 などあるリス ク者は専門家 に相談するこ と
英 国	○ 50-70 歳	○ 25-64 歳	△* ³ 60-69 歳	×	×	×	
カ ナ ダ	○ 50-69 歳	○ 18-69 歳	×	×	×	×	
フ ラ ン ス	○ 50-74 歳	○ 25-69 歳	○ 50-74 歳	×	×	×	
日 本	○ 40 歳以上	○ 20 歳以上	○ 40 歳以上	▲* ¹	○ 40 歳 以上	○ 40 歳 以上	子宮体がん 症状があり、 本人が同意す る場合に子宮 頸がんを引き 続き行う。

*1 米国がん協会 ACS のガイドラインでは 20, 30 歳代に 3 年ごとの視触診も推奨されている。

*2 米国予防サービス特別委員会での前立腺がんの評価では、推奨するとする十分な証拠はないとしている。

*3 2つの地域でのパイロット調査を行い、2006 年 4 月から 60-69 歳を対象として導入を予定

*4 国の指針では推奨していないが、検診を行っている市町村もある。