Chapter 3

Use of breast cancer screening

Delivery and uptake of screening

This chapter describes breast cancer screening in the Americas, Asia, Europe and Oceania. Screening facilities are lacking in nearly all countries of sub-Saharan Africa (Anim, 1993). Published information from countries of the Middle Eastern crescent does not allow an appropriate description of breast cancer screening studies. Two countries in Oceania (Australia and New Zealand) have organized mammographic screening programmes; other countries have initiated breast cancer screening with varying degrees of organization.

Screening is done differently in countries according to their health care and financing systems and culture. Nevertheless, screening must be organized in such a way as to follow the process illustrated in Figure 27 and described below. The process includes specific types of care and the transitions between them. The types of care include identifying the target population, recruiting them for screening, delivering screening, diagnosing cancer among those with an abnormal screening result and treating those in whom breast cancer is diagnosed. The transitions between these types of care must also be considered, as they affect what services are delivered to whom. Use of letters of invitation to screening and use of media announcements have different effects on the transition to screening. A woman with a positive result in a screening mammogram must be evaluated, and her condition must be diagnosed and treated if necessary. Ensuring that the care is of high quality, that transitions between types of care occur and that women have the best possible outcomes is the challenge in implementing screening.

As shown in the box, organized screening comprises six characteristics: a written policy specifying the target age categories, the method of screening (mammogram, clinical breast examination and/or breast self-examination) and interval; a defined target population, usually for the purpose of inviting women for screening; a management team that is responsible for overseeing facilities where screening occurs and for ensuring that the target population is screened; a clear decision structure and responsibility for health care management; a quality assurance structure, in which data relevant to the evaluation of the screening techniques, facilities and implementation are collected and validated; and a method for identifying whether breast cancer occurs in the target population.

Although organized screening programmes all have common characteristics, they can be defined in many different ways. For example, organized programmes may include policies set at a national or regional level; target populations specified by geographical region, voter registration, national population registries or health care insurance enrolment; management centralized in a national governmental structure, such as in the United Kingdom, spread throughout regional government structures, as in France, or concentrated in a committee of a health plan, such as sometimes occurs in the USA; management of health care by various combinations of physicians, nurses and other care providers, who operate independently or as part of a team; quality assurance by members of the programme management team or independent bodies, using a modified or selected set of measures such as clinical and technical image quality; and identification of cancer cases through national, regional or facility-based registries.

Screening is also conducted outside organized programmes, when it is known as 'opportunistic screening'. This form is the predominant one in the USA but also occurs in other countries outside of

Organized screening programme

- an explicit policy, with specified age categories, method and interval for screening;
- a defined target population;
- a management team responsible for implementation;
- a health care team for decisions and care;
- a quality assurance structure; and
- a method for identifying cancer occurrence in the target population

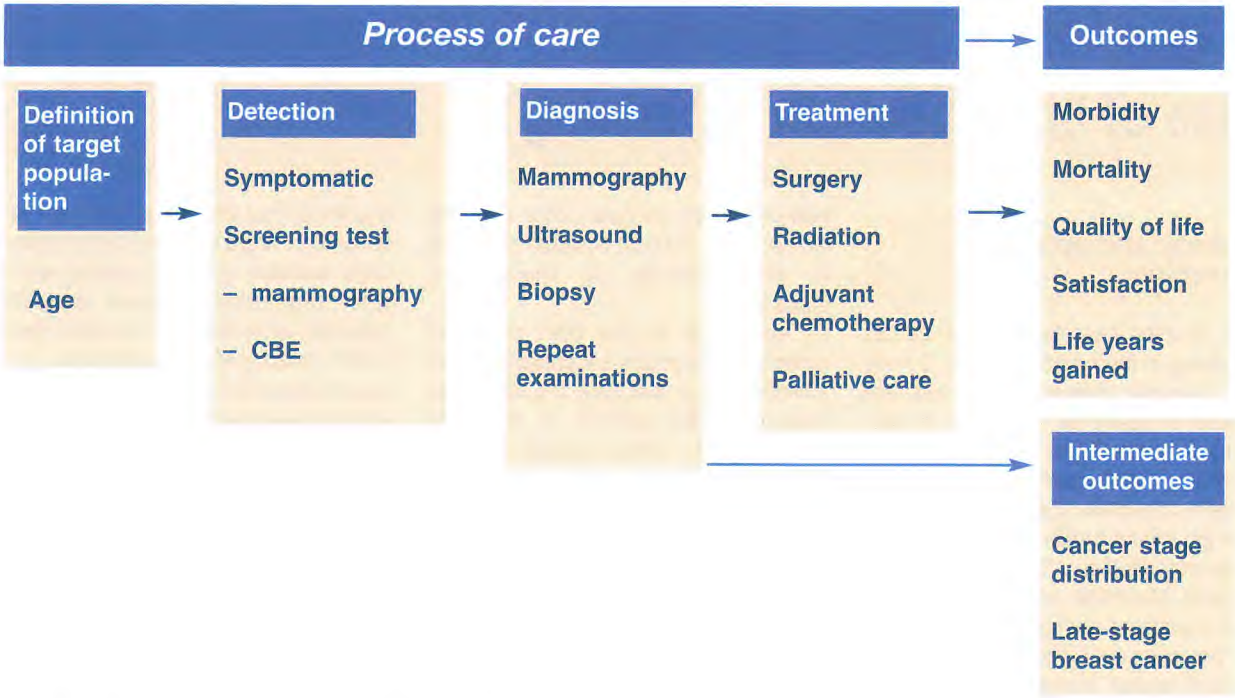

Figure 27 Screening implementation and outcome

programmes. The effectiveness of screening in a country will differ, depending on whether it includes an organized programme targeted at the population at risk and an evaluation of abnormal results on screening mammograms or simply of delivery of high-quality mammography. An evaluation of the impact of screening on populations must therefore take into account the organizational structure through which it is delivered. As noted in Chapter 5, evaluation of the effect of screening in a population is much more complicated than is its evaluation in a randomized trial.

Use of the three screening techniques, mammography, clinical breast examination and breast self-examination, throughout the world is described below. The purpose of screening is to reduce mortality from breast cancer, but that can be acheived only if the techniques are used appropriately. In the context of this chapter, 'use' of screening means the proportion of a population that has had a mammogram during a specified period. The period varies from country to country, depending on the data available, and it is different from 'participation'. 'Participation' is a prospective measure of the proportion of women who receive a mammogram within a specified period.

Table 9 summarizes the organized screening programmes in Australia, Canada, Europe, Israel, Japan and Uruguay. In the text that follows, the information in the table is discussed. For other countries and areas, information is summarized in the text or other tables, as comparable information was not available.

Europe

Breast cancer screening in Europe varies widely. It can include organized national programmes, opportunistic screening, both or neither. The programmes that exist are managed at national or regional level or are only pilot efforts. Mammography is the commonest screening test and may be associated with clinical breast examination. One or two views are offered every 1, 2 or 3 years. Double reading is generally done, and the age of the target population varies from 40 to 74 years, although most European countries emphasize the 50–69 age category. Mammography facilities can be centralized, as are quality control systems, the registration of data and evaluation.

How screening is delivered

Table 10 includes 19 European countries (del Moral Aldaz *et al.,* 1994; Moss *et al.,* 1995; Giordano *et al.*, 1996; Shapiro *et al.*, 1998b; Mammography Screening Evaluation Group, 1998; Ballard-

Table 9. Organized mammography screening programmes and services

Screening	Country	Year implemented (year nationwide)	Number of programmes	System	Detection method	Cancer registry available
Nationwide	Australia	1991	1	PC	M	Yes
	Finland	1986 (1989)	1	C	M	Yes
	France	1989 (2002)	32 (100)	PC	M ± CE	Yes[a]
	Iceland	1987 (1989)	1	C	M + CE	Yes
	Israel	1997	1	C	M	Yes
	Luxembourg	1992	1	PC	M + CE Yes	
	Netherlands	1989 (1997)	1	PC	M	Yes
	Sweden	1986 (1997)	27	PC	M	Yes
	United Kingdom	1988 (1996)	1	PC	M	Yes
Regional	Austria	1999	2	C	M	
	Belgium	1989/1992	2	D	M ± CE	No
	Canada	1988	10	PC	M+ CE + BSE	Yes[a]
	Denmark	1991–1993	2	C	M	Yes
	Ireland	1989	1	C	M	No
	Italy	1985–93	15	D	M± CE	Yes[a]
	Norway	1996	1	PC	M	Yes
	Portugal	1990	1	PC	M	Yes[a]
	Spain	1990	4	C	M	Yes[a]
	Switzerland	1999	3	D	M	Yes[a]
Pilot	Greece	1989	2	PC	M + CE +BSE	No
	Germany	1999	3	C	M	No
	Hungary	1991	1	C	M + CE	No
	Japan	1999	1	C	CE+ BSE	Yes
	Uruguay	1996	1	C	M+CE +BSE	Yes[a]

From: Del Moral Aldaz *et al*. (1994); Moss *et al.* (1995); Giordano *et al.* (1996); Mammography Screening Evaluation Group (1998); Shapiro *et al.* (1998a); Ballard-Barbash *et al*. (1999); de Landtsheer *et al*. (2000); Klabunde *et al.* (2001a); de Wolf (2001); Autier *et al*. (2002)

PC, partly centralized: national policy, local implementation protocol; C, centralized: common policy and implementation protocol; D: decentralized: different policies

M, mammography; CE, clinical examination; BSE, breast self-examination

[a] Regional population-based cancer registry overlapping with breast screening programme.

Barbash *et al*., 1999; de Landtsheer *et al.*, 2000; Klabunde *et al.*, 2001a; de Wolf, 2001; Autier *et al.,* 2002). In nine countries, the scope of the programme is intended to be national, although complete implementation has not been achieved in all (Table 9).

The first organized programmes were begun in 1986–89 in the Nordic countries and the United Kingdom (Shapiro *et al.*, 1998a). Within the framework of the Europe Against Cancer programme, a European network of pilot projects for breast cancer screening was begun in 1986 (de Waard *et al.*, 1994). Pilot projects were established in France, Greece, Ireland, Portugal and Spain and later in Denmark, Germany, Italy and Luxembourg. These pilot projects were initially funded by the Commission of the European Communities, and most were

Table 10. General characteristics of organized screening programmes

Country	Age of screened population	Population access (%)[a]	Participation rate (1988) (%)[b]	Assessment of sensitivity[c] of programme	Interval (years)	No. of views (first, subsequent)	Financing
Australia	40–69	75–100	54		2	2, 2	
Finland	50–59 –(69)[d]	100	89	Yes	2	2, 2	GT + PT
Iceland	40–69	100		Possible	2	2, 1	
Israel	50–74	70			2		
Luxembourg	50–65	98	56	Possible	2	2, 2	PT
Netherlands	50–69 –(74)[d]	75–100	81	Possible	2	2, 1	GT
Sweden	40/50 –69/74	100	81		1.5[e] /2	2, 1	GT + S
United Kingdom	50–64	100	76		3	2, 1	GT
France	50–69 (74)[d]	30	50 (17–60)	Yes	2	2, 2	GT + PT + C
Austria							Mixed
Belgium	50–64/69	< 25	28	No	2	1/2, 1/2	PT
Canada	50–69	< 25			2		GT
Denmark	50–69	18	71	Yes	2	2, 1	GT
Ireland	50–65	< 25	62			2, 1	GT, Pr
Italy	50–69	< 25	64 (46–72)	Yes	2	2, 1	GT + PT
Norway	50–69	40	79	Yes	2	2, 2	PT
Portugal	≥ 40	25–50	34	Possible	2	2, 1	GT + PT
Spain (Navarra)	45–64	< 25	85	Yes	2	1, 1	GT + PT
Switzerland	50–69		50	Possible	2	All	GT, Pr
Greece	40/50–64	< 25	40	Yes	2	2, 2	GT + PT
Germany	≥ 50	2		Yes	1	2, 2	S (80%) + Pr
Hungary	50–64				1	2, 2	
Japan	≥ 30	30	15	Possible	1	1 1	GT + S
Uruguay	≥ 45	20		Possible	2		PT

From: del Moral Aldaz *et al.* (1994); Giordano *et al.* (1996); Ancelle-Park *et al.* (1997), Ancelle-Park & Nicolau (1999); Mammography Screening Evaluation Group (1998); Shapiro *et al.* (1998a); Ballard-Barbash *et al.* (1999); Dean & Pamilo (1999); National Health Service Breast Screening Programme (2000); de Landtsheer *et al.* (2000); Klabunde *et al.* (2001a,b); Fracheboud *et al.* (2001a); de Wolf (2001); Wang *et al.* (2001); Autier *et al.* (2002)

GT, general taxes; PT, pay-roll taxes; S, self-pay; C, charity money; Pr, private insurance

[a] Proportion of national population of eligible women who have access to the programme

[b] Proportion screened

[c] As defined in Chapter 1

[d] Modified some years after implementation, or for women already in programme

[e] For women aged 40–50

later transformed into regional or national programmes financed by the country's health system. The Netherlands and the United Kingdom did not propose projects for the network as their nation-wide programmes were ready to be implemented; however, they were represented in the network and served as experts for other countries. Specific guidelines were prepared by a specially appointed working group, some of them in each of the official languages of the European Union (Day *et al.*, 1989; Kirkpatrick *et al.*, 1993; de Wolf & Perry, 1996; National Health Service Breast Screening Programme, 1993, 1997, 1998). The guidelines were designed to help standardize procedures, increase quality assurance and improve reporting of results. A consultant visited all pilot centres. Screening performance and

Breast cancer screening in Europe

- Most European countries have established nationally or regionally organized programmes, although many administer screening facilities regionally.
- Most emphasize screening women aged 50–69.
- Almost all include invitation to mammography every 2 years, and some include clinical breast examination of participants.
- The number of screening views used in practice is reduced from two to one after the initial screening.
- The proportion of women who have been screened in organized screening programmes varies. Most programmes have intermediate to high rates of use (50–89%).
- In all the organized European programmes, the main indicators of performance and effectiveness can be estimated, but with a wide variety of methods, periodicity and precision.

quality assurance were defined and standardized. With the exception of France and Luxembourg, none of the countries involved in the network had begun nationally organized programmes.

The type of delivery system is directly related to the country's health care system. In countries with health care systems supported mainly by the national government, screening is centrally organized and distinct from the delivery of general medical care. Opportunistic screening is relatively rare, and the screening tests are provided in distinct, fixed or mobile specialized units. Mammography is always offered and is sometimes complemented by clinical examination. The programme is administered at either national or local level. When the health care system is both public and private, screening is done in the context of general medical care, screening tests being provided either in specialized structures or in centres such as private radiological units. In the latter system, the role of the national government extends from no plan to strictly regulated programmes that follow guidelines, professional and structured accreditation, regulations, laws and continuous evaluation.

In organized programmes, whatever the type of organization, direct mail invitations are generally sent to women in previously defined age groups, offering them free screening. The requirement for an up-to-date list and recall system has been met more or less, except in Germany. Publicity campaigns through media advertising, pamphlets, newspapers, radio and television and referrals from general practitioners are frequently used with the mailings. In only two countries are media campaigns and direct referral the only recruitment tool. Physicians' referrals facilitate appropriate follow-up of a positive result.

Of the 19 European programmes described in Table 10, only four recommend beginning breast cancer screening at the age of 40, one (Spain, Ascune *et al.*, 1994) at the age of 45 and 14 at the age of 50. Much greater variation among countries is seen with respect to the upper age limit, which varies from 59 to 74; 10 programmes have set this limit at 69 years and three (the new French national programme, The Netherlands and Sweden) at 74 years.

The screening interval for women over 50 years of age is 2 years in almost all the programmes and once a year for women under the age of 50 and for those with a family history of breast cancer. In the United Kingdom, women aged 50–64 are offered screening every 3 years. All countries except Belgium and Spain require two views at the initial mammography (some countries recently modified their policy from one view to two to increase the sensitivity of the test). Furthermore, seven programmes require two views at both the initial and subsequent screening.

Expert radiologists recommended double reading of mammograms to improve the quality of the interpretation, and doing so increases sensibility and specificity (McCann *et al.,* 1997; see Chapter 2). Many programmes have implemented this procedure for all screens, Iceland for 95% of cases, France (in its new programme) only for women with a negative result after the first reading and the United Kingdom in 80% of screens. Each programme in which double reading is used has an established policy for arbitration of discordant interpretations.

The results, whether positive or negative, are always sent to the woman, except in Luxembourg where a notice is sent only to the referring physician. In half the countries, the results are not sent to the physician.

In order that women obtain the maximum benefit from a breast cancer screening programme, an accurate recall system must be in place to avoid losing women to follow-up after an abnormal result. All programmes except the Danish one are responsible for ensuring the follow-up of women with a positive result. The follow-up includes full assessment for diagnosis,

biopsy and treatment when necessary. In all programmes, there is reporting on the collection of data, computerized or not, and on the results of additional diagnostic procedures and cancers detected at screening.

Financing

Screening mammography is offered free in some countries, and in others it is reimbursed either by the government or by the health insurance system. The organization is funded from various sources: the government (general tax), public or private insurance (payroll tax), research funds (Europe Against Cancer) and charity funds (de Wolf, 2001). Table 10 shows that there is a mix of approaches. Money from taxes covers the financing of the administration of centres and direct delivery of care (i.e. radiologist and mammography fees).

Extent of use and access

As noted in Table 10, access and participation vary by country. The availability of organized screening varies widely, from 2% in Germany to 100% in Finland, Iceland, Sweden and the United Kingdom. The Netherlands reported 75–100% access, and Luxemburg, 98%. The proportion of women who receive a mammogram when it is recommended (participation) also varies widely, from very high rates of 89% in Finland to 28% in Belgium. Levels of overall use by country are not recorded systematically.

Methods for assuring quality

Several factors in a screening programme are expected to contribute to reducing mortality from breast cancer, such as the participation rate of the targeted population, the quality of the radiological process, the follow-up of women with abnormal results, the quality of the diagnostic procedures and initial treatment. Several initiatives have been made to develop and promote quality assurance standards, and guidelines have been published, such as those sponsored by the Europe Against Cancer Programme (de Wolf & Perry, 1996). Most European countries have implemented quality assurance by following the European guidelines (Perry *et al.*, 2001) or national guidelines. Quality assurance programmes include external controls and technical, process and outcome components (Donabedian, 1980; Klabunde *et al.*, 2001a). In Europe, breast screening programmes include extensive quality assurance and quality control components with regard to mammography but little control of the whole screening process.

External controls for quality assurance involve laws, mandatory or voluntary accreditation and surveillance and evaluation, including site visits and mandatory data collection (Table 11). Differences in external controls are linked to the type of programme, but the organization of quality assurance does not necessarily reflect the organization of the programme. Quality assurance of national breast screening programmes is more likely to be based on legislation or require mandatory accreditation of screening facilities (National Health Service Breast Screening Programme, 1998), but regionally organized programmes may include a national quality assurance programme, as in Norway and Sweden. In at least 14 countries, a special committee is appointed to control data on quality regularly, but the periodicity of their meetings varies from every week to once a year. Six countries have national laws for quality assurance, and they apply to all mammography units. Accreditation processes for cytology and pathology also exist in six countries. Periodic site visits to radiological units are organized in 13 programmes at various intervals, and external audits and guidelines exist for pathological units in six countries (National Health Service Breast Screening Programme, 1993, 1997).

Technical quality control of radiological equipment and procedures is the baseline of all the breast cancer screening programmes. Regular monitoring of mammography facilities and films, including processor sensitometry, screen–film contact, beam collimation and automatic exposure was reported for most programmes (Bassett *et al.*, 1994a). Cassette cleaning, tube voltage accuracy and reproducibility and beam quality were measured regularly in all programmes. One or two countries do not routinely perform other tests, such as for developer temperature, phantom image quality, compression force, film viewing conditions and beam entrance exposure. Some tests are not performed everywhere (Hendrick *et al.*, 2002). All programmes have a requirement for documentation of the policy and procedure for breast positioning, but five did not require documentation for women with breast implants. Qualifications and experience were mandatory for radiographers and radiologists in seven programmes, and training was required in 15.

Quality control of pathological laboratories is less common than quality control of radiological equipment and training. Only six European countries require accreditation for cytology and pathology laboratories, and regular site visits are made in only six programmes (Table 11).

The process components comprise (Donabedian, 1980; Klabunde *et al.*, 2001a):

- monitoring of invitations to women (not performed in four programmes);
- monitoring of mammography procedures (double view, double reading, standardized reading and report) generally at periodic site visits;
- monitoring of notification of results to women and/or the referring physician (means of communication, time), mentioned in all the programmes; and
- assessment after abnormal results according to specified policies (not included in quality control activities in only three programmes).

Table 11. Organization of quality assurance in breast cancer screening programmes

Country	Organizational level	Quality assurance committee	External controls		
			Radiological units: A/site visit	Guidelines[a]	Pathology laboratory: A/site visit
Australia	National	4/year	Yes / Mandatory	National	Yes / Yes
Finland	National	No	No / Mandatory	National	No / No
France	National	Varies	Yes/ Mandatory	European	No / Yes
Iceland	National	No	Yes / Mandatory	National	No / No
Israel	National	2/year	Yes / Mandatory	National	No / No
Luxembourg	National	Monthly	Yes / voluntary	European	No / No
Netherlands	National	4–6/year	Yes / Mandatory	National	Yes / Yes
Norway	National	2/year	No / Mandatory	National	No / No
Sweden	National	2/year	Yes / No	National	Yes / No
United Kingdom	National	2/year	No / Mandatory	European	No / Yes
Canada	Regional	Varies	Yes / No	National	No / No
Belgium	Facilities	No	No / Mandatory	European	No / No
Denmark	Regional	6/year	No / No	European	Yes / No
Ireland	Both	4–6/year	Yes / Yes (?)		No / No
Italy	Regional	Annually	No / voluntary	European	No / No
Portugal	Regional	Weekly?	No / voluntary	European	Yes / No
Spain	Regional	Weekly?	No / Mandatory	European	No / Yes
Switzerland	Regional		Yes/ Mandatory	European	
Greece	Regional	4/year	No / Mandatory	European	Yes / Yes
Germany	Both	2/year	Yes / Mandatory	European	No / Yes
Hungary	Regional	4/Year	No / No	National	Yes / No
Japan	Regional	No	No	National	Yes / No
Uruguay	Facilities	Monthly	Yes / Mandatory	American College of Radiology	Yes / No

From Chappelon and Jestin (1998); Mammography Screening Evaluation Group (1998); Ballard-Barbash *et al.* (1999); Dean and Pamilo (1999); de Koning (2000a); National Health Service Breast Screening Programme (2000); de Landtsheer *et al.* (2000); Fracheboud *et al*. (2001b); Klabunde *et al*. (2001a, b); Wang *et al*. (2001); Autier *et al.* (2002); Hendrick *et al*. (2002)
A, one or regular accreditations
[a] Guidelines for quality control

A time limit for diagnosis assessment is defined and monitored in nine programmes and varies from 1 week to 1 month. Few programmes define a minimum percentage of abnormal results that should lead to fine-needle aspiration, core biopsy or open biopsy.

Quality assurance in data collection is based on recommendations about the type of data needed and the management of the data while maintaining confidentiality (Klabunde *et al.*, 2001b). Nearly all programmes have computerized systems for: identification of eligible women, screening mammography test results, follow-up of women with abnormal results, results of diagnostic procedures, cancers detected at screening and treatment outcomes. Linkage to a population-based cancer registry was reported for all but three programmes. In half the programmes, the staff collecting data receive training. Standardized definitions (national or international) and coding manuals are generally used.

Performance indicators

Performance measures (Sancho-Garnier, 1993; de Koning *et al.*, 1995b; Moss

et al., 1995; van den Akker-van Marle *et al.*, 1999; Blanks *et al.*, 2000; de Koning, 2000a) reflect activities ranging from the process of care (participation rate, recall rate) to outcomes (cancer detection, interval cancer rate) (Table 12). Eleven programmes specify a maximum recall rate (based on both technical and additional imaging for diagnosis), varying from 2% (Netherlands) to 8% (United Kingdom) for the initial screening test and from 1% to 7% for subsequent examinations.

Screening performance indicators are used in all the programmes, whatever the type of organization. The most commonly estimated indicators in the initial and subsequent rounds (Table 12) are: the participation or uptake rate, the recall rate, the positive predictive value of imaging, the positive predictive value of biopsy, the benign:malignant ratio, the cancer detection rate, the percentage of screen-detected DCIS, the tumour size and the percentage of node involvement. The interval cancer rate and incidence can be estimated when a population-based registry is linked with the programme, and these allow an estimate of the sensitivity of the programme. Mortality data are available for all programmes.

Some programmes, like those in The Netherlands and the United Kingdom, allow identification of other indicators, taking into account the entire targeted population, like overall sensitivity and specificity, impact and costs. Those countries can estimate such indicators because they have a longer experience in screening and greater ease in collecting the necessary data because of the national health system and more flexible confidentiality laws.

The entries in Table 12 show that the programmes are variable, reflecting factors such as the epidemiology of the disease in the country, the characteristics of the programmes (target, procedures, data processing, quality) and the way in which the estimate was made (numerators and denominators used). Such indicators should be interpreted with caution in view of the differences in the programmes and operational definitions.

Americas

This section summarizes the available data on the delivery of screening services in Canada, Latin America and the Caribbean and the USA. The breast cancer screening techniques used in the regions reflect the differences in health care delivery systems and cultural, political and economic realities. The type of organization varies from the comprehensive breast cancer screening programme of Canada, through the provider-based screening funded from work-based and federal insurance plans in the USA to the mixture of the two in Latin America and the Caribbean. There has been growing interest in mammography during the past decade, with heavy documented use in North America, where nearly 80% of women aged 50–69 have had at least one mammogram. Clinical breast examination is also used, but the use is not well documented. Summaries of how screening is organized, financed and reviewed for quality and the level of screening achieved in the three regions are summarized below.

How screening is delivered

Canada

Organization

In Canada, breast screening is offered within a national programme but also outside the programme (opportunistic screening) (Minister of Public Works and Government Services Canada, 1999). Organized breast screening programmes are now operational in each province, which are responsible for health care in Canada. The programmes began gradually, on the basis of a recommendation of a national workshop in 1988 (Workshop Group, 1989). Women in defined age groups receive direct invitations by post for free mammography screening. All the programmes include women aged 50–69, and most accept women in their 70s but do not actively seek their participation. Throughout the history of the Canadian national programme, women aged 40–49 were actively recruited only in British Columbia, but that was abandoned in 2000. Although women aged 40–49 are not actively recruited in the programme, young women are not turned away if they seek screening, and they are then offered annual re-screening.

Mammography

Two-view (cranio-caudal and mediolateral–oblique) mammography is offered every 2 years in all programmes. Five also offer clinical breast examinations, in two programmes by a nurse, in two by a technician and in one by either a nurse or a technician. The latest report on the programmes is available at www.hc-sc.gc.ca/hpb/lcdc/publicat/obcsp-podcs98/.

Opportunistic screening for breast cancer consists of examinations by private radiologists outside the provincial programmes. Women may be referred to a radiologist for a mammogram by their family physician or go by themselves.

Clinical breast examination

Family physicians are expected to offer clinical breast examination as part of annual physical examinations. They may refer women for mammography at that time, but they also refer women without a physical examination.

Breast self-examination

Breast self-examination is promoted by the Canadian Cancer Society and by other groups interested in women's health; however, it is often poorly performed, and special instruction is rarely given, except in special projects (Baines & To, 1990).

Breast cancer screening in Canada

- Canada has a nationally organized programme that is financed and delivered by provincial organizations. Care is monitored within the programmes, but use and performance outside the programmes are not routinely monitored or reported.
- Two-view (cranio-caudal and mediolateral–oblique) mammography is offered every 2 years in all programmes; five also offer clinical breast examination.
- Mammograms are submitted to quality control in facilities involved in the provincial programmes on the basis of standards adopted by the Canadian Association of Radiologists. Performance is also monitored, but the results are not published.
- Ever having had a mammogram was reported by 79% of respondents to a national survey of women aged 50–69, 54% within the previous 2 years.

Financing

Mammography is offered free within the national programme according to its guidelines. Those who seek opportunistic screening are reimbursed for the mammogram through provincial health scheme funding, so that the woman need not pay at the time of the examination.

Latin America and the Caribbean

Organization

Health services and systems for screening vary widely across the region, from universal coverage in Cuba to a highly fragmented system in Paraguay. The degree to which any country can offer breast cancer screening is contingent on the financing scheme and the local availability of expertise. Typically, most specialized physicians remain in the largest cities, limiting access or the possibility of organizing a screening programme. In decentralized systems, decisions about the content and type of services offered are left to the provider, who is often responsible for either a geographically defined population or subscribers.

Recommendations on how screening should be done also vary widely. In order to regulate multiple providers and decentralized services, governments issue specific guidelines, some of which have legal status, as in the case of Mexico and Colombia. However, many ministries of health have no mechanism for guaranteeing implementation of or monitoring compliance with recommendations for breast cancer screening (PAHO, 1998). Reviews in 1998 and 2000 showed that 11 of 23 countries reported having official guidelines (Robles & Galanis, 2002). Three countries, Argentina (Argentina Ministry of Health, 2001), Mexico (Secretariat of Health, 2000) and Costa Rica (Costa Rica Ministry of Health, 2000), updated their guidelines during 2000–01. Table 13 summarizes the guidelines in 11 countries.

Mammography

Mammography is offered by clinics at the secondary level of care in most countries, but there are many private mammography services, which charge the full cost of the test. In Argentina, 81% of women identified a gynaecologist as the person who ordered a mammography, which implies attending a specialized service (Mejia *et al.*, 1999). Mammography is recommended in all countries except Colombia. Two countries, Bolivia and Cuba, recommend mammography as early as 25 and 30 years of age, respectively, and three others, Ecuador, Mexico and Panama, start mammography in women aged 40. In Argentina, although the basic target group is women aged 50–70, the guidelines indicate that, if the resources are available, screening by mammography can be begun at the age of 40 and extend through 74. In addition, the guidelines of Argentina and Costa Rica indicate that screening of women who have a first-degree relative who had breast cancer can begin at 35 years of age in Argentina and 40 in Costa Rica, or 10 years earlier than the age at which cancer was diagnosed in the relative. In Mexico, if a woman has two or more risk factors, she may be screened from the age of 40; however, the risk factors are not named. Mammography is recommended every 2 or 3 years, except in Ecuador, Panama and Uruguay, where annual screening is advised. In several countries, private clinics and radiologists advertise mammography services for a fee, to which women do not need referral.

Table 12. Performance indicators for breast cancer screening programmes

Country and indicators	Period	Participation (%)	Recall rate (%)	PPV of surgical biopsy[a]	Invasive cancer		Reference
					Detection rate per 1000	Screen-detected DCIS (%)	
Finland	1987–97						Dean & Pamilo (1999)
All screens (age 50–59)		88	3.3	33–66	3.7	11	
Initial screens		88	4.5		4.7		
Subsequent screens		89	2.3		2.2		
Netherlands	1993						de Koning *et al.* (1995a) Fracheboud *et al.* (1998)
All screens		78					
Initial screens		79	1.3	50	6.5	14	
Subsequent screens		77	0.7	54	3.5		
Sweden							Thurfjell & Lindgren (1994; Uppsala 1988–89); Lenner & Jonsson (1997; Nordbotten, 1991–93)
All screens	1988–89						
Initial screens (n = 2)	1991–93	87–89	4.6–2.1	53–42	4.8	11	
Subsequent screens		78–84	5.7–1.8		4.8		
United Kingdom	1998–99						National Health Service Breast Screening Programme (2000)
All screens, age ≥ 50		76	5.4		6.2	22	
Initial screens, age 50–64		74	8.2		5.2	19	
Subsequent screens		87	3.9		4.3		
France[b]	1989–97						Ancelle-Park & Nicolau (1999)
All screens		50					
Initial screens		37	7.7	52	5.5	14	
Subsequent screens (n = 18)		40	4.4	64	4.2	14	
Denmark[c]	1991–95						Mammography Screening Evaluation Group (1998)
All screens							
Initial screens (n = 2)		71–88	6.8–2.7	60–74	12–9.8	12–16	
Subsequent screens (n = 1)		69	4.6	70	6.4	8	
Italy	1994						Giordano *et al.* (1996)
All screens							
Initial screens (n = 15)		32–72	1.6–8.4		3.8–11	5.1–17	
Subsequent screens (n = 6)		59–88	1.8–6.7		4.4–6.3	5.9–23	
Norway	1996–97						Wang *et al.* (2001)
All screens							
Initial screens		80	4.2	74	6.7	20	

Table 12 (contd)

Country and indicators	Period	Participation (%)	Recall rate (%)	PPV of surgical biopsy[a]	Invasive cancer		Reference
					Detection rate per 1000	Screen-detected DCIS (%)	
Spain (Navarra)[d]	1990–94						van den Akker-van Marle *et al.* (1997)
All screens							
Initial screens		85		44–64	5.9		
Subsequent screens		86		70–78	2.9		
Germany (Aurich and Brunswick)	1990–93						Robra *et al.* (1994)
All screens			4.8	34	3.3		
Initial screens			5.1	34	3.4	14	
Belgium (Flemish region)	1989–92						van Oyen & Verellen (1994)
Initial screens		28	4.1	52	2.9	30	
Ireland	1989						Codd *et al.* (1994)
Initial screens		62	4.2	50	7.2	12	
Portugal[d]	1986–90						
Initial screens		35	13–2.3	64	1.1–3.2	17–20	Rocha Alves *et al.* (1994)
Greece (southern)	1989						Garas *et al.* (1994)
Initial screens		51	5.5	47	3.9	3.5	

PPV, positive, predictive value; DCIS, ductal carcinoma *in situ*
[a] Referral or performed
[b] Results from 26 regional programmes for initial screening and 18 for subsequent screening
[c] Copenhagen 1991–93 and Fyns 1993–95
[d] Age 45–65

Clinical breast examination

In general, primary care providers are expected to conduct clinical breast examination and teach breast self-examination, if recommended. The extent to which this actually occurs is unclear and varies by country. In Mexico, guidelines were developed by consensus among all institutions that provide health care, of which the main ones are the Secretariat of Health and the Mexican Institute of Social Security; others include the Social Security and Services Institute for State Workers, several Army services and nongovernmental organizations. In principle, this means that all these institutions guarantee implementation of the guidelines and coverage of services at minimum cost to women. In Colombia, where there is a highly decentralized system, insurers must offer a basic package of preventive services, which include clinical breast examination. Brazil's '*Viva Mulher*' programme includes cervical and breast cancer screening by municipal and State departments of health, coordinated by the National Cancer Institute. In Argentina, clinical breast examination is recommended with mammography and not separately. Uruguay has a screening programme based on clinical breast examination for women aged ≥ 30 (Ministerio de Salud, 2000) and also recommends mammography after the age of 50. Clinical breast examination is also the main method of screening for breast cancer in Chile (Ministerio de Salud, 1998) and is recommended for women aged 35–64 every 3 years,

Table 13. Guidelines for breast screening in 11 Latin American countries

Country	Breast self-examination		Clinical breast examination			Mammography		
	Recommended	Age	Recommended	Age	Frequency	Recommended	Age	Frequency
Argentina	No	–	Yes	50–70	Yearly	Yes	50–70	2 years
Bolivia	Yes	15–75	Yes	25–75	Yearly	Yes	25–75	2 years
Chile	Yes	≥ 35	Yes	35–64	3 years	Yes	50–74	3 years
Colombia	No	–	Yes	–	NR	No	NR	–
Costa Rica	No	–	No	–	–	Yes	50–70	2 years
Cuba	Yes	≥ 30	Yes	≥ 30	Yearly	Yes	30–49	2 years
							50–65	2–3 years
Ecuador	Yes	≥ 12	Yes	≥ 12	Yearly	Yes	40–49	2 years
							≥ 50	yearly
Mexico	Yes	≥ 12	Yes	≥ 25	Yearly	Yes	≥ 40	2 years
Panama	Yes	≥ 20	Yes	20–59	Yearly	Yes	≥ 40	Yearly
Uruguay	Yes	≥ 30	Yes	30–39	3 years	Yes	50–64	Yearly
				40–65	Yearly			
Venezuela	Yes	12–64	Yes	35–74	Yearly	Yes	NR	NR

NR, not reported

in conjunction with a Pap smear; mammography is being introduced in a second phase. Screening by clinical beast examination is begun for girls of 12 years of age in Ecuador and for women aged 20 in Panama and 25 in Bolivia and Mexico.

Breast self-examination

Most countries, except Argentina, Colombia and Costa Rica, recommend breast self-examination. In addition, several externally funded family planning programmes have introduced teaching of breast self-examination as part of women's health packages. As shown in Table 13, there is no consistency about the age at which women are supposed to start practising breast self-examination.

The age range or frequency of screening is not related to the incidence of or mortality from the disease in the various countries or with the resources of the health care system. In fact, countries with low mortality rates from breast cancer, such as Ecuador, recommend screening by breast-self examination and clinical breast examination at menarche. Most notably, the guidelines of many countries are clearly not based on evidence.

Financing

In general, countries that have developed guidelines for breast cancer screening offer the test at no cost, and it is incorporated in health care delivery systems by a range of financing mechanisms, including health insurance, social security and government revenues. Financing is not universal. In Trinidad and Tobago, a country with one of the highest rates of mortality from breast cancer in the region, high cost was the main reason cited by women for not having had mammography (Modeste *et al.,* 1999). Chile has a dual system of financing, with a minimum of 7% of income contributed by individuals. Part of the system is run by the State and approximately 30% by private insurers, which charge more than the minimum rate, on the basis of individual risk. Public health clinics are offered incentives if they perform periodic health examinations that include screening for cancers of the cervix and breast.

In most countries, the main problems arise when diagnostic work-up and treatment are required. Several countries do not cover the full extent of services or have cooperative payment schemes. Policy-makers in developing countries regard breast cancer control as expensive, but a study in São Paulo, Brazil, suggested that the total national cost of case management of breast cancer is US$ 1646 per case (Arredondo *et al.*, 1995). The cost of breast cancer management consists of 30% for human resources, 7.8% for diagnostic services and 43% for treatment. Although no data on the cost of services for breast cancer control were available for other

countries, a study in Jamaica showed that 50% of cancer patients had to forego treatment because of an inability to pay (Henry-Lee & Yearwood, 1999). In several Caribbean countries, screening services are available but treatment has to be sought elsewhere, even at Government expense. Three countries, Argentina, Chile and Mexico, have information systems that allow monitoring of follow-up and mechanisms to ensure that women with positive results at screening undergo diagnostic work-up and treatment. Although the Costa Rican guidelines do not address this component of the programme, the social security system offers full coverage for diagnosis and treatment, and the population-based cancer registry has national coverage. Cuba, Uruguay and Venezuela can also provide full follow-up. Assistance for non-medical costs comes from the nongovernmental sector in many countries.

Collateral financing

In several countries, cancer care is provided through a public–private partnership, with strong participation from the nongovernmental sector and volunteer organizations. In Ecuador, a country that spends only 5.3% of its gross national product on health, a law mandates that 0.1% of credit transactions be assigned to cancer control by the 'Society against Cancer'. Although the Government participates, the Society is in essence a nongovernmental organization, with semi-autonomous chapters based in major cities. In Brazil, the Ministry of Health has delegated the cancer control programme to the National Cancer Institute. A non-profit foundation channels resources to the Institute, thus maintaining high standards of care. In its preventive programme, the Institute, in turn, works through State and municipal health services. Its breast cancer screening programme is expected to reach all the population at risk of Brazil. Costa Rica, although it has a social security system covering nearly 90% of the population and devotes 8.5% of its gross national product to health, funds its national cancer institute through a lottery. As stated above, guidelines were developed recently and a cancer control department created within the Social Security system. Implementation of the programme is in the initial stages. In all cases, most of the income generated is spent on curative services. This financing scheme, which other countries are emulating, allows for expansion of the available resources and provides an opportunity for introducing preventive services.

USA

Organization

Health care providers in the USA offer clinical breast examination, mammography and teaching of breast self-examination to screen for breast cancer. As reflected in Table 14, there is disagreement on how those techniques should be used, although all groups recommend mammography at some interval among women aged 50–64. No single group in the USA establishes the national standard.

Mammography

Mammography is almost always done in a facility that offers an array of radiology services, although those services may occasionally be provided by a primary care practice, a mobile unit or a specialized centre. Facilities that seek reimbursement for the procedure from the Federal Government must meet specific requirements, including use of qualified radiologists and technicians, use of dedicated mammography equipment that produces high quality images and record keeping (Food & Drug Administration, 1997).

Clinical breast examination

Most clinical breast examination is provided by primary care providers during a complete physical examination or at the time of a woman's health examination which includes a Pap smear and pelvic examination. Breast self-examination instruction is exceptionally provided during the visit. There are no organized programmes of screening based on geographic

Table 14. Guidelines for breast screening in the USA

National group	Age group	Clinical breast examination	Mammography	Breast self-examination
Preventive Services Task Force	40–49	No recommendation	Every 1–2 years	No recommendation
	50–69	Annually	Every 1–2 years	No recommendation
	≥ 70	No recommendation	No recommendation	No recommendation
American Cancer Society	40–49	Annually	Annually	Monthly
	50–69	Annually	Annually	Monthly
	≥ 70	Same as above; cessation based on morbidity		

Breast cancer screening in Latin America

- Mammography is available on demand in Latin America. Nonetheless, the national policies are not always based on available scientific evidence.
- Organized breast cancer screening programmes have been attempted in Uruguay, with clinical breast examination and mammography.
- The mortality rates from breast cancer in Argentina and Uruguay are as high as those in industrialized countries, and the trend continues upwards.
- In Jamaica, 50% of cancer patients had to forego treatment as they were unable to pay.

region, although some programmes exist within organized health plans (Rimer *et al.*, 1988; Taplin *et al.*, 1997). Most women are first screened by clinical breast examination and then referred for mammography. Women must take the initiative to schedule a visit with their primary care provider, although some health plans send reminders to schedule that examination or a mammography, or women may refer themselves for a mammogram.

Breast self-examination

Some national groups recommend instruction in breast self-examination, but this is not universally endorsed. The extent of the practice in the USA is unclear but is thought to be low. In one study of women doctors, only 21% reported breast self-examination at least monthly (Frank *et al.*, 2000).

Financing

How screening is financed in the USA depends on whether a woman has health care insurance, what type of insurance she has and the practice of the community in which she lives. While the national standard for care is improving, geographic variation still exists. Lobbying in state legislatures secured reimbursement for mammography through commercial insurance in all 50 states by 2000 (Fowler, 2000; Rathore *et al.*, 2000). Insurance plans provide reimbursement for care of individuals on the basis of what they use (fee for service) or to their health care providers on a fixed rate per person under their care (capitation). Before the lobbying of the late 1980s, preventive care was not necessarily reimbursed. In parallel with the effort to secure reimbursement from commercial insurance, increasing efforts were made to obtain reimbursement through Federal insurance programmes (Medicare/Medicaid) (Blustein, 1995). The latter provides reimbursement for health care of individuals aged ≥ 65, disabled individuals and low-income families. People covered by commercial insurance, Medicare or Medicaid represent a median of 84% of the state populations (Chattopadhyay *et al.*, 1999). Medicare began coverage for mammography every 2 years in 1991 and annually in 2001.

Extent of use and access

Canada

All women who meet the age requirements of the provincial programmes have access to mammography. By 1996, the proportion of women aged 50–69 who had participated in the seven organized programmes of Canada varied from 11 to 54% (Paquette *et al.*, 2000). Between 1981 and 1994, the annual number of mammograms performed in Canada increased from fewer than 200 000 to more than 1.4 million (Gaudette *et al.*, 1996). Data from the 1996–97 National Population Health survey were analysed to determine the extent to which women in the target group for the provincial programmes (aged 50–69) receive mammography from all sources. Of the respondents, 79% reported ever having had a mammogram, 54% within the previous 2 years (Maxwell *et al.*, 2001). The latter proportion varied by province, ranging from 41% in Newfoundland to 69% in British Columbia. Predictors of never having had a mammogram included higher age, residence in a rural area, Asia as place of birth, no involvement in volunteer groups, no regular physician or recent medical consultation (including recent blood pressure check), current smoking, infrequent physical activity and no hormone replacement therapy. The proportion of women aged 40–49 who had never had a mammogram was 44%. Among those who had recently had a mammogram, 80% had done so for screening purposes. The corresponding proportions for women aged ≥ 70 were 36% and 83%, respectively.

Corresponding data for breast self-examination and clinical breast examinations by a health professional have not been published.

Latin America and the Caribbean

Most women are reimbursed for screening by clinical breast examination and mammography, but the availability of facilities and personnel varies widely. No published data for a probabilistic population-based sample were available with

regard to use of breast cancer screening services in Latin America, but some information can be derived from studies of specific populations. For example, women in Puerto Rico with higher educational status are more likely to have had a mammogram or clinical breast examination. In this group, no relationship was found between knowledge and screening practices, whereas beliefs did play an important role (Frazier *et al.*, 1996a; Oliver-Vazquez *et al.*, 1999). A study of preventive practices in five low-income settings in Latin America confirmed that beliefs, including fear of cancer, are an important determinant of preventive behaviour (Agurto, 2001). Women in this group considered that health services are important only during their reproductive years; thus, middle-aged women were likely to attend only if they felt ill. In addition, women were more likely to attend screening services when their peers had done so and had had a positive experience.

Two independent studies showed that breast cancer was diagnosed at stage I in only 9.8–10% of women. The first study was based on the records of the histopathology registry of Mexico (Rodriguez-Cuevas *et al.*, 2001) and the other on data from three major hospitals in Mexico City (Lopez-Carillo *et al.*, 2001). Although these are not population-based studies, their results compare unfavourably with those of similar studies in developed countries, emphasizing the low rate of early diagnosis in these settings. Women of higher socioeconomic status may have access to screening services recommended by their physician, especially a gynaecologist, but access to diagnostic and treatment facilities, necessary to complete the screening process, may be limited.

USA

In the USA, the extent of screening is affected by the proportion of women who have some reimbursement for primary care and/or mammography. As noted above, the mean percentage of adults in the USA who have some type of insurance is 84%; however there is geographic variation in the availability of insurance, such that 9% of the Wisconsin population and 24% of that in Texas is uninsured. Populations with lower socioeconomic status are more likely to have insufficient insurance, but there are specific programmes to serve low-income populations (Chattopadhyay *et al.*, 1999). Once income is accounted for, differences in use by race and other factors are harder to identify (Lawson *et al.*, 2000).

Mammography

The proportion of women aged ≥ 40 who report having had at least one mammogram has grown steadily since the late 1980s, to 85% (Figure 28; Blackman *et al.*, 1999). Similarly, the proportion of women who had a mammogram within the previous 2 years grew to 71%. Both estimates were based on telephone surveys. A recent report based on household surveys, not dependent on having access to a telephone, showed a comparable but lower level of mammography use (67%) within the previous 2 years among women aged ≥ 40 (Breen *et al.*, 2001). There are no national measures of the proportion of women who have had a first and subsequent screens.

Despite the growing use of mammography within the USA, it is not evenly distributed. For example, a smaller proportion of Hispanic women than white women reported having had a mammogram, and they were less likely than blacks or whites to have had clinical breast examination (Frazier *et al.*, 1996a). Women in the oldest (≥ 70) and youngest (40–49) age categories had the lowest rates of any use (80% and 82%, respectively). Native Americans and Hispanics in the USA also had somewhat lower rates of any use

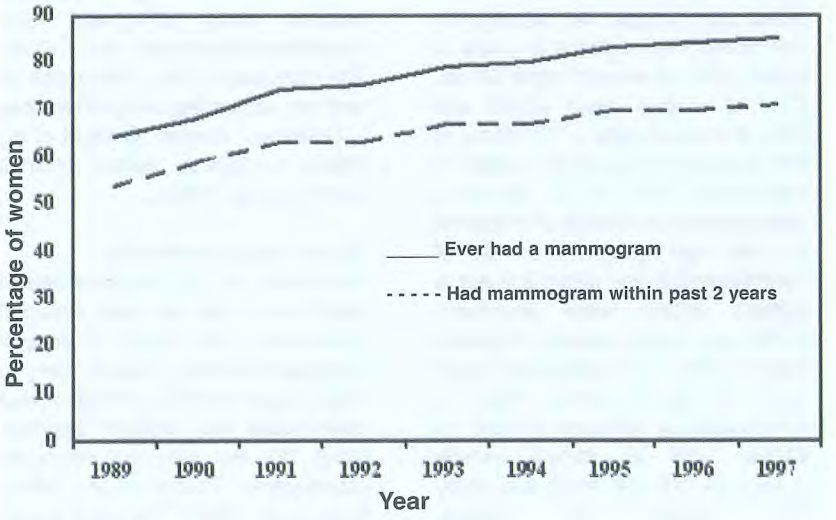

Figure 28 Trends in mammogram use, USA, 1989–97

Percentage of women aged ≥ 40 years in 38 states who reported ever having had a mammogram, having their most recent mammogram as part of a routine check-up and having had a mammogram within the past 2 years; Behavioral Risk Factor Surveillance System; adjusted to the 1989 age distribution for women

From Blackman *et al.* (1999)

Breast cancer screening in the USA

- Screening is opportunistic, except for some programmes organized within health care plans.
- Screening by mammography is usually done after referral by a primary care physician who has performed clinical breast examination.
- Mammography is free of charge for the 84% of women with health care coverage.
- An increasing proportion of low-income women without health care insurance may have mammograms at federally-financed screening organized through state health departments.
- Treatment is available through private or government-based insurance to all women in whom breast cancer is diagnosed.
- Use of mammography is assessed in state-based telephone surveys.
- Cancer occurrence is monitored by state registries, but high-quality case ascertainment is most reliable in populations living within regions served by the nine organized cancer registries funded by the National Cancer Institute.

(79% and 82%, respectively). For the oldest age groups, the disparity for use within the previous 2 years is wider: 78% of women aged 50–59, 71% of women aged 40–49 and 67% of women aged > 70. Some of the disparity for younger women is undoubtedly due to the continuing debate about the benefit of screening for this age group. The rate of mammography use within 2 years is highest among black Americans (73%) and lowest among American Indians (60%). The apparently lower rates of use by some races is confounded by economic factors, as women with an annual income < US$ 10 000 are much less likely than women with incomes > US$ 50 000 to have ever had a mammogram (77% and 90%, respectively) (Qureshi *et al.*, 2000). The disparity for use within 2 years increases with extremes of income, mammography use among women in the lowest and highest income brackets being 58% and 79%, respectively (Blackman *et al.*, 1999). The suggestion that differences in race are accounted for by differences in household income (Qureshi *et al.*, 2000) contradicts earlier findings (Gornick *et al.*, 1996).

Clinical breast examination

Information on use of clinical breast examination has not been collected consistently. The results of population-based surveys in each state in 1993 suggested that clinical breast examination was frequent (median, 90%), but this was not measured subsequently (Frazier *et al.*, 1996b; Bolen *et al.*, 2000). The same survey technique showed the frequency of clinical breast examination within 2 years to be lower in 1993 (73%) and only slightly higher by 1997 (77%) (Bolen *et al.*, 2000). Use of clinical breast examination differs by race, with a rate as low as 20% among American Samoans in 1993. However, race and economic factors may be confounded in these reports as the rates were higher (45%) among individuals earning > US$ 20 000 per year (Mishra *et al.*, 2001).

Methods for assuring quality

Canada

Mammography

Mammography performed in facilities in the provincial programmes is controlled to ensure that it is of high quality, based on standards adopted by the Canadian Association of Radiologists, which are similar to those in the USA. However, quality control may be deficient for radiologists who are not part of provincial programmes. Details of the quality control programmes have not been published.

Clinical breast examination

Family physicians are not trained consistently in performing a clinical breast examination and may neglect to offer it. There are no standards for quality.

Latin America and the Caribbean

Mammography

Guidelines in Argentina and Mexico mention quality assurance for mammography in general terms but make no reference to a specific programme or to standards. In Mexico, provision is made for internal and external quality assurance for all screening methods, but no detailed description is given. A study of the use of mammography for diagnosis in Mexico suggested that the quality may be deficient (Poblano-Verastegui *et al.*, 2000).

Clinical breast examination

No standards for quality are available. Training of health personnel varies across countries, and no detailed

description is presented in any of the guidelines.

USA

Mammography

The United States Congress passed the Mammography Quality Standards Act in 1991 to ensure high-quality mammography. The Act established parameters for the technical and clinical quality of the image. The technical assessment includes evaluation of imaging equipment with a standardized test object (phantom), evaluation of the processor to ensure that it is appropriately set for the film used and measurement of the dose of radiation to the breast (Hendrick *et al.*, 1995). Clinical assessment involves review of the films produced by a facility and consideration of positioning, breast compression, contrast, exposure, noise, sharpness, artefacts and labelling (Bassett, 1995; Food & Drug Administration, 1997). The Mammography Quality Standards Act established a mammography certification programme that includes evaluation of facility personnel, procedures and technical image quality at annual site inspections and clinical quality review at least every 3 years through an accreditation body (Hendrick *et al.*, 1995; Food & Drug Administration, 1997). Since implementation of the Act, there has been a demonstrable improvement in technical quality (Hendrick *et al.*, 1998).

Clinical breast examination

There are no standards for the quality of clinical breast examination and no regular reviews of performance. Physicians may receive instruction in clinical breast examination at medical school and during residency training, but it is not systematic and is rarely, if ever, reviewed (Barton *et al.*, 1999).

Performance indicators

Table 15 shows performance indicators for mammography in Canada and the USA. Similar data were not available for Latin America and the Caribbean.

Canada

The information in Table 15 for Canada for 1997–98 is derived from a report on the national screening programme. The programme's database allows a comparison of the performance of initial and subsequent screens separately. As expected, the proportion of abnormal results or cancer decreased at subsequent screens. Of the cancers found through the programme, the proportion without nodal involvement was high for women aged 50–59 and 60–69 (78% and 79%, respectively). The proportion of tumours ≤ 10 mm was lower among women aged 50–59 than among those aged 60–69 (35% and 40%, respectively).

Table 15. Performance indicators for breast cancer screening in Canada and the USA

Outcome	Canada		USA	
	Age	Age	Age	Age
	50–59	60–69	50–59	60–69
Women attending when invited (%)	12–55	12–55		
Abnormal recalls:				
Initial screen (%)	12	10	12	11
Subsequent (%)	6.4	6.0	NA	NA
Cancer detection rate (per 1000)				
Initial screen	5.6	8.7	4.8	7.4
Subsequent	3.5	4.8	NA	NA
PPV of abnormal screen	5.0	8.8	3.6	6.2
Benign:malignant open biopsy ratio	2.0	1.2	2.5	1.4
Ductal carcinoma *in situ* (%)	22	17	23	19

From Organized Breast Cancer Screening Programs in Canada—1997 and 1998 report (available on www.hc-sc.gc.ca/hpb/lcdc/publicat/obcsp-podcs98/) and Kerlikowske *et al.* (2000)

Latin America and the Caribbean

Performance indicators for mammography are not available throughout Latin America and the Caribbean; however, they are available from a screening programme in Uruguay based on clinical breast examination (Robles & Galanis, 2002). The guidelines for the programme recommended clinical breast examination for women aged ≥ 30. Data from 14 health care delivery centres in which 10 266 women were examined during 1999–2000 showed that 3813 (37%) required further study, but 14% were lost to follow-up. The average age of the women studied was 52 years. It is not clear whether the screens were initial or subsequent ones or if women were actively invited for screening. The detection rate was 19 per 1000, for a total of 193 confirmed malignant neoplasms of the breast during this period. The detection rates varied substantially across centres, ranging from 4.6 to 41 per 1000. The follow-up of women with negative results at screening is not described. Overall, the positive predictive value was 5.1%. Half (51%) of the women in whom breast cancer was diagnosed had no node involvement, and 33% had invasive tumours measuring ≤ 10 mm. Mammography is offered parallel to this programme, but there was no indication of whether women participating in the clinical breast examination programme were also screened by mammography. The programme continues and may provide an opportunity to evaluate the use of clinical breast examination in a developing country with high rates of incidence of and mortality from breast cancer.

Performance indicators for mammography screening in Latin America may be difficult to obtain, as much of the screening is opportunistic. If the Chilean and Mexican guidelines were fully implemented and the corresponding information systems generated good data, evaluation would be feasible. The new programme in Costa Rica is also based on mammography; however the incidence and mortality rates in this country are still low, and the population of women at risk is less than 200 000.

USA

Performance indicators are available from one report on seven sites of the Breast Cancer Surveillance Consortium (Kerlikowske *et al*., 2000). The Consortium is a collaborative effort to link information from mammography and tumour registries for women in geographically diverse sites (Ballard-Barbash *et al*., 1997). The data in Table 15 represent those collected up to 1996 and are therefore somewhat earlier than the Canadian data. Although the data mainly reflect initial mammograms, the sample also included women who had had prior mammography. The proportion of abnormal results and the cancer detection rate are somewhat lower than from the initial screens in Canada, partly because of the inclusion of women who had had more than one mammogram.

Oceania and Asia

For countries with no known breast cancer screening programme, a search was undertaken for a cancer society affiliated with UICC or a cancer registry affiliated with IARC, or both. If the country had one or both, a further search was carried out for evidence of a cancer control, and possibly a screening, policy. Two health networks organized under the auspices of WHO provided information about South-East Asia and the Western Pacific.

The publication *Cancer Survival in Developing Countries* (Sankaranarayanan *et al.,* 1998) contains brief comments about cancer control programmes, including mention of screening in countries of Asia and Oceania. Four regions of Asia have or have had trials of screening: of clinical breast examination in Shanghai, China, of clinical breast examination and mammography in Japan, of clinical breast examination in the Philippines and a trial in progress of clinical breast examination and breast self-examination in Mumbai, India (funded by the United States National Cancer Institute).

The WHO Cancer Database for the Western Pacific Region (WHO, 1999a; hereafter referred to as the 1997 WPRO survey) shows that 15 of 29 countries surveyed for cancer control activities in 1997 responded 'Yes' to the question "Has screening for breast cancer been routinely available to women?". The countries that replied 'Yes' were American Samoa, Australia, China (and Hong Kong), Japan, Malaysia, New Zealand, the Philippines, Republic of Korea and Viet Nam. Apart from this response, no other information was available for Guam, Mariana Islands, Niue, Palau and Tokelau.

Countries with organized mammographic screening

How screening is delivered

Australia

Mammography

Organized mammography was begun in three states of Australia in mid-1991 and was available to most women by mid-1994, with the last units in place nationwide by the end of 1995. In addition to the organized programme, medical practitioners can refer women for mammography within the private health system.

A review of international evidence led to the establishment of six pilot screening programmes in Australia in 1989 and the National Program for the Early Detection of Breast Cancer in 1991. The organized programme, called BreastScreen Australia since 1996, is funded jointly by the national Government and the States and Territories. The description of BreastScreen Australia and its organization given below is based on information in two national reports (Australian Institute of Health and Welfare, 1998, 2000), five state reports (Breast-

Organized breast cancer screening programmes in Oceania

- **The BreastScreen Australia programme began gradually. It targets women aged 50–69, but all women ≥ 40 years who attend are screened. It has national accreditation requirements which were first published in 1991 and revised in 1994 and 1999–2000, and has a nationally agreed minimum data set for reporting.**
- **In BreastScreen Aotearoa, implemented nationally in New Zealand, only asymptomatic women 50–64 years of age are screened. The programme had interim national quality standards at commencement and receives agreed data items from providers as part of their contract.**

Screen SA, 1999; (BreastScreen NSW, 2000; BreastScreen Queensland, 2000; BreastScreen Victoria, 2001; BreastScreen WA, 2001) and a review of the national accreditation requirements in BreastScreen Australia (National Quality Management Committee of BreastScreen Australia, 2001).

BreastScreen Australia targets asymptomatic women aged 50–69 years, who are screened with two-view, 2-yearly mammograms read by two independent readers, of whom one is a radiologist; women aged 40–49 and ≥ 70 may also attend. Individual services differ with regard to their policy on screening women with symptoms. Initial invitation letters are sent to women listed on the Australian electoral roll, and reminders for re-screening are sent to those who have attended. The programme's services are free. Before BreastScreen commenced, all mammograms were done in the private health care system and reimbursed by Medicare, the national health insurance scheme of the Health Insurance Commission. BreastScreen overcomes the challenge of distance in Australia with a combination of fixed-site, mobile, relocatable and satellite services.

Mammography is still available outside the BreastScreen services, mainly reimbursed by Medicare, although private radiology services also offer mammograms for which women pay the full cost. While the Medicare-reimbursed mammogram was intended for diagnostic purposes only, the large numbers suggest its use in screening.

Clinical breast examination

Most women have clinical breast examination at their own request or as part of a health check at a visit to their primary health-care provider or at a health centre, at the time of a Pap test in the national cervical screening programme. Visits by individuals to a general practitioner are reimbursed under the national compulsory medical scheme, Medicare.

Breast self-examination

A number of large public health information programmes in Australia were designed to encourage women to practise routine breast self-examination. Cancer societies, mammographic screening services, cancer support groups and various public and private organizations involved in disseminating health messages have developed statements about the benefits of breast self-examination, although few offer instruction. Financing of such instruction depends on an organization's conviction about the benefits of breast self-examination and its commitment and financial resources. In 1996, 53% of women surveyed nationally reported that a general medical practitioner had recommended that they practise breast self-examination (Barratt *et al.,* 1997a).

An expert advisory group of the National Breast Cancer Centre (2001) recommended in 2001 that women should know how their breasts look and feel normally and to have changes investigated promptly by their doctor.

New Zealand

Mammography

National screening began within Breastscreen Aotearoa with six lead providers in December 1998. Mammography is also readily available outside the programme from private medical practitioners. The Cancer Society of New Zealand and the Department of Health invited a working group to make recommendations about screening in 1987. The report concluded that New Zealand's shortage of appropriately specialized professionals was too great, and it recommended waiting for the outcome of pilot programmes before deciding on a routine screening programme (BreastScreen Aotearoa, 1998). Two pilot programmes began in 1991 and continued to December 1996, while the national programme began in December 1998. Information about BreastScreen Aotearoa is available on its website (www.cancersoc.org.nz) or through contact with the National Screening Unit, Ministry of Health, Wellington.

The programme is funded by the Government through the Ministry of Health, which allocates funds, in competition with other resources, to the National Screening Unit, an indepen-

dent business unit. BreastScreen contracts directly with six lead provider services (four public health and two private units) that cover the regions of 22 district health boards.

Asymptomatic women aged 50–64 are invited by letter, can attend voluntarily or may be referred by a general practitioner to the organized screening programme and are offered free, 2-yearly, two-view mammography within a network of fixed and mobile screening units and fixed assessment centres. Women with symptoms are advised to consult their usual medical practitioner. As the programme does not have access to a population register, there is no way of identifying and inviting all eligible women. Women outside the age range of the programme are eligible for Government-funded mammograms, provided they meet certain criteria or, if they do not, can pay for mammograms in the private health system. The lead providers send a reminder letter to women to attend for re-screening.

Clinical breast examination

The New Zealand Cancer Society encourages doctors to offer a breast check to women who are concerned about breast cancer, especially those 40 years of age and older, although it does not recommend regular clinical breast examination. The Breast Cancer Screening Policy Advisory Group acknowledged the role of clinical breast examination in clinical practice for women with symptoms or those recalled with abnormalities detected through mammographic screening.

Breast self-examination

Breast self-examination is not taught within BreastScreen Aotearoa, but the New Zealand Cancer Society, in recognition of the need to optimize women's chances of finding symptomatic changes and reporting them promptly to their doctors, supports a concept of 'breast awareness', recommending that women, especially those over the age of 40, know what is normal for their breasts and to look and feel for changes regularly (www.cancersoc.org.nz).

Financing

Organized mammographic screening in Australia and New Zealand is financed from general taxes. A fixed part of the cost of mammograms outside organized screening is paid from general taxes, while the individual pays the difference between the fixed rebate from the Government and the amount charged by the private provider of the service.

Extent of use and access

Australia

BreastScreen services are available to all women in Australia aged 50–69, although women aged 40–49 and ≥ 70 years who approach BreastScreen services are also screened; the expected participation rate by age group is 40% of women aged 40–49, 70% at 50–69 and 15% at 70–79 years. BreastScreen monitors several indicators of its coverage of population groups: indigenous women, women from non-English-speaking backgrounds, women in metropolitan, rural or remote areas by socioeconomic status. While the programme

A mannequin, named Merindah Bibi (meaning beautiful women, breast) as the centerpiece to the work is dressed in traditional costume. One breast is painted in an anatomical style and the other displays an Aboriginal design which represents breast paintings used in traditional dance. The backdrop is a silhouette of Merindah Bibi, the aura of this woman is shown by splashes of colour which represent her spiritual health and well-being. At her feet a turtle shell is filled with painted emu eggs, showing what health and well-being means to each individual woman.

BreastScreen Victoria project in partnership with the Victorian Aboriginal Health Service to raise awareness of breast screening and to inspire Koori women to think and feel positively about their bodies and their health.

was designed primarily for asymptomatic women, some women present with a symptom and are screened. State-based programmes vary in their approach to these women, most advising or encouraging consultation with the woman's medical practitioner outside the programme.

Australia has universal health insurance coverage of its population by Medicare, which is funded by the Commonwealth Government and includes a levy on taxpayers in higher income brackets. Medicare reimburses its scheduled fee to women who have a medical practitioner's referral for mammography in the private sector; the women themselves must fund the difference in the provider's fee. Women who attend private radiology services for mammography without a referral do not qualify for fee reimbursement.

Mammography

By 1998, 54% of women aged 50–69 had participated in the national programme (Table 16). No national data are available on attendance for re-screening, but State-based programmes reported rates of 74% in Western Australia and 82% in Queensland for index screens in 1995 or 1996. The proportion of women attending for initial (range, 15–40%) and subsequent screens (range, 60–85%) varied among states, depending on the length of time since implementation and the geographic spread of services to be established. Uptake of screening by women with symptoms was reported to range from < 1% in Western Australia in 1995–96 to 4.7% in Victoria in 1997 and Queensland in 1998 and 8.4% in South Australia in 1995.

Most of the women who were screened (≥ 80%) were from an English-speaking background, the percentage screened varying across states but close to the population proportions in the 1996 census. Participation was greater in areas outside metropolitan regions in all states. The percentage of women who were identified as Aboriginal and Torres Strait Islander was low but in line with the population proportions in the 1996 census in three states.

Use of mammography in the private sector peaked in 1992. More than 300 000 bilateral mammograms were reimbursed in Medicare each year from 1996 to 1999, of which 40% were for women aged 50–69.

Clinical breast examination

In the 1996 national breast health survey, 68% of women aged 30–69 reported having had a clinical breast examination by a health professional within the past 2 years, whereas only 35–50% had been examined in the past 3 years in earlier studies. In 1996, more younger than older women reported having had a clinical breast examination within the past 12 months (Barratt *et al*., 1997a).

Breast self-examination

In the 1989–90 national health survey, 63% of women aged 18–64 reported performing breast self-examination 'regularly' (Barratt *et al.*, 1997b). By 1996, however, only one-third of women between 30 and 69 years of age reported performing monthly breast self-examination.

New Zealand

BreastScreen Aotearoa covers all areas in New Zealand and all symptomatic women 50–64 years of age. At the end of the first complete 2-year round of mammography in December 2000, the participation rate was 54% of women aged 50–64 years (Table 16). Participation was lower than the overall rate among Maori (35%) and Pacific Islander (34%) women and higher (56%) among all other women. The extent of use of clinical breast examination and breast self-examination is unknown.

Methods for assuring quality

Australia

Mammography

A national committee advises BreastScreen Australia on specific policy, quality, data management, clinical aspects and administrative issues in programme management; five working groups report to the committee. In addition, a national quality management committee oversees accreditation issues in a comprehensive system to ensure that all BreastScreen services operate under a common set of standards. Each service is assessed every 3 years by an independent team of expert reviewers to ensure that service delivery complies with the national accreditation requirements, a set of minimum standards and requirements covering all aspects of service delivery.

In addition, the services must meet the equivalent of the national performance indicators, depending on the number of screens delivered, the cancer detection rate, the small-cancer detection rate, the number of interval cancers (invasive only) and detection of DCIS. To ensure that the standards remain relevant and current, the requirements were comprehensively updated in 2000–01 by the National Breast Cancer Centre, which collated evidence-based reviews undertaken by expert multidisciplinary teams appointed for the purpose.

Data are monitored independently of the accreditation process. Performance indicators were agreed at the national level, under the guidance of the National Advisory Committee, initially in relation to participation, cancer detection, small-cancer detection, programme sensitivity (interval cancers) and incidence and mortality. Services collect data in accordance with the BreastScreen Australia minimum data set, on the basis of nationally agreed definitions and classifications. Data

Table 16. Performance indicators of breast cancer screening in Oceania: Age-standardized percentage and rates of participation per 10 000 women screened at 50–69 and ≥ 40 years

Country and indicator		
Australia, 1997–98[a]		
	50–69 years	**≥ 40 years**
Participation (%)	54 (54–54)	36 (36–36)
Invasive cancer detection rate		
First round 1998 (/1 000)	5.9 (5.5–6.3)	6.0 (0.7–6.4)
Subsequent round 1998 (/1 000)	3.6 (3.4–3.8)	3.4 (3.3–3.6)
Small invasive cancer (≤ 10 mm) detection rate		
First round 1998 (/1 000)	1.9 (1.6–2.1)	1.8 (1.6–2.0)
Subsequent round 1998 (/1 000)	1.5 (1.4–1.6)	1.4 (1.3–1.5)
Interval cancer rate (invasive cancers only)		0.65/1000[b]
Re-screening rates	**Year of index screen**	**Rate in women 50–69 years (%)**
Victoria	1997	81
New South Wales	1996	75
Queensland	1996	82
South Australia	1995	79
Western Australia	1995/96	74
Percentage DCIS of all cancers	**Year**	**Women 50–69 years**
Victoria	1999	22
New South Wales	1998	23
Queensland	1997	22
South Australia	1997	25
Western Australia	1997–98	21
New Zealand, 1998–2000[c]	**50–64 years**	
Participation (%)		
All women	54	
Maori	35	
Pacific Islander	34	
Other	56	
Assessment (%)	6.8	
False-positive rate (%)	6	
Specificity (%)	94	
Cancer detection rate	7.0 / 1000	

[a] BreastScreen SA (1999); Australian Institute of Health and Welfare (2000); BreastScreen NSW (2000); BreastScreen Queensland (2000); BreastScreen Victoria (2001); BreastScreen WA (2001)

[b] Crude rate in asymptomatic women screened in 1996 during 12 months' follow-up

are supplied by the six state and two territorial programmes to the Australian Institute of Health and Welfare for collation and analysis and reported jointly by BreastScreen, the Institute and the Commonwealth Department of Health and Aged Care.

Clinical breast examination

There are no standards of quality for clinical breast examination. Studies have shown an effect of training in clinical breast examination on the skill of clinicians (see Chapter 2), and some evidence was found that those performing clinical breast examination do not feel confident in their skills.

Breast self-examination

No standards for teaching breast self-examination were available. In 1996, 28% of women in Australia who had ever practised breast self-examination reported that their practice was correct (Barratt *et al.*, 1997b).

New Zealand

Mammography

As part of the programme, the Government convened a group of national and international experts to develop interim national quality standards that all providers must meet. The standards, which were in place when the programme commenced, reflect six key areas: radiology, medical radiation therapy, medical physics, nursing, pathology and surgery. A current review will add standards relating to programme management, data management and health promotion and education.

The BreastScreen Aotearoa Independent Monitoring Group monitors and evaluates the programme under contract with the Ministry of Health, assessing performance against indicators specified by the Ministry. Lead providers are contractually bound to supply specified data regularly to the

independent monitoring group. The first monitoring report appeared in February 2000, and quarterly reports had been produced up to September 2001 (BreastScreen Aotearoa Independent Monitoring Group, 2001).

The lack of a population register currently precludes complete enumeration of all eligible women and accurate calculation of registration and participation rates. BreastScreen Aotearoa may be able to use the electoral roll to identify eligible women in the future.

Clinical breast examination

The New Zealand Cancer Society acknowledges the importance of the quality of clinical breast examination, and its statement on the matter repeats the message of the 1997 National Institutes of Health Consensus Development Conference, that clinical breast examination requires proper quality control and monitoring before it can be regarded as a satisfactory screening tool.

Breast self-examination

The New Zealand Cancer Society has acknowledged the barriers to women practising breast self-examination regularly and competently and the fact that its practice can lead to unnecessary anxiety and medical investigations, particularly among younger women. Although no quality assurance strategies have been reported, women participating in focus group research in New Zealand admitted to a lack of confidence in doing breast self-examination and greater confidence in doing 'casual' checks. The message of familiarity with one's breasts was considered compatible with encouraging women to continue casual checks and increase their confidence. The researchers reported that women were comfortable with the breast awareness message, but the level of practice is unknown(http://-www.healthywomen.org.nz/bsa/default.asp).

Performance indicators

Australia

The national performance indicators in BreastScreen Australia are the rates of participation, cancer detection, small-cancer detection and programme sensitivity (interval cancers) in women 50–69 years of age (Table 16). The national participation rate was 54% (age-adjusted) in 1997–98, whereas the programme target is 70%. No reliable estimates are available of the proportion of mammograms conducted in women of these ages under Medicare that might be de-facto screening. The invasive cancer detection rate was 5.9 per 1000 women screened, and the rate of small cancers detected in the first screening round was 1.9 per 1000 (age-standardized rates). The minimum standards for cancer detection set in the 1991 national accreditation requirements included invasive cancers and DCIS, but the standards have since been revised to exclude DCIS. The minimum standard for sensitivity of the programme was less than 0.6 interval cancers per 1000 women screened. Nationally, a rate of 0.65 per 1000 was achieved in 1996 in all screening rounds in asymptomatic women of all ages in the 12 months after a negative result. Although BreastScreen Australia does not report the percentage of DCIS, these figures are calculated in five States for comparison with programmes in other countries (Table 16).

New Zealand

The agreed performance indicators are rates of participation, technical recalls, technical repeats, assessment, false-positives, open surgical biopsies and benign biopsy sample weighing < 20 g (BreastScreen Aotearoa Independent Monitoring Group 2001). The target participation rate is 70%, as in other programmes internationally. Accurate calculation of the participation rate requires a population-based register to identify eligible women. BreastScreen Aotearoa is also making progress in complete and timely data collection to enable monitoring of cancer rates by size, stage, nodal status and grade.

Countries or regions with no organized mammographic screening

Information from China (Shanghai), India (Mumbai), Japan, the Philippines and Singapore, indicated that some type of screening programme or a screening trial existed.

China

It is uncertain whether there is screening in China, although the 1997 WPRO survey indicated that breast cancer screening had been offered routinely since 1975 and that mammography was part of the procedure. Health education, well-developed and accessible health services and public awareness have been mentioned as necessary in the early diagnosis of breast cancers in China (Sankaranarayanan *et al.,* 1998).

In a trial of breast self-examination in the absence of mammography was conducted in the Shanghai Textile Industry Bureau in 1989–9, it was concluded that the efficacy of breast self-examination is unproven (Thomas *et al.,* 1997). Contact with the Women's Health Institute in Shanghai (Gao Xiao Ling, Deputy Director, personal communication) indicated that the Institute is responsible for 100 teams who supply breast and cervical screening to 400 000 women aged 25–60. Breast screening is carried out by clinical examination by teams of doctors and health workers. Women may come into contact with the team during a team visit to the workplace or when individual women attend a team clinic, e.g, in one of 19 maternal and child health centres in Shanghai. The visit is recorded on a card (extent of detail unknown) which is held by the woman, by the workplace or by the clinic.

Repeated visits at worksites are made to women seen at past visits and newly eligible women, and it would appear that women are eligible (criteria unknown) for repeat visits to clinics.

When a suspect sign or symptom is detected, the woman is referred to a hospital for mammography. A doctor from the team may accompany the woman to the hospital, although they are usually unaccompanied. Women can also attend the hospital directly (Gao Xiao Ling, personal communication).

India

A Government-funded national cancer control programme associated with the Indian Cancer Society offers various activities across States, constituted mainly of health education programmes for early detection of cancers, including breast cancer, but there is no organized screening programme (Sankaranarayanan *et al.*, 1998).

The Preventive Oncology Division of the Tata Memorial Centre offers regular cancer screening services (clinical examination and training in breast self-examination) to 3000–4000 women, who are screened annually at outpatient clinics, and to similar numbers who are screened at community-based cancer camps (www.tatamemorial centre.com).

A randomized intervention trial funded by the US National Cancer Institute is under way at the Tata Memorial Centre, Mumbai, to evaluate clinical breast examination and the teaching of breast self-examination in the control of breast cancer in that city; it is in its fourth year (I. Mittra, personal communication). The trial includes 150 000 women in suburban Mumbai in four rounds of screening at approximately 18-month intervals; cancer awareness messages are delivered to women in both arms of the trial in addition to the screening intervention, which also includes cervical screening.

Japan

Clinical breast examination, which has been used for screening in Japan since about 1975, was incorporated into mass screening in 1987, with annual clinical examinations of women aged ≥ 30 years. The intervention was reported to cover approximately 8% of the population in 1995 (Abe *et al.*, 1983; Ballard-Barbash *et al.,* 1999). A screening trial in Miyagi Prefecture, Japan, in 1989–91 comprised one-view mammography every 2 years, at first to women aged ≥ 50 years and later to younger women. An improved cancer detection rate was found when compared with clinical examination alone (Ohuchi *et al.*, 1993; Yokoe *et al.*, 1998). The Ministry of Health and Welfare supported a study to analyse the cost-effectiveness and sensitivity of mammographic screening. After 1997, the group planned guidelines for a national mammographic screening programme, setting up training and assessing the quality and sensitivity of mammography (N. Ohuchi, personal communication).

Guidelines for quality assurance of mammography were drafted in 1999 (Klabunde *et al.*, 2001b). In 2000, the national guidelines for breast cancer screening were changed to recommend one-view mammography every 2 years for women aged ≥ 50 (N. Ohuchi, personal communication). The programme targets 30% of the eligible population and has available two mammography facilities and three radiology units (Klabunde *et al.*, 2001b). Population-based mammographic screening for women 40–49 years of age is still under consideration (Morimoto *et al.*, 2000). The International Breast Cancer Screening Network, of which Japan is a member, has published summary information on the screening initiative in Japan (Ballard-Barbash *et al.,* 1999; Klabunde *et al*., 2001b).

Philippines

A randomized controlled trial of screening for breast cancer by clinical examination performed by trained nurses was established in 1995 in Greater Manila, with support from the United States Army Medical Research Development Command. A total of 202 health centres were randomized, with 219 000 women in the intervention and 190 000 in the control arm. The first round of examinations was completed by the end of 1997. Because of a very low rate of compliance with referral among women who had a positive result at clinical examination, the trial was discontinued after the first screening round, and follow-up of the target population was undertaken. Overall, 105 new cases of invasive breast cancer were found in the study population after an average of 3 years of follow-up. The proportion of cases diagnosed at stage I or IIA increased by 9% after the intervention (Parkin *et al.*, 2001).

Singapore

The Singapore Cancer Society offers free screening at its headquarters and has a mobile breast screening unit (www.cancer.org.sg). The Breast Cancer Foundation, a non-profit organization, offers instruction in breast self-examination and screening by clinical breast examination for women < 40 years and by mammography for women ≥ 40 years (www.bcf.org.sg). Up to the mid-1990s, screening was offered to women attending Government clinics for ante- and postnatal visits, and they were given instruction in examining their breasts. From 1987, Well Woman Clinics offered a clinical breast examination and instruction in breast self-examination, and after 1989 women aged ≥ 40 were encouraged to attend for mammography, although by the mid-1990s no more than 25% of women 50–64 years of age were estimated to have ever had a mammogram, perhaps because of the high fee (Seow *et al.*, 1997). The

National Breast Cancer Screening Project conducted in 1994–96 enrolled 28 231 women aged 50–64 for a single free mammogram at one of two large mammographic screening centres, with 97 294 women as controls (Ng *et al*., 1998). The project concluded with recommendations for quality assurance programmes to ensure consistent reporting and for the establishment of minimum standards (Tan *et al*., 2000)

The Singapore Ministry of Health is introducing a mammographic screening programme for asymptomatic women in 2002, offering annual screening to women aged 40–49 and screening every 2 years to women aged 50–64. The programme will be linked to a population register to invite eligible women aged 50–64 and will maintain a screening register. Women with symptoms will not be screened in the programme but advised to see a doctor for investigation. After having a screening mammogram with negative results, women will be reminded to continue monthly breast self-examination. The programme aims to screen 50 000 women in the early years, to increase its coverage every year, and to screen 70% of the population by 2008 (T. Yoong, Singapore Ministry of Health, personal communication).

Countries or regions for which there is more limited information

American Samoa

Although the 1997 WPRO survey indicated that screening had been conducted since 1996, with 52% coverage of the target population, there is no mention of mammographic screening. In contrast, a recent paper noted very little screening (Mishra *et al.,* 2001).

Bangladesh

Information on breast cancer detection in Bangladesh was abstracted from a conference presentation of Dr R. Sultana at the World Conference on Breast Cancer in Ontario, Canada, in 2000 (www.bangla2000.com). The key facts mentioned were the lack of free health services, health insurance or a systematic health monitoring system in Bangladesh; furthermore, the numbers of women who develop or die from breast cancer each year are unknown. The Cancer Institute and Research Hospital in Dhaka is the sole Government-funded facility for cancer patients. The hospital, in collaboration with the Bangladesh Cancer Society and some private clinics in Dhaka, offers mammography and other breast cancer services.

Hong Kong (China)

Hong Kong lacks an organized screening programme. Four local health centres offer screening by clinical breast examination and mammography to mostly asymptomatic women aged between 40 and 65–70 years who are self-referred and pay for the services themselves (Abdullah & Leung, 2001; T. Lee, Hong Kong Anti-cancer Society, personal communication). The centres all have registers and report attendance of 4000–6000 a year per centre, indicating that many women in Hong Kong do not use the screening services (Chan *et al*., 1998; Lau *et al*., 1998; Abdullah & Leung, 2001; Hong Kong Sanatorium, personal communication). A fifth clinic, conducted by the Department of Health, is restricted to women 45–64 years of age; it charges an annual fee for its health promotion and disease prevention programmes and a separate fee for mammography.

Taiwan (China)

Breast self-examination, clinical breast examination and mammography all appear to be used in Taiwan (Chie *et al*., 2000). Hospitals with websites mention general clinical screening for cancer in adults and three specialized breast clinics. The Department of Health's breast cancer control programme aims to increase the number of women who carry out breast self-examination and to conduct examinations, presumably clinical examinations, of up to 1 million women over 35 years of age for breast cancer (www.gio.gov.tw).

Republic of Korea

The 1997 WPRO survey reported that screening had been available since 1996 and that mammography formed part of the procedure. Information on the Korean Breast Cancer Society website confirmed this observation and suggested increased detection of breast cancer by mammography. Mammographic screening has been available since 1994 at Yonsei University Medical Centre.

Thailand

The two population-based cancer registries, in Chiang Mai and Khon Kaen, reported no organized breast cancer screening programmes and indicated that breast cancer screening was a low priority because of a low, but increasing, incidence. Khon Kaen and Chiang Mai University Hospitals offer health education and a mammography service on demand (Sankaranarayanan *et al.,* 1998).

Viet Nam

Training programmes in breast cancer screening supported by WHO have been mentioned on the WHO Western Pacific Region website in Ha Noi and Hue and three pilot projects in Ha Noi and Ho Chi Minh City. Two publications from the Ha Noi and Ho Chi Minh City cancer registries mention a high breast cancer incidence but do not refer to early detection programmes (Anh *et al.,* 1993; Nguyen *et al.,* 1998).

The only source of information for a number of other countries on routine breast cancer was the 1997 WPRO survey. The countries are:

Guam
Screening since 1985, coverage unknown, mammography offered.

Malaysia
Screening since 1985, 60% coverage of the target population, no mammography

Mariana Islands
Screening offered, no mention of year of commencement, mammography

Niue
Screening since 1983, coverage unknown, no mammography

Palau
Screening since 1980, coverage unknown, no mammography.

Tokelau
Screening since 1996, coverage unknown, no mammography

Fiji
The WHO website mentioned support from WHO to develop breast and other cancer screening programmes.

Behavioural factors and the longer-term success of screening

Behavioural factors are fundamental to the longer-term success of a screening programme. They include communication about breast cancer and the screening process, psychological consequences of participating in screening and issues affecting participation in screening. Most research about behavioural factors and screening has focused on predictors of participation and evaluation of strategies designed to encourage higher rates of participation.

Information and understanding

Cancer screening programmes target individuals without symptoms, with the aim of preventing deaths from the disease. However, participation in screening may have considerable negative sides for the individual in terms of increased anxiety, additional tests and treatment if cancer is detected. Furthermore, ethical and legal considerations in respect of informed consent require that women fully understand the process of screening. Participants should therefore be fully informed about the potential benefits and harms of a screening programme in order that they can decide whether or not they wish to take part.

Understanding the benefits and harms of screening

Women's decisions about whether to take part in screening and their understanding of the experience are affected both by their views about their own risk for developing breast cancer and by their understanding of the risks and benefits of screening.

Women's understanding of the risk for breast cancer

Women have been shown to overestimate their own risk for developing breast cancer. In one study, women overestimated their risk for dying from breast cancer within 10 years by 20-fold (Black *et al.*, 1995). In an Australian population-based study, Barratt *et al.* (1997b) found that 65% of women overestimated the risk for developing breast cancer, and 15% believing that more than 50% of women will develop breast cancer at some time in their lives. Women also overestimated their own risk for developing breast cancer, and younger women believed themselves to be at greater risk than did older women. Information about screening is interpreted against a community belief that the rates of breast cancer and individual risk for the disease are high.

Women's understanding of the accuracy of screening

Women tend to overestimate the accuracy of screening. Black *et al.* (1995) for example, found that women overestimated the reduction in relative risk due to mammographic screening by sixfold and the reduction in absolute risk by more than 100-fold. Thirty-two per cent of women in an Australian study substantially overestimated the accuracy of screening mammography, believing that over 95% of cancers are detected (Barratt *et al.*, 1999). All the women in this sample believed that screening mammography should pick up all cancers, and three-quarters believed that the sensitivity of mammographic screening should be over 90%. Forty-five per cent of women thought that compensation should be awarded if a breast cancer was missed because it was not found in the test (Barratt *et al.*, 1999). These beliefs are based on a misunderstanding of the accuracy of mammography rather than unrealistic perceptions about what is needed for a worthwhile test; women said they would still find the test worthwhile if it found only 50% of cancers. Schwartz *et al.* (2000) also reported that women were tolerant of false-positive results.

Overestimation of the accuracy of screening mammography may have significant consequences. If a woman has a negative result in a screening mammogram and then develops breast cancer, she may feel a sense of betrayal and may believe that she is entitled to financial compensation. If she believes that the screening mammogram is highly reliable, she may delay seeking advice about a symptom that develops between screens. If she hears that cancers have been missed in other women by the screening programme, she may be discouraged from attending, in a belief that the particular programme is ineffective. A strong belief in the accuracy of screening may cause her to place considerable reliance on a positive result; even if it is found to be a false-positive finding, she may maintain concern that 'the test could not have been completely wrong'.

Understanding and informed consent

The legal requirements for consent to screening vary between jurisdictions. In Australia, for example, State legislation requires signed consent for participation in screening and for each assessment test. In Italy, no written consent is required for screening or for additional mammography of lesions detected at screening, although written consent is required for biopsy.

In most jurisdictions, however, the concept of 'informed consent' is fundamental (Austoker, 1999). Informed consent means that the woman understands what is involved in the screening process and that clear, comprehensible information is given about the key issues of relevance for the woman, particularly in relation to potential benefits and harms.

Providing better information about the benefits and harms of mammographic screening

The challenge is to create more accurate understanding of screening and screening mammography among women in the community. There is growing pressure on screening programmes to provide fuller information about the sensitivity, specificity and potential harms and benefits of screening (e.g. Dixon-Woods *et al*., 2001).

Relatively little is known about how best to communicate these sometimes complex issues in a way that is clear, accurate and relevant to women. Screening programmes rarely provide detailed information about the accuracy of screening mammography; in an Australian study of 58 pamphlets containing information about mammographic screening, only one-fourth gave information about sensitivity and none gave data about specificity (Slaytor & Ward, 1998).

Community understanding might be improved by describing the result of screening mammography as the 'magnitude of the risk' for having cancer rather than a simple dichotomy of 'having cancer or not' (Goyder *et al*., 2000). For example, a negative result in a screening test might be described as indicating a 'low risk' for breast cancer rather than 'no abnormality'. Goyder *et al.* (2000) analysed some of the questions that may be important to women in understanding screening for breast cancer and deciding whether or not to participate, as shown in the box below. Some research has been done of individuals' understanding of risk, both absolute and relative, and the preference for numerical or verbal information. Individuals clearly differ in the type and style of information they prefer and in their interpretation of verbal, numerical and graphical information (Sutherland *et al.*, 1991; Butow *et al.*, 1996; O'Connor *et al*., 1998).

Another approach is to consider tailored printed communications which provide individualized information based on the risk and other characteristics of the individual. Rimer and Glassman (1999) reviewed five studies of communications designed to encourage participation in screening mammography and reported inconsistent results. However, this approach has been effective in providing information in relation to other health problems; it may be that the provision of more accurate information about mammographic screening will not necessarily increase participation rates but might provide women with an opportunity to assess better whether they wish to take part. At present, little is known about how best to assist women in understanding the harms and benefits of breast cancer screening.

Other issues in communication and information

Other communication issues of relevance to screening include:

Questions women may ask in considering whether to participate in mammographic screening

- **What is my chance of dying from breast cancer if I decide not to be screened?**
- **What is my chance of dying from breast cancer if I decide to participate in screening?**
- **What is the chance that my mammogram will be normal?**
- **If my mammogram is not normal, what is the chance that I have breast cancer?**
- **What further tests might I be advised to have if my mammogram is not normal?**
- **If my mammogram is normal, what is my chance of having breast cancer anyway (that is, cancer undetected by the mammogram)?**
- **What is the chance that I may be harmed by screening, by receiving unnecessary treatment or exposure to radiation?**

Adapted from Goyder *et al*. (2000)

- *Information about tests:* There is good evidence that satisfaction with care and compliance with recommendations are increased if individuals are provided with adequate information before undergoing medical tests and procedures (e.g. Johnston & Voegele, 1993). Screening programmes should provide detailed information about the benefits and harms of the assessment and of diagnostic tests and about the experience of undergoing the test itself.

- *Understanding the consequences of a diagnosis:* The ways in which women are told they have breast cancer can affect their understanding of their illness and their long-term adjustment (e.g. Roberts *et al.*, 1994). Screening results in higher rates of detection of non-invasive conditions such as DCIS, and this makes communication about the diagnosis particularly complex. Information about the likelihood of developing subsequent invasive disease must be conveyed, although little is known about the prognosis for some types of DCIS. Women with a diagnosis of ductal carcinoma are confused about their diagnosis and its consequences (Bluman *et al.*, 2001).

Psychological consequences of participation in screening

One of the potential harms of mammographic screening is increased anxiety for women. High levels of anxiety may also reduce the likelihood of regular participation in screening. Increased anxiety may be generated at several points in the screening pathway.

Anxiety associated with mammography screening

A number of studies have explored anxiety and distress associated with mammographic screening; in general, the studies had methodological problems, including small sample sizes, lack of comparability between attenders and control groups and lack of validated measures (Rimer & Bluman, 1997).

A review (Rimer & Bluman, 1997) addressed four studies in which anxiety associated with screening was measured and concluded that most studies showed increased anxiety among women attending for screening. One study (Fine *et al.*, 1993) showed that 60% of women were anxious about having a mammogram and 20% were very anxious; another study (Walker *et al.*, 1994) showed that 20% of women attending for screening had clinically significant anxiety levels. Some studies have suggested that women with lower levels of education, African Americans and women with a family history may be more vulnerable to anxiety (Rimer & Bluman, 1997). Women's anxiety appears to be more closely related to fear of an abnormal result than to the mammogram procedure itself (Mainiero *et al.*, 2001).

Several studies have examined the impact of pain from mammography. Many women (73%; 66%) reported that mammography was painful (Hafslund, 2000; Keemers-Gels *et al.*, 2000); however, most found the pain mild, and very few reported that the pain might deter them from participating in screening in the future.

Anxiety associated with false-positive results

A number of studies have explored the psychological impact of a false-positive result, and most reported a short-term, moderate increase in anxiety and distress. There is no evidence that a false-positive result decreases subsequent participation in mammographic screening. The psychological effects of false-positive results are discussed in Chapter 5.

Anxiety associated with a diagnosis of breast cancer

While most women with breast cancer experience some symptoms of anxiety, 12–30% have been found to experience clinically significant anxiety (Maraste *et al.*, 1992; Pinder *et al.*, 1993), and there are major psychological, physical and practical consequences of a diagnosis of breast cancer. While these problems are managed primarily by treatment teams, screening programme personnel often inform women of a diagnosis of breast cancer.

Encouraging participation in screening

The long-term success of a screening programme depends on participation by a substantial proportion of eligible women. Considerable research has been conducted on the factors associated with participation in screening and strategies for increasing participation rates in relation to each of the programmes for breast cancer, as described below. The studies of predictors of participation rarely addressed the contribution of these factors to non-participation. Studies of the effectiveness of various intervention strategies may therefore contribute more to our understanding of participation in screening.

Mammographic screening

Predictors of participation

High participation rates in mammographic screening make a major contribution to the cost–effectiveness of the entire screening programme. In order to identify factors associated with an increased likelihood of participating in mammographic screening, a literature search was undertaken with the search terms 'mammographic screening x participation, attendance and predictors'; a recent review of studies of participation in screening (Potter *et al.*, 1996) was used as another source. The results are shown in Table 17.

Table 17. Predictors of attending for mammographic screening

Reference	Study type	Country	Study population	Key findings: Increased attendance associated with:
Prospective studies				
Sutton *et al.* (1994)	Prospective survey before invitation to attend breast screening for the first time; objective measure of attendance	United Kingdom	3291 women aged 50–64	Demographic: owning accommodation (compared with renting); married or single; black. No significant association with other indicators of socioeconomic status; education; age; distance from screening centre Cognitive: Perceived importance of regular screening; intention to go for breast screening; beliefs about personal consequences of screening, effectiveness of screening and chance of getting breast cancer; attitudes of significant others; moderate anxiety (rather than low or excessive anxiety)
Turnbull *et al.* (1995)	Prospective interview of women invited to attend for screening; objective measure of attendance	Australia	285 women aged 45–70	Cognitive: no significant association with knowledge, attitudes, prior experience, perceived susceptibility, information about screening
Cockburn *et al.* (1997)	Cohort study with prospective interview before arrival of mobile van; objective measure of participation	Australia	180 rural women	Demographic: higher education Cognitive: perceiving a personal risk; intention to attend Health care: no previous mammogram Access: knowing location of service
Aro *et al.* (1999)	Prospective interview 1 month before invitation to attend first round of screening; objective measure of attendance	Finland	Attenders: 946 Non-attenders: 641	Demographic: working, middle income, average education Cognitive: overoptimism about sensitivity of mammography; perception of own risk as moderate Health care: regular visit to gynaecologist; attend for Pap smears and practise breast self-examination
Aro *et al.* (2001)	Prospective interview; objective measure of attendance	Finland	436	Cognitive: lower levels of depression and anxiety; more social support Health care: less compliance with health recommendations

Table 17 (contd)

Reference	Study type	Country	Study population	Key findings: Increased attendance associated with:
Comparisons of attenders and non-attenders with objective measure of participation				
Donato *et al.* (1991)	Survey of sample of attenders and non-attenders at screening; objective measure of attendance	Italy	429 non-attenders; 477 attenders	Demographic: lower educational level, married and widowed (compared with single, separated, divorced) Cognitive: family history of breast cancer
Ciatto *et al.* (1992)	Sample of attenders and non-attenders at screening; objective measure of attendance	Italy	393 women: 227 attenders; 166 non-attenders	Demographic: aged 40–49 (compared with younger and older), marital status. No significant association with socioeconomic status or education Cognitive: belief that screening is useful Health care: attendance at gynaecologist; advice from doctor
Kee *et al.* (1992)	Sample of attenders and non-attenders at screening; objective measure of attendance	Ireland	300 attenders; 300 non-attenders	Demographic: younger age Access: attendance by private car (rather than public transport); accepted appointment during office hours
Margolis *et al.* (1993)	Women invited to attend scheduled mammography at a teaching hospital; objective measure of attendance	USA	907 women	Demographic: aged ≥ 60; race; insured women
McNoe *et al.* (1996)	Samples of attenders and non-attenders; objective measure of attendance	New Zealand	191 attenders; 174 non-attenders	Demographic: not significantly associated with age, education, income, socioeconomic status
Lagerlund *et al.* (2000a)	Samples of attenders and non-attenders; objective measure of attendance	Sweden	434 non-attenders; 515 attenders	Cognitive: lower emotional barriers; anxiety about breast cancer; perceived benefits of screening; more knowledge Health care: physician recommendation
Lagerlund *et al.* (2000b)	Samples of attenders and non-attenders; objective measure of attendance	Sweden	434 non-attenders; 515 attenders	Demographic: married, employed Health care: greater use of health care services, other preventive behaviour and screening tests
Lostao & Joiner (2001)	Survey of attenders and non-attenders; objective measure of screening	Spain	708 women 45–65 years; 512 participants and 196 non-participants	Demographic: aged 45–50 and 56–60 Cognitive: knowing someone with breast cancer; belief that breast cancer can be treated; anxiety about cancer Health care: being in better health
Banks *et al.* (2002a)	All women invited to screening in two general practices; objective measure of attendance	United Kingdom	1064 women aged 50–64	Demographic: more affluent areas Health care: having a prescription for hormone replacement therapy

Table 17 (contd)

Reference	Study type	Country	Study population	Key findings: Increased attendance associated with:
Cross-sectional self-reported				
Bernstein *et al.* (1991)	Cross sectional survey; self-reported measure of attendance	USA	4728 women ≥ 40	Health care: being a member of a health management organization
Glanz *et al.* (1992)	Cross-sectional telephone survey at selected, diverse work sites	USA	798 women ≥ 40 at 39 work sites	Cognitive: better knowledge; belief that cancer is curable, mammography is effective and mammograms necessary in the absence of symptoms; knowing someone with breast cancer Health care: doctor's recommendation
Grady *et al.* (1992)	Population-based cross-sectional survey, randomly selected from census; self-reported	USA	630 women aged 45–75	Health care: physician encouragement to a greater degree than health status, health care use, attitudes or demographic characteristics. Older women no more likely to report physician encouragement
Zapka *et al.* (1992)	Cross-sectional survey of women aged 52–75; self-reported participation	USA	1987: 838 1990: 601	Cognitive: family history Health care: having a regular physician
deBruin *et al.* (1993)	Cross-sectional survey; self-reported	Netherlands	2702	Health care: having recently had a Pap test
Calle *et al.* (1993)	Cross-sectional survey; self-reported	USA	12 252 women	Demographic: higher income, non-Hispanic or other non-white background, higher education attendance, age < 65, living in urban area
Mandelblatt *et al.* (1993a)	Cross-sectional survey of attendees at public hospital clinic	USA	271 women (average age, 75 years, 99% black)	Cognitive: intention to have a mammogram. No significant association with knowledge or attitudes Health care: more than three chronic illnesses
Fox & Roetzheim (1994); Fox *et al.* (1994)	Medicare sample of older women plus cross-sectional population survey; self-reported	USA	Older sample: 724 women ≥ 65 years (5% Hispanic) Population sample: 972 women ≥ 50 years	Ethnicity: Hispanic women reported greater concern than white or African American women. No significant differences in attendance rates. Health care: physician endorsement of mammography
Urban *et al.* (1994)	Cross-sectional survey; 50–75-year-old women in four counties in Washington; self-reported	USA	Whole country, analysis by residential area	Demographic: higher income Cognitive: family history of breast cancer Health care: regular visits to gynaecologist or physician
van Gessel-Dauekaussen & de Konig (1995)	Cross-sectional survey	Netherlands	1638	Demographics: no association with education, income or marital status
Rosenman *et al.* (1995)	Cross-sectional survey of women in four farming communities; self-report	USA	680 women	Demographic: higher education, income and insurance; same rates of screening as in urban women

Table 17 (contd)

Reference	Study type	Country	Study population	Key findings: Increased attendance associated with:
Cross-sectional self-reported (contd)				
Frazier *et al.* (1996a)	Cross-sectional survey; self-reported	USA	22 657	Demographic: higher education Health care: routine examination in past year
Thomas *et al.* (1996)	Cross-sectional interview; self-reported measure of participation	USA	1011 women aged ≥ 65	Cognitive: belief that screening 'eases the mind'
Barratt *et al.* (1997b)	Cross-sectional survey; self-reported measure of attendance	Australia	3014	Demographic: aged 50–69. No association with age or rural residence
McPhee *et al.* (1997)	Cross-sectional survey in Vietnamese-American communities; self-reported	USA	258 women aged ≥ 40	Demographic: years in USA; education Health care: good health
Ali-Abarghoui *et al.* (1998)	Cross-sectional survey; self-reported measure of participation	USA	915	Demographic: higher education, health insurance
Fox *et al.* (1998)	Cross-sectional survey of church attenders	USA	1517	Health care: physician recommendation; having medical insurance Ethnicity: African American white (rather than Hispanic). Compared with community sample, churchgoers more likely to be screened
Hoffman-Goetz *et al.* (1998)	Cross-sectional population surveys, 1987 and 1992; separate analyses by racial or ethnic group by income; self-reported	USA	1987:22 043 1992:12 035	Demographic: higher education and income in all racial groups (white, African American, Hispanic)
Paskett *et al.* (1998)	Cross-sectional survey of African–American women; self-reported	USA	555 women aged ≥ 40	Cognitive: better knowledge of mammography; belief that mammography is useful Health care: regular visits to physicians; regular check-ups; having a medical condition
Friedman *et al.* (1999)	Cross-sectional survey in clinic population; self-reported	USA	121 ethnically diverse low-income women recruited from hospital psychiatry clinic	Cognitive: knowledge of breast cancer Health care: physician recommendation
Borràs *et al.* (1999)	Cross-sectional survey; self-reported	Spain	5865 women aged ≥ 20 years	Demographic: age 40–49; higher education, membership of voluntary private health insurance, educational level in women over 40

Table 17 (contd)

Reference	Study type	Country	Study population	Key findings: Increased attendance associated with:
Cross-sectional self-reported (contd)				
Mandelblatt *et al.* (1999)	Cross-sectional population survey; quota sample stratified by age, using random-digit dialling to find 50 women per ethnic group; self-reported	USA	1420 women from four Hispanic and three black groups	Demographic: born in USA or lived there for some time Cognitive: positive attitudes to cancer Health care: having usual source of care; having private health insurance
Michielutte *et al.* (1999)	Women attending seven primary care clinics; self-reported	USA	719 women aged ≥ 60	Cognitive: symptoms; perceived susceptibility; belief that mammography is useful Health care: physician recommendation Access: knowing where to get a mammogram
Maxwell *et al.* (2001)	Cross-sectional survey; self-reported	Canada	8602 women aged 50–69	Demographic: younger age, residence in urban area, born in Canada Health care: regular doctor, recent doctor visit, not smoking
Rutledge *et al.* (2001)	Cross-sectional survey of members of women clubs; self-reported	USA	538 women (average age, 60)	Demographic: older age Health care: recommendation from doctor or nurse Cognitive: knowledge of screening
Valdez *et al.* (2001)	Cross-sectional survey of self-identified Latinas; self-reported	USA	583 women aged > 40	Health care: having a regular doctor
Other designs				
Conry *et al.* (1993)	Patients of family physicians; chart review	USA	839 patients	Health care: first visit to that doctor; had a mammogram in the past; had a breast-related complaint; attending for an annual examination; considered by doctor as more likely to participate
Horton Taylor *et al.* (1996)	Response rates to special invitation by 65–74-year-olds compared with routinely invited women aged 50–64; pilot study on effectiveness of screening	United Kingdom	65–74: 4836 50–64: 7446	Demographics: aged 50–64 compared with older women

Studies of women who had attended for screening and those who had not were included, as were studies in which actual attendance for screening and self-reported attendance were used. Nevertheless, more reliance should be placed on studies of actual attendance as the outcome measure, as there is likely to be some response bias in self-reported attendance. Studies in which 'intention to attend' was used as a surrogate measure were excluded. As community views about mammographic screening and its availability have changed considerably over the past decade, only studies published after 1990 were included.

Several studies (e.g. Sutton *et al.,* 1994; Cockburn *et al.*, 1997) were prospective surveys of women invited to screening, and the characteristics of those women who subsequently attended were compared with those who did not; these provide the most reliable data about predictors of screening. In several studies, non-attenders were interviewed to identify their reasons for not participating; some information from these studies has been included, where relevant, although individuals may not be able to explain reliably why they did not attend, and there may be response bias. Studies with very small sample sizes were also excluded, although it should be noted that there has been considerable qualitative research (e.g. Lagerlund *et al.*, 2001), on which the interventions described in the following chapter were based.

The review indicated at the outset that the characteristics of the health service delivery system (whether screening was offered opportunistically, whether it was free, whether it was population-based) would be related to the characteristics of the women who attended. However, in practice, there was remarkable similarity among countries and screening programmes in the characteristics of women who attended for screening.

Demographic predictors of attendance

Age

Most studies have shown that younger women, even within the range 50–70 years, are more likely to attend for screening than older women (Ciatto *et al.,* 1992; Horton Taylor *et al.,* 1996; Maxwell *et al.*, 2001).

Socioeconomic status

Lower educational and income status were associated with lower rates of participation in many studies (e.g. Calle *et al.*, 1993; Urban *et al.*, 1994; Cockburn *et al.*, 1997; Ali-Abarghoui *et al.*, 1998; Hoffman-Goetz *et al.*, 1998; Borràs *et al.,* 1999). For example, Calle *et al.* (1993) found that 80% of women living below the poverty level had never had a mammogram, and Hoffman-Goetz *et al.* (1998) found that socioeconomic status was an independent predictor of attendance within racial or ethnic groups in the USA.

The apparent influence of socioeconomic status on participation may, however, be due to the strategies used for recruitment and the characteristics of health service delivery. For example, in Italy, less well educated women were more likely to attend a public screening programme (Donato *et al.,* 1991), and socioeconomic status was not associated with attendance (Ciatto *et al.*, 1992). The authors postulated that more affluent women were screened in the private sector. In a large prospective study in the United Kingdom (Sutton *et al.,* 1994), women in rented accommodation were less likely than those in owned homes to attend for screening; no other indicator of socioeconomic status was important.

Rural residence

The findings about whether living in rural areas affects attendance are inconsistent; some studies have shown that rural women are as likely to attend for screening as urban women (e.g. Rosenman *et al.*, 1995; Barratt *et al.*, 1997b), while others have shown lower attendance rates by rural women (Calle *et al.*, 1993; Maxwell *et al.*, 2001). The inconsistency of these findings may be due to confounding between rural residence and access to screening. In areas where mobile screening is available, rural residence appeared to be less important (e.g. Barratt *et al.*, 1997b), and distance from a screening centre has been shown to affect attendance (e.g. Sutton *et al.*, 1994).

Marital status

Married and single women were more likely than divorced, separated or widowed women to attend for screening (e.g. Donato *et al.*, 1991; Ciatto *et al.*, 1992; Sutton *et al.*, 1994).

Ethnic background

Most research suggests that ethnic background itself is not an important independent predictor of attendance at mammographic screening (e.g. Fox & Roetzheim, 1994; Fox *et al.*, 1994; Sutton *et al.,* 1994), and that factors like socioeconomic status and physicians' recommendation are important (Hoffman-Goetz *et al.*, 1998; Friedman *et al.*, 1999).

Knowledge and attitudes as predictors of attendance

Studies of the effect of knowledge and attitudes on participation in screening are difficult to compare when different questions and measurement tools are used. Nonetheless, four factors can be distinguished:

Knowledge of screening

Women who know about mammographic screening are more likely to attend (e.g. Glanz *et al.,* 1992; Friedman *et al.*, 1999; Lostao *et al.*, 2001; Valdez *et al.*, 2001).

Predictors of participation in mammographic screening

The factors most consistently associated with participation in mammographic screening appear to be:

- **an invitation or reminder to participate in an organized programme;**
- **a strong recommendation from a doctor;**
- **good understanding of the benefits of mammographic screening and a belief that breast cancer can be treated;**
- **a perception of personal risk and moderate anxiety about breast cancer; and having recently had a Pap test or other health intervention.**

Belief that screening is effective

Women are more likely to attend for screening if they believe that mammographic screening is effective in finding small cancers that can be cured (Donato *et al.*, 1991; Ciatto *et al.*, 1992; Glanz *et al.,* 1992; Sutton *et al.,* 1994; Paskett *et al.*, 1998; Lagerlund *et al.*, 2000a; Lostao & Joiner, 2001; Lostao *et al.*, 2001).

Fear that breast cancer will be detected

Strong fear that breast cancer will be detected is associated with a decreased likelihood of attending for screening (Donato *et al.*, 1991; Ciatto *et al.,* 1992; Munn, 1993). Women who report being very concerned about breast cancer may not attend for screening (Ciatto *et al.*, 1992), whereas moderate anxiety (rather than little or excessive anxiety) about breast cancer is most likely to predict attendance at screening (Sutton *et al.*, 1994). In interviews of non-attenders, the reasons given for not participating in screening included 'apathy' or lack of concern (Donato *et al.*, 1991; Munn, 1993), fear of a positive result (Donato *et al.*, 1991; Munn, 1993; Sutton *et al.*, 1994), 'rather not know' (Kee *et al.*, 1992) and fear of pain or embarrassment (Kee *et al.*, 1992).

Perceived personal risk

Perceived personal risk is also a key predictor of attending for screening. Women who believe they are more likely to develop breast cancer are more likely to attend (Donato *et al.*, 1991; Cockburn *et al.*, 1997), as are women who report breast cancer among family members (Donato *et al.*, 1991; Glanz *et al.*, 1992; Vernon *et al.*, 1992) or friends (Glanz *et al.*, 1992).

Health care factors as predictors of participation

A recommendation by a doctor to attend for screening appears to be very influential and has been shown to be associated with attendance in many studies (e.g. Glockner *et al.*, 1992; Zapka *et al.*, 1992; Fox & Roetzheim, 1994; Crane *et al.*, 1998; Paskett *et al.*, 1998; Friedman *et al.*, 1999; Lagerlund *et al.*, 2000a). For example, Fox *et al.* (1994) reported that women who said that their physician had recommended a mammogram were 4.5 times more likely to participate. Grady *et al.* (1992) found that encouragement by a physician was more important than any other variable explored.

Many studies have shown that women who participate in other screening programmes, such as those for cervical cancer, or who practise breast self-examination are more likely to attend for mammographic screening (e.g. Vernon *et al.*, 1992). This apparent association might reflect a belief in the value of early detection and screening. It might also be linked with access to health services: women who have a usual source of care are more likely to have a mammogram (Urban *et al.*, 1994; Mandelblatt *et al.*, 1999; Maxwell *et al.*, 2001; Valdez *et al.*, 2001). This hypothesis is supported by the finding that doctors are more likely to order a mammogram for women who have had a previous mammogram or clinical breast examination (Glanz *et al.*, 1992; Conry *et al.*, 1993); the medical record may prompt a doctor to order a mammogram. The value of prompting a doctor to recommend mammographic screening is also reflected in the increased likelihood that women will have a screen after a check-up visit (Conry *et al.,* 1993).

Access as a predictor of participation

The role of structural factors, such as access, cost and health insurance, has been less thoroughly investigated, and inconsistent findings have been reported. All the studies listed in Table 17 were of predictors of attendance within a particular health system. Regular letters of invitation and reminders to attend, which are part of an organized approach to screening, were found to increase access and attendance (e.g. Irwig *et al.*, 1990; Sutton *et al.*, 1994; Somkin *et al.*, 1997).

Distance from the screening site was found to be important in some studies (Haiart *et al.*, 1990) but not others (Sutton *et al.*, 1994). The inconsistency may be due differences in distance, the availability of public transport and attitudes towards travel for health care. Access to private transport was found

to be important in one study (Kee *et al.,* 1992). Interviews of non-attenders indicated that poor access was often cited as a reason for not participating in screening (e.g. Glockner *et al.,* 1992; Hopkins & Hensley, 1993; Munn, 1993).

The role of cost is more difficult to assess, and the findings about the extent to which socioeconomic status predicts attendance are mixed (Donato *et al.*, 1991; Calle *et al*., 1993; Sutton *et al.*, 1994). Income level is likely to be confounded by health service delivery characteristics, in particular whether screening is free and the availability and cost of private screening and insurance. Nonetheless, cost is often cited as a reason for not attending (Hopkins & Hensley, 1993; Munn, 1993). Cost might be important only below a certain income level. For example, Hopkins and Hensley (1993) found that women with annual incomes below US$ 15 000 were more likely to cite high cost as important, and Calle *et al.* (1993) found that women living below the poverty line were less likely to participate.

Participation in re-screening

Although most programmes have shown high re-screening rates (e.g. Fracheboud *et al.*, 1998; BreastScreen Victoria, 2001), little is known about the factors that encourage regular mammographic screening. While these factors are probably different from those that cause women to attend for a first screen, first screens were not differentiated from subsequent screens in most studies.

Several studies have been conducted of re-attendance. In the United Kingdom, Orton *et al.* (1991) explored the reasons for non-attendance among the 11% of women who did not return for re-screening. These women were more likely to report the test as having been embarrassing or distressing and significantly less likely to have found the clinic staff helpful or to report that they considered their attendance worthwhile or reassuring. Women who had received a false-positive result were not less likely to attend for subsequent screening. Baines *et al.* (1990) found that women who did not return for re-screening were less likely than regular participants to report that they had received prompt, courteous, competent examination.

Cockburn *et al*. (1997) followed a group of women from first to second screening rounds. They found that 'reluctant attenders' at the first screening were least likely to come back. The predictors of returning for a second screening were initially being invited through a community campaign rather than by letter and having had a previous mammogram before the screen. O'Byrne *et al*. (2000), in a study of women in Australia invited for second-round mammographic screening, found that women were less likely to attend the second time if they were from a non-English-speaking background, indigenous or reported breast symptoms at the first screen.

Strategies to encourage participation in mammographic screening

As participation in mammographic screening is less than optimal in most countries, many approaches have been tested to encourage attendance. However, as yet, no recommendations can be made about the most effective strategies for public health screening programmes, for several reasons. Few studies have been conducted on the cost of the various recruitment strategies, although, in a population progamme, the cost–effectiveness of the approach is of critical importance. A statistically significant increase in participation found in a randomized trial to be due to a particular intervention may be of little consequence to a population programme if the cost is high.

Furthermore, little information is available about the effects of community-based strategies or programmes for specific populations. During the initial phase of a new screening programme, community-based strategies are often implemented to raise awareness. As the screening programme becomes established, specific strategies may be needed for specific groups whose attendance is low. Although such strategies are of considerable interest to the providers of public health programmes, they are difficult to assess in randomized trials and are therefore not included in systematic reviews.

Comparison of studies is difficult because of the differences in interventions, populations and methods. Differences in health service delivery systems may also confound the effectiveness of an intervention; for example, a strategy may be differentially effective depending on whether the system is population-based or whether mammograms are provided free of charge.

The types of intervention that have been investigated include strategies targeting individual women, community-based strategies, health care provider programmes and strategies for specific groups.

Strategies targeting individual women

Many studies have been conducted of strategies to encourage individual women to participate in mammographic screening. These were summarized in a Cochrane Collaboration review (Bonfill *et al.,* 2001), which highlighted the limitations of many studies of the effect of such strategies: of the 151 studies located, only 16 met the criteria for inclusion in the review. The review showed that five active strategies were effective in encouraging women to participate in population-based mammographic screening relative to controls with no intervention: a letter of invitation (odds ratio [OR] 1.66; 95% CI, 1.43–1.92), mailed educational material (OR, 2.81; 95% CI, 1.96–4.02); letter of invitation plus phone call (OR, 2.53; 95% CI, 2.02–3.18);

phone call (OR, 1.94; 95% CI, 1.70–2.23) and training plus direct reminders (OR, 2.46; 95% CI, 1.72–3.50). Neither home visits nor letters of invitation to multiple examinations with educational material increased participation.

Four studies included in the review explored the effect of receiving a letter of invitation (Irwig *et al.*, 1990; Turnbull *et al.*, 1991; Sutton *et al.*, 1994; Somkin *et al.*, 1997). All the studies reported higher rates of participation among women who received the letter. On average, the invitation letter increased attendance by about 30%, with greater increases when an appointment time or medical chart reminder were included with the letter.

Three studies explored the effect of an invitation letter plus a phone call (Lantz *et al.*, 1995; Janz *et al.,* 1997; Bodiya *et al*., 1999). All the studies found that adding a telephone call to the invitation letter increased participation; in one study (Lantz *et al.*, 1995), the rate of attendance was four times greater among women who received a phone call. However, the costs of a telephone invitation are clearly greater than those of an invitation alone; it was estimated in one study that the phone call increased costs by about US$ 9 per mammogram (Bodiya *et al.*, 1999).

In several studies in the review, multi-component strategies were compared with a single strategy. The multi-component approaches were found to be more effective, but the relative cost–effectiveness of the different approaches could be evaluated in few of the studies. For example, Davis *et al*. (1997) compared a birthday-card reminder, a personalized letter and a multi-component phone call including reminder, counselling and scheduling of appointments. The third strategy was the most effective in increasing participation rates; however, although no data on cost were provided, it would also have been the most expensive. The importance of considering cost–effectiveness was illustrated in a comparison of three strategies: reminder postcard, reminder telephone call and motivational phone call (Fishman *et al.*, 2000). The marginal cost–effectiveness was US$ 22 per woman screened for the postcard and US$ 92 for the reminder call.

Several studies in the review showed that inclusion of an appointment increases participation, an appointment functioning as a behavioural prompt to attending for screening. For example, Irwig *et al.* (1990) reported participation rates of 38% for a group who received an appointment with the screening letter and 24% for those without an appointment. Another study showed a 132-fold increase in attendance when an appointment was included (Hurley *et al*., 1994).

Overall, most recruitment strategies targeting individual women were more effective than no intervention in encouraging participation in mammographic screening. Although combinations of effective strategies resulted in greater participation, more data are needed about relative cost–effectiveness.

Programmes with health care providers

Effect of a recommendation from a health care provider

Several studies have shown that a recommendation from a doctor is strongly associated with participation in mammographic screening (Grady *et al*., 1992; Fox & Roetzheim, 1994), as have most randomized trials. In Australia, two studies (Cockburn *et al.,* 1990; Clover *et al*., 1992) showed high rates of attendance after a verbal recommendation by a doctor to attend for screening. Fox *et al.* (1994) and Kohatsu *et al*. (1994) showed that the enthusiasm with which a doctor recommends screening is a key predictor of attendance; women who perceived their physicians as having some enthusiasm for mammography were 4.5 times more likely to be screened.

Several studies have shown that a personal letter from a woman's doctor increases participation; for example, Turner *et al.* (1994) found that inclusion of a letter from the woman's general practitioner with the standard second invitation letter doubled the number of women attending for screening. Mayer *et al.* (1994) found that a reminder on the doctor's letterhead resulted in a greater participation rate than one on a standard letterhead. In Italy, Giorgi *et al.* (2000) found that in some but not all towns the involvement of a general practitioner increased participation. Sharp *et al.* (1996) reported that a personal letter from a general practitioner was at least as effective as a home visit from a nurse and certainly more cost–effective. However, two studies showed that a personal letter from a woman's doctor did not increase participation over that with a standard letter from the programme (Taplin *et al*., 1994; O'Connor *et al*., 1998). A personal telephone call from a doctor increased participation (e.g. Hoare *et al.*, 1994; Bodiya *et al.*, 1999).

Despite their potential effectiveness, doctor-based strategies might be costly and therefore of limited use in public health programmes. Other health care workers may be equally effective in encouraging participation and perhaps more cost–effective. For example, Mohler (1995) found that a call from a medical assistant was more cost–effective (US$ 3 per mammogram) than either a doctor's letter alone (US$ 14 per mammogram) or a call from the doctor (US$ 52 per mammogram). The cost of doctor-based strategies might be reduced by minimal interventions. Two studies showed that brief interventions can be as effective as more extensive, costly interventions. Clover *et al*. (1992) found that 82% of women attended for screening after a simple recommendation from their doctor and 91%

attended after a more intensive educational programme. Likewise, Taplin *et al.* (2000) found that a brief reminder call from a counsellor was as effective as a motivational call of nearly three times the length.

Strategies to encourage doctors to recommend mammographic screening

Although a recommendation from a doctor is highly effective in encouraging screening, many women have reported that their doctor had not recommended participation. For example, only 35% of Australian women of the target age for screening reported that their doctor had recommended it (Barratt *et al.*, 1997b), and only 50% of women in the USA reported that their physician had encouraged them to attend (Paskett *et al.*, 1998).

A meta-analysis of the effect of strategies to encourage health professionals to recommend screening (Mandelblatt & Yabroff, 1999) was conducted of studies from the USA of randomized or non-randomized design with concurrent controls; 35 studies that met the inclusion criteria were located. Behavioural, cognitive and sociological interventions with health professionals increased participation rates to a similar extent (13.2%; 95% CI, 7.8–18.4; 18.6%; 95% CI, 12.8–24.4; 13.1%; 95% CI, 6.8–19.3). Strategies targeting doctors and women were usually no more effective than those targeting doctors alone. In this review, the sociological interventions were heterogeneous, including interventions by nurses; the behavioural strategies included reminders or office prompts. Several studies showed that prompts to doctors based on medical records or computer files increased participation in mammographic screening among their patients. For example, Burack *et al.* (1994) found that including a reminder form for mammography in the medical record prompted physician referral and increased participation in screening. Ornstein *et al.* (1991) tested computer-generated reminders to patients, to their doctors or to both patients and their doctors. The greatest increases were seen when both received a reminder, with a doubling in participation in mammographic screening. The cognitive interventions included provision of educational materials or audit and feedback; for example, Dietrich *et al.* (1992) found that educational sessions plus office system planning resulted in increased rates of mammographic screening, as did the educational sessions alone.

Cost–effectiveness must also be considered in strategies for encouraging health care providers to recommend screening. Over time, it may be cost–effective to target those doctors who regularly do not refer women to screening; it may be possible to identify these doctors from the low attendance rates of their patients (Lane & Messina, 1999).

Community strategies

Community strategies may be particularly important for announcing the establishment of a screening programme, creating a context for other recruitment strategies and recruiting women from specific groups. The few studies of the effect of community strategies were not randomized trials, but some included a control community. Unfortunately, in few of these studies were the costs of these potentially expensive, resource-intensive strategies assessed.

The media were the most commonly cited source of information about mammographic screening (Metsch *et al.*, 1998), and media coverage can affect attendance (Clover *et al.*, 1996; Yanovitzky & Blitz, 2000). However, the media alone are less effective than community development, health professional or telephone strategies (Clover *et al.*, 1996; Barr *et al.*, 2001). Barr *et al.* (2001) found that routine media publicity was as effective as a mail strategy.

Community participation and development programmes increase participation in screening more than media strategies or the provision of free screening in a mobile van (Clover *et al.*, 1996; Flynn *et al.*, 1997). Nevertheless, community development and participation programmes are expensive, resource-intensive and likely to result in long- rather than short-term gains. The role of such strategies for specific groups warrants further investigation, as community development programmes might have other health benefits beyond the issue of interest.

Strategies to modify access and cost can also be implemented at community level. The provision of vouchers for free screening increases participation rates (Stoner *et al.*, 1998); however, cost probably interacts with a range of other variables, such as income level and insurance. The effect of cost might be modified by other variables; for example, Rimer *et al.* (1992) compared the effect of providing free screening with that of providing free screening and improving access and education. Women in the communities receiving the more extensive intervention were much more likely to participate in screening. The authors concluded that the provision of free mammography alone is not sufficient to generate attendance.

Strategies for specific ethnic groups

The few studies of strategies to encourage attendance among women from specific ethnic groups were not based on a trial method. Community-based programmes appeared to be effective among African American women (Paskett *et al.*, 1999), and use of health workers of the same ethnic group increased attendance in some communities (e.g. Bird *et al.*, 1998) but not in others (Hoare *et al.*, 1994). A media programme targeting Vietnamese American

women increased their knowledge about mammography but did not affect their attendance (Jenkins *et al*., 1999).

Several studies have shown that programmes run by health care providers are particularly effective. For example, Atri *et al.* (1997) in the United Kingdom randomized doctors' receptionists to receive training in encouraging participation in screening by patients from minority ethnic groups. The overall rate of participation by these women was very low (4%), and the training resulted in a modest but statistically significant increase. The intervention was more effective in certain ethnic groups: the participation of Indian women increased by 14% as compared with an increase of 5% in the total intervention sample. A study in Wales showed that special programmes in a general practice increased the attendance of women in specific ethnic communities (Bell *et al*., 1999). Nurse practitioners were found to be effective in encouraging attendance by poor, elderly black women (Mandelblatt *et al*., 1993b). However, a primary care programme for women with low income and of minority groups did not increase screening rates (Manfredi *et al*., 1998).

As participation rates increase in the community as a whole, cost–effective strategies to reach such groups will become more important.

Clinical breast examination

Various approaches have been taken to investigating clinical breast examination, with differences among studies in the population and the age of the women, the frequency of clinical breast examination and measures of practice (e.g. self-report, chart review). There is little information for countries outside Europe, North America and Australasia about the practice of clinical breast examination.

Studies in western countries suggested higher rates of practice of clinical breast examination than of breast self-examination. The annual rates of clinical breast examination ranged from 42% in Michigan, USA (Ruffin *et al*., 2000), to 54% in Australia (Barratt *et al.*, 1997b) and 87% (20–40 year-olds) and 70% (over 40 years) in the USA (Vincent *et al*., 1995). Two-thirds of female physicians in the USA reported undergoing annual clinical breast examination (Frank *et al.,* 2000).

Several studies have been conducted with health professionals to explore predictors of offering clinical breast examination. Male but not female doctors reported that women's embarrassment prevented them from offering clinical breast examination (Desnick *et al.*, 1999), and there is some evidence that screening is commoner among the patients of female doctors (Burns *et al.,* 1996).

There also appear to be woman-specific factors that increase the likelihood of receiving clinical breast examination, but it is not clear whether these factors increase the likelihood that women will request examination or that doctors will offer it. Women receiving clinical breast examination were more likely to perceive that the examination was of value and to have greater health motivation (Fung, 1998; Mandelblatt *et al.*, 1999; Rutledge *et al*., 2001; Tanjasiri & Sablan-Santos, 2001); they were more likely to have seen a specialist for routine examination in the previous year, to have a usual source of care and to have had more than a high-school education (Frazier *et al.*, 1996a; Mandelblatt *et al.,* 1999; Tanjasiri & Sablan-Santos, 2001). An Australian study (Barratt *et al.,* 1997b) found that a clinical breast examination in the previous 2 years was commoner among women aged over 50 than in younger women, and a study of Hispanic-American women found clinical breast examination to be associated with knowledge of breast self-examination, being a non-smoker and having recently had a Pap smear and mammogram (Zambrana *et al*., 1999).

Strategies targeting doctors increase the frequency with which clinical breast examination is offered. For example, in randomized trials, the numbers of women receiving clinical breast examination was increased after introduction of a computer prompt system (Williams *et al.,* 1998) and an office reminder system (Manfredi *et al.*, 1998).

Breast self-examination

Programmes to encourage breast self-examination were first established in Europe, Australasia and North America in the 1950s, and major sustained public information programmes were implemented up to the late 1990s to encourage women to practise monthly breast self-examination (see also Chapter 2). By the mid-1990s, however, surveys in most western countries indicated that only about one-third of women regularly practised this examination: for example, 31% in Virginia, USA (Giles *et al.,* 2001), 37% in Australia (Barratt *et al.*, 1997b), 27% in Seattle, USA (Strickland *et al.*, 1997), 28% in Ireland (Murray & McMillan, 1993), 15% of Chinese-American women (Lu, 1995) and 27% of Chamorro women in the USA (Tanjasiri & Sablan-Santos, 2001). The rates of monthly breast self-examination were low even among female physicians, who might be expected to practise preventive health measures more commonly; for example, 30% of Norwegian (Rosvold *et al.,* 2001) and 21% of American (Frank *et al*., 2000) female physicians reported practising monthly breast self-examination.

Many studies have been conducted of the characteristics of women who practise breast self-examination, and a range of indicators was found. Comparison between studies is difficult, however, because of the different populations and assessment of different measures; various questions have been used to assess practice, and it is not possible to evaluate the extent to which women's reports of breast self-

examination are accurate. Taking these factors into account, women appear to be more likely to practise breast self-examination if they are very anxious about breast cancer (e.g. Abdel-Fattah *et al.*, 2000) or have a significant family history of the disease (e.g. Brain *et al.*, 1999). In general, women who were better educated and had more knowledge were more likely to practise breast self-examination (e.g. Murray & McMillan, 1993; Friedman *et al.*, 1999). Women who were more confident about how to undertake breast self-examination were also more likely to practise it (e.g. Murray & McMillan, 1993; Friedman *et al.*, 1999; Rutledge *et al.*, 2001), as were women whose doctor had recommended the practice (e.g. Friedman *et al.*, 1999). Women under 50 (Murray & McMillan, 1993), married women and those working outside of the home were more likely to practise breast self-examination (Murray & McMillan, 1993). In Hong Kong, breast self-examination was associated with being more health-conscious (Abdullah & Leung, 2001).

The small number of studies of the practice of breast self-examination in non-western countries, outside of organized cancer control activities, found low rates: 1.3% of women reported practising breast self-examination in Malaysia (Chan, 1999), 10% in Egypt (Abdel-Fattah *et al.*, 2000) and 16% in Hong Kong (Fung, 1998).

Studies in developed countries found that few women practised breast self-examination competently (Coe *et al.*, 1994; Bragg Leight *et al.*, 2000). Training improved the frequency of practice, confidence and objective proficiency as rated by others (Clarke & Savage, 1999; Bragg Leight *et al.*, 2000).