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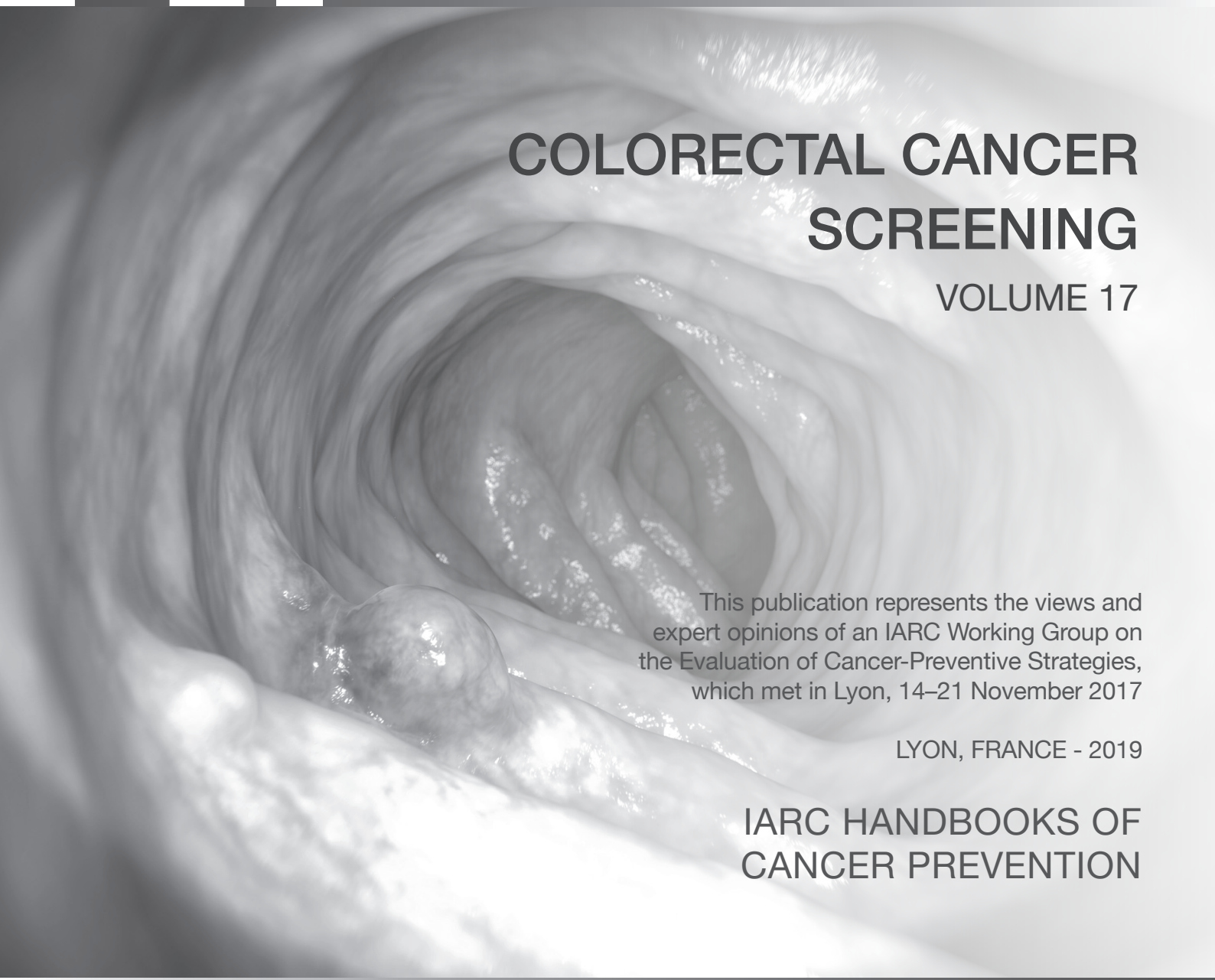

COLORECTAL CANCER SCREENING

VOLUME 17

This publication represents the views and expert opinions of an IARC Working Group on the Evaluation of Cancer-Preventive Strategies, which met in Lyon, 14–21 November 2017

LYON, FRANCE - 2019

IARC HANDBOOKS OF CANCER PREVENTION

International Agency for Research on Cancer

World Health Organization

2. AVAILABILITY AND USE OF COLORECTAL CANCER SCREENING

2.1 Europe

In this section, the following 47 countries are considered: the 28 Member States of the European Union (EU) and Albania, Andorra, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Georgia, Iceland, Liechtenstein, Monaco, Montenegro, Norway, the Republic of Moldova, the Russian Federation, San Marino, Serbia, Switzerland, the former Yugoslav Republic of Macedonia, and Ukraine.

During the past decade, since the publication of the first EU report on cancer screening activity (Von Karsa et al., 2008), a substantial improvement has taken place in the implementation of colorectal cancer (CRC) screening in Europe. Information about CRC screening policies, strategies adopted in current programmes, implementation status, and participation in screening activities is available from five recent surveys. One of them focused on the EU Member States (Altobelli et al., 2014), two reported information from non-EU countries in Europe (Altobelli et al., 2016; Giordano et al., 2016), and the other two reported European data as part of a worldwide survey of CRC screening (Benson et al., 2008; Schreuders et al., 2015). Additional data are available from the second EU report on cancer screening (Ponti et al., 2017), which reported updated information about policies, strategies, and organization of screening in EU Member States, as well as quantitative performance data for breast cancer, cervical cancer, and CRC screening programmes.

The involvement of experts and stakeholders from several EU Member States in the development of EU guidelines (Segnan et al., 2010), together with the implementation of international cooperative projects – the European Partnership for Action Against Cancer (EPAAC) (European Partnership for Action Against Cancer, 2012), Europe against Cancer: Optimisation of the Use of Registries for Scientific Excellence in Research (EUROCOURSE) (Anttila et al., 2015), and the Joint Action on Cancer Control (CANCON) programmes (Albreht et al., 2017) – extended to new EU Member States from eastern and central Europe, contributed to the adoption of a common framework for the implementation of population-based programmes, reaching a large proportion of the European population.

More recently, cooperation has also been extended to European countries that are not members of the EU, within the framework of the EUROMED CANCER Network project (Giordano et al., 2016), which supports the development of the skills, organizational resources, and infrastructure that are needed to implement high-quality screening.

2.1.1 Guidelines

In 2003, the EU Council called for the introduction of evidence-based screening, adopting a population-based approach (European Council, 2003). Only the guaiac faecal occult blood test (gFOBT) was recommended as the primary screening test for people aged 50–74 years.

More recently, the EU quality assurance guidelines for CRC screening, developed following an evidence-based methodology (Segnan et al., 2010), concluded that there was good evidence to support the adoption of gFOBT, reasonable evidence of the effectiveness of the faecal immunochemical test (FIT), reasonable evidence (only one trial had been published at the time) of the effectiveness of sigmoidoscopy, and limited evidence of the effectiveness of primary screening with colonoscopy. No evidence was available on the effectiveness of newer tests (computed tomography [CT] colonography, capsule colonoscopy, or stool DNA tests), which were not recommended for screening average-risk subjects. FIT was recommended as the faecal test of choice for population-based programmes.

2.1.2 Policies

To maximize the impact of screening, the EU guidelines (Segnan et al., 2010) recommended the implementation of organized programmes, which, unlike opportunistic screening or case finding, can ensure high coverage and equity of access and enable comprehensive quality assurance. By 2016, population-based organized programmes had been established or piloted in 22 of the 28 EU Member States (Table 2.1), and Germany is planning to switch from the current opportunistic screening to a population-based programme in 2019. Non-population-based programmes exist in Greece and Latvia (Ponti et al., 2017).

Seven of the 19 non-EU countries in Europe (Georgia, Monaco, Montenegro, Norway, San Marino, Serbia, and Switzerland) have adopted at least some policies to implement or pilot population-based programmes (Table 2.1). Among Balkan countries outside the EU, population-based programmes exist in Montenegro and in Serbia, and opportunistic screening is available in Bosnia and Herzegovina, whereas no programmes have been implemented in Albania or the former Yugoslav Republic of Macedonia (Schreuders et al., 2015; Altobelli et al., 2016; Giordano et al., 2016; Scepanovic et al., 2017). In Switzerland, the canton of Vaud has launched a systematic organized CRC screening programme, offering both FIT and colonoscopy to the eligible population (Selby et al., 2016). In Iceland, the implementation of a population-based programme offering biennial screening with FIT, which had been planned for 2008, was postponed because of the onset of the economic crisis (Altobelli et al., 2016). Pilot projects comparing FIT and sigmoidoscopy are under way in Norway (Bretthauer & Hoff, 2012). No programmes have been implemented in Andorra or Liechtenstein (Schreuders et al., 2015; Altobelli et al., 2016).

In the Russian Federation, CRC screening is not included in the National Priority Project "Health", which provides guidelines for cancer prevention efforts (Avksentyeva, 2010; Goss et al., 2014). Among the other European countries of the former Soviet Union, only Georgia has recently implemented a pilot project with gFOBT (Altobelli et al., 2016). Belarus has implemented a project to assess the performance of FIT among asymptomatic subjects who undergo colonoscopy at a single institution, to obtain information useful for planning the implementation of national screening (Rebeko et al., 2016). In Ukraine, CRC prevention was included in the most recent cancer plan, for 2002–2006, but no information is available about the current implementation (Altobelli et al., 2016). No programmes have been implemented in the remaining countries (Altobelli et al., 2016; Giordano et al., 2016).

Table 2.1 Policies and practice for colorectal cancer screening in Europe[a]

Country	Start year	Type of programme	Target age range (years)	Screening interval (years)	Screening method	Examination coverage[b] (%)	Invitation coverage[c] (%)	Participation rate[d] (%)	References
Austria[e]	2003	Opportunistic; population-based organized in one region	40–80	1	TC; FIT	NR	NR	NA	Ponti et al. (2017)
Belgium	2009	Population-based organized	56–74 (Flemish Region) 50–74 (Wallonia-Brussels)	2	FIT	27.7	99.2	50.3 (Flemish Region) 4.5 (Wallonia-Brussels)	Ponti et al. (2017)
Bosnia and Herzegovina	NR	Opportunistic	≥ 50	NR	FIT	NR	NR	NA	Altobelli et al. (2016)
Croatia	2008	Population-based organized	50–74	2	gFOBT	15.3	100.5	15.3	Ponti et al. (2017)
Cyprus	2013	Population-based organized (pilot)	50–69	2	FIT	NR	NR	NR	Ponti et al. (2017)
Czech Republic[f]	2014	Population-based organized	50–70 (FIT) ≥ 55 (TC)	1 (FIT, 50–54) 2 (FIT, 55–70) 10 (TC)	FIT/TC	21.0	NR	NR	Ponti et al. (2017)
Denmark	2014	Population-based organized	50–74	2	FIT	NR	NR	NR	Ponti et al. (2017)
Estonia	2016	Population-based organized	60–69	2	FIT	NR	NR	NR	Ponti et al. (2017)
Finland	2004	Population-based organized (pilot)	60–69	2	gFOBT	15.9	23.9	66.6	Ponti et al. (2017)
France	2002	Population-based organized	50–74	2	FIT	26.5	99.1	24.4	Ponti et al. (2017)
Georgia	NR	Population-based organized (pilot)	50–69	2	gFOBT	NR	NR	53	Altobelli et al. (2016)
Germany[g]	1974[g]	Opportunistic	50–54 (FIT) ≥ 55 (TC)	1 (FIT, 50–54) 2 (FIT, ≥ 55) 10 (TC)	FIT/TC	22.5	NR	NA	Ponti et al. (2017)
Greece	NR	Opportunistic	50–70	2 (gFOBT) 5 (TC)	gFOBT/TC	NR	NR	NA	Ponti et al. (2017)
Hungary	2007	Population-based organized	50–70	2	FIT	0.6	1.7	36.7	Ponti et al. (2017)
Ireland	2012	Population-based organized	60–69	2	FIT	11.5	28.6	43.1	Ponti et al. (2017)

Table 2.1 (continued)

Country	Start year	Type of programme	Target age range (years)	Screening interval (years)	Screening method	Examination coverage[b] (%)	Invitation coverage[c] (%)	Participation rate[d] (%)	References
Italy[h]	1982	Population-based organized	50–69	2 (FIT) Once in lifetime (FS)	FIT/FS (Piedmont)	28.6	63.0	45.7 (FIT) 37.3 (FS+FIT)	Ponti et al. (2017)
Latvia	2009	Opportunistic	50–74	1	gFOBT	11.1	NR	NA	Ponti et al. (2017)
Lithuania[i]	2009	Population-based organized	50–74	2	FIT	53.1	NR	NR	Ponti et al. (2017)
Luxembourg	2016	Population-based organized	55–74	2 (FIT) 10 (TC)	FIT/TC	NR	NR	NR	Ponti et al. (2017)
Malta	2013	Population-based organized	55–66	2	FIT	45.4	127.1	35.7	Ponti et al. (2017)
Monaco	2006	Population-based organized	50–80	2	FIT	NR	NR	60.0	Altobelli et al. (2016)
Montenegro	2013	Population-based organized	57–66	2	FIT	63.6	84.4	75.4	Scepanovic et al. (2017)
Netherlands	2014	Population-based organized	55–75	2	FIT	27.2	38.2	71.3	Ponti et al. (2017)
Norway	2012	Population-based organized (pilot)	55–64	2 (FIT) Once in lifetime (FS)	FIT/FS	NR	NR	NR	Altobelli et al. (2016)
Poland	2012	Population-based organized (pilot)	55–64	Once in lifetime	TC	1.7	10.1	16.7	Ponti et al. (2017)
Portugal	2009	Population-based organized	50–70	2	FIT	1.1	1.8	62.8	Ponti et al. (2017)
San Marino	2009	Population-based organized	50–75	2	FIT	NR	NR	65	Altobelli et al. (2016)
Serbia	2013	Population-based organized	50–74	2	FIT	11.8	18.9	62.5	Altobelli et al. (2016); Scepanovic et al. (2017)
Slovenia	2009	Population-based organized	50–74	2	FIT	47.1	93.4	50.5	Ponti et al. (2017)
Spain	2000	Population-based organized	50–69	2	FIT	8.3	16.4	52.2	Ponti et al. (2017)
Sweden[j]	2008	Population-based organized	60–69	2	FIT	11.9	19.8	60.2	Ponti et al. (2017)

Table 2.1 (continued)

Country	Start year	Type of programme	Target age range (years)	Screening interval (years)	Screening method	Examination coverage[b] (%)	Invitation coverage[c] (%)	Participation rate[d] (%)	References
Switzerland[k]	2015	Opportunistic; population-based organized in one canton	50–69	2 (FIT) 10 (TC)	FIT/TC	NA	NA	NA	Selby et al. (2016)
United Kingdom	2006[l]	Population-based organized	55–74 (England) 60–74 (Northern Ireland) 50–74 (Scotland) 60–74 (Wales)	2 (gFOBT/FIT) Once in lifetime (FS)	gFOBT/FIT FS (England)	56.1	100.5	55.4	Ponti et al. (2017)

FIT, faecal immunochemical test; FS, flexible sigmoidoscopy; gFOBT, guaiac faecal occult blood test; NA, not applicable; NR, not reported; TC, total colonoscopy.

[a] Only countries that have implemented a population-based programme or have introduced some recommendations or policies for opportunistic (non-population-based) screening are included. No official recommendation or screening policy was available for the following countries: Albania, Andorra, Armenia, Azerbaijan, Belarus, Bulgaria, Iceland, Liechtenstein, the Republic of Moldova, Romania, the Russian Federation, Slovakia, the former Yugoslav Republic of Macedonia, and Ukraine.

[b] Examination coverage: the number of people screened with the recommended test in a given year divided by the number of people eligible for screening (the eligible target population per screening interval) in the same reference year.

[c] Invitation coverage: the number of people invited to screening in a given year divided by the number of people eligible for screening (the eligible target population per screening interval) in the same reference year.

[d] Participation rate (only for population-based organized programmes): the number of people screened divided by the eligible number of people invited to screening during the reference period.

[e] In Austria, a population-based screening programme is implemented in Burgenland only; opportunistic screening is available in the rest of the country.

[f] In the Czech Republic, opportunistic screening has been under way since 2000; since 2014, invitations have been sent only to non-attenders.

[g] In Germany, a population-based programme is expected to start in 2019; examination coverage represents the estimated 10-year cumulative participation rate in a colonoscopy programme among subjects aged 55–74 years (Altenhofen, 2016).

[h] In Italy, screening started in 1982 in Florence, and between 2000 and 2004 in other regions; in Piedmont, subjects are invited to undergo FS, and FS refusers are offered biennial FIT.

[i] In Lithuania, the population-based programme started in 2009 in two districts and became nationwide in 2014.

[j] In Sweden, only the Stockholm-Gotland region has introduced screening.

[k] In Switzerland, a screening programme has been implemented in the canton of Vaud; only opportunistic screening is available in the rest of the country (Selby et al., 2016).

[l] Year of programme initiation: 2006 (England), 2010 (Northern Ireland), 2007 (Scotland), and 2008 (Wales).

Population-based programmes are publicly funded and the screening tests are provided free of charge, except in Croatia, where the costs are reimbursed through the health insurance system (Ponti et al., 2017), and in Switzerland, where individuals are required to make a 10% co-payment for all costs (Auer et al., 2015). In the non-population-based programmes in Austria, Germany, Greece, and Latvia, the cost of the tests is covered by the health system or by health insurance (Ponti et al., 2017).

2.1.3 Programme implementation

(a) Organization

Call–recall systems, which ensure active invitation of the entire target population at regular intervals by sending written invitation letters to all eligible subjects identified through screening registries, have been implemented in all population-based programmes in the EU, except in Lithuania, where invitations are sent through primary health care providers (Ponti et al., 2017). In non-EU countries in Europe, subjects in the target age range are often invited by general practitioners or by other primary health care providers (Giordano et al., 2016). In Switzerland (canton of Vaud), a decision aid is mailed to citizens in the target age range that conveys information about the programme and the available screening modalities and encourages discussion with the individual's primary care physician, who will propose one of the available tests (Selby et al., 2016).

(b) Target age range

The 2003 EU Council recommendation (European Council, 2003) indicated that screening should be offered to all subjects aged 50–74 years, and left the option of adopting a narrower age band, based on national prioritization. The European Code Against Cancer (Armaroli et al., 2015) recommended to start inviting people aged 50–60 years and to continue sending invitations up to ages 70–75 years. The expected cost–effectiveness ratio of different policies depends on several factors, including background risk, target age range, screening method, organization of the programme, and availability of health-care resources. Issues related to colonoscopy capacity influence the choice of both the method and the target age range. About half of the population-based programmes (Table 2.1) start screening at age 55 years or age 60 years and stop screening at age 69 years (Ponti et al., 2017). A stopping age for screening is often not defined by non-population-based programmes, which often also target subjects outside the age range for which a favourable balance of benefits and harms has been demonstrated.

(c) Screening strategy

Most EU Member States have adopted FIT as the CRC screening method or are in the process of switching from gFOBT to FIT (Ponti et al., 2017) (Table 2.1); gFOBT is still offered in Croatia, Finland, and the United Kingdom as well as in the non-population-based programmes in Greece and Latvia (Ponti et al., 2017). FIT has been adopted in the non-EU countries in Europe that have started population-based programmes, except in the pilot programme in Georgia, which offers gFOBT (Altobelli et al., 2016; Giordano et al., 2016) (Table 2.1). Only Poland has implemented colonoscopy screening within a pilot organized programme, with active invitation of the target population. Colonoscopy is recommended within the opportunistic screening in Austria, Germany, and Greece, although a pilot population-based programme with FIT is under way in one region (Burgenland) in Austria. The population-based programmes in the Czech Republic (Ponti et al., 2017), Luxembourg (Ponti et al., 2017), and Switzerland (canton of Vaud) (Selby et al., 2016) offer the option to choose between colonoscopy and FIT. Primary screening with sigmoidoscopy has been implemented in England and in one region (Piedmont) in Italy;

in both programmes, FIT is also offered, either as an alternative test for those who decline sigmoidoscopy or as an additional test for subjects older than 60 years (Ponti et al., 2017).

The screening interval for stool-based tests for blood is 2 years in most population-based and non-population-based programmes. A 1-year interval has been adopted in the population-based programmes with FIT in Austria (Burgenland) and the Czech Republic (for subjects aged 50–54 years) and in the non-population-based programmes in Germany (offering FIT to subjects aged 50–54 years) and Latvia (offering gFOBT to subjects aged 50–74 years). Colonoscopy is offered at a 10-year interval in non-population-based programmes or in programmes that offer a choice between FIT and colonoscopy (Selby et al. 2016; Ponti et al., 2017), whereas both colonoscopy and sigmoidoscopy are offered once in a lifetime in organized programmes that use endoscopy as the primary screening test.

(d) Quality assurance

The EU guidelines (Segnan et al., 2010) provide guiding principles and evidence-based recommendations on the quality assurance that should be followed when implementing CRC screening programmes. The guidelines also outline key performance indicators and standards that cover the different phases of the process, including organization, primary screening, diagnostic assessment, treatment, and surveillance. Quality assurance initiatives that focus more specifically on the laboratory standards for FIT (Fraser et al., 2012) and on endoscopy services (Sint Nicolaas et al., 2012; Joint Advisory Group on Gastrointestinal Endoscopy, 2013) have also been implemented, facilitating national and international comparisons and benchmarking.

Organized screening programmes are incorporating comparative effectiveness research projects: the programmes in Finland and Poland have been implemented with a randomized design that enables the impact of the adopted strategy to be assessed (Malila et al., 2005, 2008; Kaminski et al., 2015), and randomized comparisons of different screening strategies have been conducted, or are under way, within established programmes in France (Faivre et al., 2012), Italy (Segnan et al., 2005, 2007; Grazzini et al., 2009; Giorgi Rossi et al., 2011), the Netherlands (van Rossum et al., 2009; Hol et al., 2010; Stoop et al., 2012), Norway (Bretthauer & Hoff, 2012), Sweden (Aronsson et al., 2017) and the United Kingdom (Digby et al., 2013; Moss et al., 2017).

2.1.4 Participation

Participation rates in population-based organized CRC screening programmes vary widely across countries (Ponti et al., 2017). The screening strategy influences the participation rate; there is a general trend towards a higher participation rate among subjects invited to FIT screening than among those invited to gFOBT screening. Compared with men, women consistently show a higher participation rate in gFOBT or FIT programmes and a lower response to invitations for endoscopy screening. Overall, endoscopy screening programmes show a lower participation rate compared with gFOBT or FIT programmes.

[It should be taken into account that the available data are based on the comparison of the participation rate in a single invitation round, whereas the appropriate (and relevant) comparison should balance the proportion of regular participants over several rounds of screening with gFOBT or FIT and the proportion of attendees in a single endoscopy screening during the same interval.]

2.2 Canada and the USA

Screening for CRC was pioneered in the USA and is well established in both Canada and the USA. This is due to the high incidence of CRC in these countries and the evidence produced by the National Polyp Study (Winawer et al., 1993) and by randomized controlled trials with gFOBT conducted in the USA in the past decades. In Canada, CRC screening is offered through population-based programmes, whereas in the USA, CRC screening is mainly opportunistic (Table 2.2).

2.2.1 Canada

In 2008, Canada established an organized CRC screening programme, by province. The Canadian Task Force on Preventive Health Care recommends screening average-risk adults aged 50–74 years with gFOBT or FIT every 2 years or with sigmoidoscopy every 10 years (Canadian Task Force on Preventive Health Care, 2016). Colonoscopy is not recommended as a primary screening test for CRC; in some provinces, it is recommended only for those with a family history of CRC in one or more first-degree relatives.

All 10 Canadian provinces have announced, planned, or implemented organized CRC screening programmes (Canadian Partnership Against Cancer, 2017), whereas the three territories of Canada do not have organized CRC screening programmes. Implementation of a screening programme is particularly challenging in the territories, because of a lack of resources and facilities. Also, the very low population density across a vast territory means that CRC screening is not cost-effective.

Ontario's ColonCancerCheck, the first organized CRC screening programme in Canada, launched CRC screening throughout the province in 2008 (Rabeneck et al., 2014). In 2010–2011, the participation rate in gFOBT screening was 29.8%. In 2013, 58% of the target population had participated in CRC screening, taking into account all screening modalities. Early aggregate results from the first round of screening (from January 2009 to December 2011) of five other provincial programmes (in British Columbia, Manitoba, Nova Scotia, Prince Edward Island, and Saskatchewan) showed a much lower participation rate (16.1%) (Major et al., 2013). In 2013–2014, participation rates ranged from 8.6% to 53% across the provinces, all below the target rate (≥ 60%) (Canadian Partnership Against Cancer, 2017). The retention rate, which is defined as the percentage of individuals rescreened within 30 months after a normal result from a stool-based test for blood, ranged from 38.9% to 77.4%.

The 2012 Canadian Community Health Survey reported that more than half of Canadians were up to date with CRC screening in 2012, but there were large differences among provinces (Singh et al., 2015). In 2012, the prevalence of up-to-date CRC screening among people aged 50–74 years was 55.2%, ranging from 41.3% in the territories to 67.2% in Manitoba; the average prevalence of sigmoidoscopy or colonoscopy screening was 37.2% (highest in Ontario, at 43.3%) and of gFOBT screening was 30.1% (highest in Manitoba, at 51.7%). About 41% of those who had been screened with gFOBT had also been screened with sigmoidoscopy or colonoscopy. Individuals in the groups with the highest education level or income were more likely to comply with the CRC screening programme compared with those in groups with lower education level or income.

The National Colorectal Cancer Screening Network regularly collects data on national quality indicators for organized screening programmes, to track programme progress and identify opportunities to maximize the quality and benefit of CRC screening for all eligible Canadians (Canadian Partnership Against Cancer, 2017). The Canada-Global Rating Scale is an online survey to monitor the quality of

Table 2.2 Policies and practice for colorectal cancer screening in Canada and the USA

Country	Start year	Type of programme	Target age range (years)	Screening interval (years)	Screening method	Examination coverage[a] (%)	References
Canada	2008	Population-based organized	50–74	2 (gFOBT/FIT) 10 (FS)	gFOBT/FIT FS[b]	8.6–53.0[c]	Canadian Partnership Against Cancer (2017)
USA	1960s	Opportunistic	50–75	1 (FIT) 3 (mt-sDNA) 5 (CTC/FS) 10 (TC)	FIT/mt-sDNA/ CTC/FS/TC	Endoscopy: 60.3[d] Stool-based test for blood: 7.2 Combined: 62.6	U.S. Preventive Services Task Force (2017)

CTC, computed tomography colonography; FIT, faecal immunochemical test; FS, flexible sigmoidoscopy; gFOBT, guaiac faecal occult blood test; mt-sDNA, multitarget stool DNA; TC, total colonoscopy.

[a] Examination coverage: the number of people screened with the recommended test in a given year divided by the number of people eligible for screening (the eligible target population per screening interval) in the same reference year.

[b] FS is used only in one province.

[c] Reported in 2013–2014 by organized colorectal cancer screening programmes across Canada for stool-based tests for blood.

[d] According to the 2015 National Health Interview Survey; endoscopy includes FS in the past 5 years or TC in the past 10 years, stool-based test for blood includes gFOBT or FIT in the past year, and combined includes either endoscopy or stool-based test for blood (ACS, 2017).

endoscopy services. It consists of two parts: clinical quality (consent process including patient information, safety, comfort, quality of the procedure, appropriateness, and communicating results) and quality of the patient experience (equality of access, timeliness, booking choice, privacy and dignity, aftercare, and ability to provide feedback) (Canadian Partnership Against Cancer, 2016).

2.2.2 USA

The United States Preventive Services Task Force (USPSTF) recommends CRC screening in the USA starting at age 50 years and continuing until age 75 years (U.S. Preventive Services Task Force, 2017). The recommendations of the USPSTF also indicate that the decision about whether to screen for CRC in adults aged 75–85 years should be an individual one, taking into account the patient's overall health and prior screening history. Screening would be appropriate among adults who (i) are healthy enough to undergo treatment if CRC is detected and (ii) do not have comorbid conditions that would significantly limit their life expectancy (U.S. Preventive Services Task Force, 2017).

Screening strategies recommended by the USPSTF include any one of the following options: (i) annual screening with FIT, (ii) screening every 10 years with sigmoidoscopy and annual screening with FIT, (iii) screening every 10 years with colonoscopy, and (iv) screening every 5 years with CT colonography. The USPSTF also stated that screening with the multitarget stool DNA (mt-sDNA) test every 3 years would provide about the same amount of benefit as screening with sigmoidoscopy alone every 5 years (U.S. Preventive Services Task Force, 2017).

The USPSTF recognized that clinical decisions involve more considerations than evidence alone. Clinicians should not only understand the evidence but also individualize decision-making to the specific patient or situation. Similarly, the USPSTF noted that decisions about policy and coverage involve considerations in addition to the evidence of clinical benefits and harms.

In the USA, participation in CRC screening has been reported to have risen steadily from about 35% in the 1980s to more than 65% in 2010 (Doubeni, 2014). Among different ethnic groups in the country, participation is highest in Whites, followed by African Americans, and is lowest in Hispanics.

Data from the annual Behavioral Risk Factor Surveillance System survey revealed that in 2012, approximately 65% of adults in the USA were up to date with CRC screening, and colonoscopy was the most widely used technique (Centers for Disease Control and Prevention, 2013). The proportion of adults who had never been screened was higher in those without health insurance (55%) than in those with health insurance (24%) and higher in those without a regular health care provider (61%) than in those with a regular health care provider (24%) (Centers for Disease Control and Prevention, 2013).

The National Health Interview Survey reported that in 2015, almost 63% of adults in the USA aged 50 years and older were up to date with CRC screening, in accordance with guidelines; 60.3% of subjects had been screened by endoscopy (sigmoidoscopy in the past 5 years or colonoscopy in the past 10 years), and 7.2% had been screened with a stool-based test for blood (gFOBT or FIT in the past year) (ACS, 2017).

The National Colorectal Cancer Roundtable launched the "80% by 2018" initiative to increase participation in CRC screening (NCCRT, 2017). A recent study investigated the adherence of the population aged 50–54 years to the USPSTF CRC screening recommendations, using a large, continuously insured screening population during a 10-year period (Cyhaniuk & Coombes, 2016). The report showed that 64% of that population were adherent to the current USPSTF CRC screening recommendations; 12% were

considered inadequately screened, and 24% had never participated in CRC screening. In those subjects who received CRC screening in whichever form, the average age at screening initiation was 53 years. Of those subjects who were inadequately screened, nearly half (46%) received only one test (gFOBT or FIT) over the 10-year period.

Quality initiatives supported by national organizations and gastrointestinal societies such as the USPSTF, the American Cancer Society, the American Gastroenterological Association, the American Society for Gastrointestinal Endoscopy, and the National Colorectal Cancer Roundtable, among others, have played a significant role in increasing participation in screening in the USA.

Some organized screening programmes have also been established in the USA. Two prime examples are the Kaiser Permanente Northern California organized screening programme and the Veterans Health Administration programme. Participation rates in the Kaiser Permanente Northern California programme have doubled since 2004, to almost 80% in 2013 (Mehta et al., 2016); participation rates in the Veterans Health Administration programme among veterans 52 years or older were 68% in 2001 (Chao et al., 2009; Levin et al., 2011) and increased to 80% in 2009 (Long et al., 2012).

In 2015, the Centers for Disease Control and Prevention launched continuing education programmes for both primary care providers and endoscopists that provide guidance and tools for clinicians on the optimal ways to implement CRC screening, to help ensure that patients receive maximum benefit (Centers for Disease Control and Prevention, 2016). Among the quality indicators, the adenoma detection rate of CRC screening with colonoscopy is probably the most important.

2.3 Latin America

Latin America includes Central America, South America, and the Spanish-speaking countries of the Caribbean: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Uruguay, and Venezuela. In recent decades, a few countries in this region, particularly those with the highest CRC mortality rates and with very high or high Human Development Index, have started the process of introducing population-based pilot CRC screening programmes or activities for CRC prevention (Aedo et al., 2016). Only Argentina, Brazil, and Chile have population-based pilot CRC screening programmes, in urban areas; six countries (Columbia, Cuba, Ecuador, Mexico, Puerto Rico, and Uruguay) offer opportunistic screening with clinical guidelines (Table 2.3). Information about screening activities in the other countries is not available (WHO, 2014b).

In 2011, the National Cancer Institute of Argentina assessed the human and technological resources needed for CRC screening (Instituto Nacional del Cáncer, Ministerio de Salud, 2011). In 2013, CRC screening was established as a priority on the public health agenda, a nationwide CRC screening programme was defined, and national clinical guidelines were developed (Instituto Nacional del Cáncer, Ministerio de Salud, 2017). In addition, standardized diagnostic criteria, treatment and follow-up protocols, guidelines for quality control and quality assurance, training programmes for health professionals, communication strategies, information systems for monitoring, and measurements of programme impact were defined (Instituto Nacional del Cáncer, Ministerio de Salud, 2017). The national CRC screening programme has a coordination centre that is organized into different levels: screening and risk assessment, diagnosis, and treatment of adenomas and cancer (Instituto Nacional del

Table 2.3 Policies and practice for colorectal cancer screening in Latin America[a]

Country	Start year	Type of programme	Target age range (years)	Screening interval (years)	Screening method	Examination coverage or participation rate[b] (%)	References
Argentina	2013	Population-based organized (pilot)	50–75	1	FIT	10–50[c]	Instituto Nacional del Cáncer, Ministerio de Salud (2017)
Brazil	2006	Population-based organized (pilot)	≥ 50	1	FIT	NR	Schreuders et al. (2015)
Chile	2007	Population-based organized (pilot)	≥ 50	1	FIT	77[d]	López-Köstner et al. (2012)
Colombia	2013	Opportunistic	≥ 50	2 (FIT) 10 (TC)	FIT/TC	Women: 8.6[e] Men: 7.1[e]	Colombia Ministerio de Salud y Protección Social (2013, 2015)
Cuba	NR	Opportunistic	≥ 50	NR	FIT	> 70[c]	Schreuders et al. (2015); OPS (2016)
Ecuador	NR	Opportunistic	50–74	NR	gFOBT/FIT	< 10[c]	OPS (2016)
Mexico	NR	Opportunistic	≥ 50	1	gFOBT/FIT	NR	Schreuders et al. (2015)
Puerto Rico	NR	Opportunistic	50–75	NR	gFOBT/FS/TC	NR	Schreuders et al. (2015)
Uruguay	NR	Opportunistic	≥ 50	2	FIT	NR	Schreuders et al. (2015)

FIT, faecal immunochemical test; FS, flexible sigmoidoscopy; gFOBT, guaiac faecal occult blood test; NR, not reported; TC, total colonoscopy.

[a] Only countries that have implemented a population-based programme or have introduced some recommendations or policies for opportunistic (non-population-based) screening are included.

[b] Examination coverage: the number of people screened with the recommended test in a given year divided by the number of people eligible for screening (the eligible target population per screening interval) in the same reference year; participation rate (only for population-based organized programmes): the number of people screened divided by the eligible number of people invited to screening during the reference period.

[c] Examination coverage.

[d] Participation rate.

[e] Adults aged 50–69 years who have undergone a stool-based test for blood.

Cáncer, Ministerio de Salud, 2015). The National Cancer Institute of Argentina recommended a two-step population-based CRC screening programme that uses a questionnaire about risk factors to identify high-risk individuals. People in the population aged 50–75 years with no additional background risk are invited to FIT screening, and those with a positive FIT result are referred for colonoscopy. High-risk subjects – individuals with a family or personal history of adenomas, of CRC, or of inflammatory bowel disease – are invited to medical counselling and are referred for the appropriate follow-up, generally colonoscopy (Instituto Nacional del Cáncer, Ministerio de Salud, 2017). According to the Pan American Health Organization, 10–50% of the target population at average risk of CRC has been screened (OPS, 2016).

In 2004, the Brazilian Association for Cancer Prevention started an advocacy programme to promote CRC screening in Brazil (Habr-Gama, 2005). In 2006, the state of São Paulo, under the leadership of the National Cancer Institute of Brazil, developed pilot CRC screening programmes with FIT (Oliva Perez et al., 2008; Prefeitura do Município de São Paulo, 2012).

In 2007, Chile started a prospective multicentre pilot study (PREVICOLON), in which residents of seven major cities aged 50 years and older and without risk factors for CRC were invited to FIT screening, and those with a positive FIT result were referred for colonoscopy (López-Köstner et al., 2012). This study was used as the basis for planning the Prevention Project for Neoplasia of the Colon and Rectum (PRENEC) in collaboration with Tokyo Medical and Dental University (TMDU), and in 2012, the PRENEC project started in three cities (Okada et al., 2016). As a result, colonoscopy training and skills for local physicians improved, and quality indicators also improved over time (Okada et al., 2016). Similar collaborations are being established in other countries, including Brazil, Ecuador, Paraguay, and Uruguay (TMDU International Exchange Site, 2017).

CRC screening activities in the majority of Latin American countries are opportunistic (Table 2.3). Screening with gFOBT or FIT is offered to people older than 50 years, defined as the target population. Some countries are in the process of switching from gFOBT to FIT. In 2013, Colombia defined national CRC clinical guidelines and recommended biennial screening with FIT or screening every 10 years with colonoscopy, when available (Pinzon Florez et al., 2012; Colombia Ministerio de Salud y Protección Social, 2013), but screening coverage is still very low (Colombia Ministerio de Salud y Protección Social, 2015). Cuba has opportunistic CRC screening with good examination coverage (OPS, 2016). In Puerto Rico, in addition to gFOBT, sigmoidoscopy and colonoscopy are also recommended (Schreuders et al., 2015). In Uruguay, an observational prospective study was carried out in an average-risk population to evaluate the feasibility of CRC screening with FIT. A high participation rate of about 90% was achieved (Fenocchi et al., 2006).

2.4 Africa

2.4.1 North Africa

The region of North Africa comprises the following five countries: Algeria, Egypt, Libya, Morocco, and Tunisia.

In November 2017, IARC/World Health Organization (WHO) initiated a pilot demonstration research project, designed to promote participation in FIT screening, in the Rabat region of Morocco. The aim of this project was to evaluate the acceptability and feasibility of CRC screening in the general population setting and to provide guidance on the eventual scaling up of CRC screening to cover the entire country (IARC, 2017).

No other current CRC screening initiative using either endoscopy or stool-based tests for blood was identified by recent surveys that collected information about current CRC screening activities that adopt a population-based approach (Benson et al., 2008), following the International Agency for Research on Cancer (IARC) criteria (Von Karsa et al., 2014), or that include both organized and opportunistic screening (Schreuders et al., 2015; Giordano et al. 2016).

A survey of preventive practices of general practitioners in Morocco reported that only 7% of respondents ordered stool-based tests for blood, compared with a high proportion of physicians who ordered prostate-specific antigen (PSA) screening (El Fakir et al., 2013).

2.4.2 Sub-Saharan Africa

The region of sub-Saharan Africa comprises the following countries: Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, the Central African Republic, Chad, Comoros, Congo, the Democratic Republic of the Congo, Côte d'Ivoire, Djibouti, Equatorial Guinea, Eritrea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Réunion (France), Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Togo, Uganda, the United Republic of Tanzania, Western Sahara, Zambia, and Zimbabwe.

No current CRC screening initiative using either endoscopy or stool-based tests for blood was identified by recent surveys that collected information about current CRC screening activities that adopt a population-based approach (Benson et al., 2008), following the IARC criteria (Von Karsa et al., 2014), or that include both organized and opportunistic screening (Schreuders et al., 2015). The lack of current screening initiatives in the sub-Saharan Africa region was confirmed by a literature search performed in PubMed and Embase covering the period from 1 January 2000 to 21 May 2017.

The available data about CRC management are derived mainly from descriptive reports of endoscopy activity, as well as from cancer registries. The studies are usually based on the experience of a single centre, and their size is generally small (only two included > 500 subjects), which limits the generalizability of the reported findings.

Reports of colonoscopy activity, mainly from Nigeria (Onyekwere et al., 2013; Alatise et al., 2014; Akere & Akande, 2017; Ray-Offor et al., 2017) and South Africa (Mahomed et al., 2012), suggest that the quality of endoscopy is suboptimal: the colonoscopy reporting format was not standardized, completion rates varied between 81% and 90%, and the adenoma detection rate was less than 10%, although a lower prevalence of pre-neoplastic lesions could be expected in Africa compared with Europe or the USA. In most regions, colonoscopy facilities are lacking and there are not an appropriate number of well-trained specialists. Low levels of awareness, limited human and financial resources, lack of cancer prevention and control policies, and unaffordability of care contribute to the high CRC mortality rates (Busolo & Woodgate, 2015).

2.5 Central, West, and South Asia

This region comprises Afghanistan, Bahrain, Bangladesh, Bhutan, India, the Islamic Republic of Iran, Iraq, Israel, Jordan, Kazakhstan, Kuwait, Kyrgyzstan, Lebanon, Maldives, Nepal, Oman, Pakistan, Palestine, Qatar, Saudi Arabia, Sri Lanka, the Syrian Arab Republic, Tajikistan, Turkey, Turkmenistan, the United Arab Emirates, Uzbekistan, and Yemen.

The incidence of CRC is relatively low in this region (see Section 1.1). However, in view of the substantial increase in CRC incidence in many of the countries in this region (Arafa & Farhat,

2015), more attention has been paid to prevention and early diagnosis of CRC. Because of financial considerations, in some countries in this region CRC screening focuses on individuals with familial CRC, in particular those with Lynch syndrome. During recent meetings, the Palestinian Society of Gastroenterology and the Mediterranean Task Force for Cancer Control established a network on hereditary CRC, with the goal of improving care for high-risk groups in the Middle East and Mediterranean countries (Ghorbanoghli et al., 2018).

There are very few nationwide organized or pilot programmes for CRC screening in this region (Table 2.4). Bahrain was the first country in the Middle East to implement CRC screening. In 2010, the Bahrain Ministry of Health launched a pilot screening campaign that offered annual screening with FIT to subjects aged 50–90 years (Madan, 2010). In Israel, randomized comparisons of different screening strategies were conducted within established programmes, and a population-based screening programme offering annual screening with FIT to subjects aged 50–75 years was implemented (Levi et al., 2011).

In 2014, the Ministry of Health of Kuwait launched a national pilot CRC screening study that offered biennial screening with FIT to subjects 50 years or older, and in 2016, a total of 70 000 individuals were enrolled (Kuwait Cancer Control Center, 2017). In 2016, the Ministry of Public Health of Qatar launched a national CRC screening programme that offered annual screening with FIT to asymptomatic adults aged 50–74 years (Qatar Ministry of Public Health, 2016).

In 2010, the Health Authority of the United Arab Emirates started a non-population-based programme in Abu Dhabi that advised screening with colonoscopy for people older than 40 years. In 2013, CRC screening with either biennial screening with FIT or screening every 10 years with colonoscopy was offered to subjects aged 40–75 years across the country (Fayadh et al. 2016; Abu Dhabi Health Authority, 2017).

Opportunistic screening is offered in the Islamic Republic of Iran, Lebanon, and Turkey. In 2017, the Ministry of Health of Saudi Arabia launched a pilot screening programme that offers screening with FIT annually for subjects aged 45–75 years (Alsanea et al., 2015; S. Alhomoud, personal communication).

2.6 East and South-East Asia

The region of East Asia includes China, the Democratic People's Republic of Korea, Hong Kong Special Administrative Region (China), Japan, Mongolia, the Republic of Korea, and Taiwan (China). The region of South-East Asia includes Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam.

Most countries in East Asia are highly developed, have a higher incidence of CRC, and have introduced screening programmes; in contrast, most of the countries in South-East Asia (except Singapore) have a lower incidence of CRC and have no organized screening programmes (WHO, 2014b). The Republic of Korea, Singapore, and Taiwan (China) have national CRC screening programmes, whereas regional pilot screening programmes have been implemented in China, Hong Kong Special Administrative Region (China), and Thailand (Table 2.5). Recommendations for opportunistic screening are available in Brunei Darussalam, Japan, Malaysia, and the Philippines.

In recent years, the Asia-Pacific Working Group on Colorectal Cancer has proposed the Asia-Pacific Colorectal Screening scoring system, to stratify risk on the basis of age, sex, family history, and smoking, for the countries that lack resources and infrastructure (Yeoh et al., 2011). This scoring system serves to determine the risk of CRC and adenomas in asymptomatic

Table 2.4 Policies and practice for colorectal cancer screening in Central, West, and South Asia[a]

Country	Start year	Type of programme	Target age range (years)	Screening interval (years)	Screening method	References
Bahrain	2010	Opportunistic; population-based (pilot)	50–90	1	FIT	WHO (2014a)
Islamic Republic of Iran	NR	Opportunistic	≥ 50[b]	NR	TC[b]	Dolatkhah et al. (2015)
Israel	NR	Population-based organized	50–75	1	FIT	Levi et al. (2011)
Kuwait	2014	Population-based organized (pilot)	≥ 50	2	FIT	Kuwait Cancer Control Center (2017)
Lebanon	NR	Opportunistic	50–70[b]	1 or 2[b]	FIT[b]	Sharara (2013)
Qatar	2016	Population-based organized	50–74	1	FIT	Qatar Ministry of Public Health (2016)
Saudi Arabia	2017	Population-based organized (pilot)	45–75	1 (FIT)	FIT	Alsanea et al. (2015); S. Alhomoud (personal communication)
Turkey	NR	Opportunistic	50–70	NR	NR	Artac (2016)
United Arab Emirates	2013	Population-based organized	40–75	2 (FIT) 10 (TC)	FIT/TC	Fayadh et al. (2016); Abu Dhabi Health Authority (2017)

FIT, faecal immunochemical test; FS, flexible sigmoidoscopy; NR, not reported; TC, total colonoscopy.

[a] Only countries that have implemented a population-based programme or have introduced some recommendations or policies for opportunistic (non-population-based) screening are included. Data on screening coverage are not available.

[b] Expert recommendation.

Table 2.5 Policies and practice for colorectal cancer screening in East and South-East Asia[a]

Country	Start year	Type of programme	Target age range (years)	Screening interval (years)	Screening method	Examination coverage or participation rate[b] (%)	References
East Asia							
China	2006	Population-based organized (pilot)	40–74	NR	FIT	NR	Meng et al. (2009)
Hong Kong Special Administrative Region, China	2016	Population-based organized (pilot)	61–70	2	FIT	NR	Department of Health of the Hong Kong Special Administrative Region (2016)
Japan	1992	Opportunistic	≥ 40	1	FIT	13.8[c]	Goto et al. (2015); Ministry of Health, Labour and Welfare, Japan (2017)
Republic of Korea	2004	Population-based organized	≥ 50	1	FIT	29.1[d]	National Cancer Center Korea (2015); Suh et al. (2017)
Taiwan, China	2004	Population-based organized	50–74	2	FIT	42.0[e]	Health Promotion Administration, Ministry of Health and Welfare, Taiwan (2016)
South-East Asia							
Brunei Darussalam	2008	Opportunistic	≥ 40	NR	FIT	66.9[f]	Chong et al. (2013)
Malaysia	NR	Opportunistic	≥ 40	NR	gFOBT/FS	NR	Academy of Medicine of Malaysia (2017)
Philippines	NR	Opportunistic	≥ 50	1 (gFOBT) 3–5 (FS)	gFOBT/FS	NR	Ngelangel & Wang (2002)
Singapore	2011	Population-based organized	≥ 50	1	FIT	33.8[g]	Ministry of Health Singapore (2014, 2017)
Thailand	2011	Population-based organized (pilot)	50–65	NR	FIT	62.9[h]	Khuhaprema et al. (2014)

FIT, faecal immunochemical test; FS, flexible sigmoidoscopy; gFOBT, guaiac faecal occult blood test; NR, not reported.

[a] Only countries that have implemented a population-based programme or have introduced some recommendations or policies for opportunistic (non-population-based) screening are included.

[b] Examination coverage: the number of people screened with the recommended test in a given year divided by the number of people eligible for screening (the eligible target population per screening interval) in the same reference year; participation rate (only for population-based organized programmes): the number of people screened divided by the eligible number of people invited to screening during the reference period.

[c] Participation rate among people aged 40–69 years in 2015.

[d] Participation rate.

[e] Examination coverage among people aged 50–69 years in the past 2 years.

[f] Examination coverage; target population = 11 576 people.

[g] Examination coverage.

[h] Examination coverage; target population = 127 301 people.

individuals, to enable the selection of high-risk subjects for CRC screening, and may thus substantially reduce the colonoscopy workload (Chiu et al., 2016); however, it has not yet been widely validated.

2.6.1 East Asia

(a) China

In 2003, China launched the 2004–2010 National Cancer Prevention and Control Program, which included CRC screening as one of the highest priorities for intervention (Kang & Qiao, 2014). In 2006–2008, the Ministry of Health of China implemented a two-step population-based CRC screening programme in the Xiacheng District for adults aged 40–74 years, which provided screening with FIT to high-risk individuals identified through a questionnaire about risk factors, followed by colonoscopy for those with a positive FIT result (Meng et al., 2009). However, because of the large population and limited resources, population-based CRC screening has been implemented only in a small proportion of the target population and covers a limited part of the country (Kang & Qiao, 2014).

(b) Hong Kong Special Administrative Region, China

In September 2016, a CRC screening pilot programme was launched in Hong Kong Special Administrative Region, China, with the aim of evaluating the feasibility of a large population-based organized screening programme. The pilot programme provides subsidized screening with FIT every 2 years for asymptomatic residents of Hong Kong Special Administrative Region, China, born in 1946–1955 (ages 61–70 years), followed by colonoscopy for those with a positive FIT result. People born in 1946–1948 are the first cohort to join the programme, and other age groups will join in subsequent phases (Department of Health of the Hong Kong Special Administrative Region, 2016).

(c) Japan

Since 1983, national screening programmes have been implemented in accordance with the Law of Health and Medical Services for the Elderly, and CRC screening with gFOBT was added in 1992 (Goto et al., 2015). In 2006, the National Cancer Center Japan developed evidence-based guidelines, which are continuously reassessed for policy-making (Hamashima, 2018). CRC screening targets individuals 40 years and older without an upper age limit, and the screening interval is 1 year; FIT has been the most commonly used method of CRC screening (Saito 2006; Goto et al., 2015). In the quality assurance manual for CRC screening, academic societies recommend colonoscopy and CT colonography as the diagnostic examinations after a positive FIT result (Japanese Association of Gastrointestinal Cancer Screening, 2017). All municipalities have to submit their basic screening results to the national government in order to obtain subsidies for the following year. Because there is no official call–recall system and national cancer registries were lacking until 2015, screening in Japan is considered opportunistic. Although most workplaces have also provided CRC screening for employees, specific guidelines were not followed (Hamashima & Yoshida, 2003). In 2015, the participation rate in community-based CRC screening in the municipalities was 13.8% among individuals aged 40–69 years (Ministry of Health, Labour and Welfare, Japan, 2017). In 2015, the combined participation rate in community-based organized screening programmes and opportunistic screening was 41.4% (National Cancer Center Japan, 2017).

(d) Republic of Korea

In the Republic of Korea, the National Cancer Screening Program for CRC, which covers all Korean men and women 50 years or older, began in 2004 (Suh et al., 2017). The National Cancer Screening Program provides annual screening

with FIT as the primary CRC screening method. For individuals who are covered by Medicaid and whose insurance premium is less than the 50th percentile, a free programme is provided by the National Health Insurance Service (Kim et al., 2011). People whose premium is more than the 50th percentile can receive screening with a 20% out-of-pocket payment (Kim et al., 2011). In 2015, a consensus statement developed by a multisociety expert committee recommended annual or biennial screening for adults aged 45–80 years (Sohn et al., 2015). The National Cancer Screening Program is managed and monitored by the National Cancer Center, in cooperation with the National Health Insurance Service. Participants with a positive FIT result are referred for either colonoscopy or a double-contrast barium enema (DCBE) (National Cancer Center Korea, 2015). Colonoscopy or DCBE is performed free of charge at a clinic or hospital designated as a CRC screening unit by the National Health Insurance Service. To improve the quality of screening, the Committee for Quality Assurance published a screening quality guideline in 2009 (Kim et al., 2011). Participation rates in CRC screening increased steadily from 7.3% in 2004 (the first year of the programme) to 25.0% in 2012 (Suh et al., 2017). According to the National Cancer Screening Survey, conducted annually since 2004, the participation rate was 29.1% in 2014 (National Cancer Center Korea, 2015).

(e) Taiwan, China

The government of Taiwan, China, launched a national CRC screening programme in 2004 as part of the National Cancer Control Program (Chen et al., 2004; Yang et al., 2006; Ministry of Health and Welfare Taiwan, 2017). The Health Promotion Administration provided a subsidized CRC screening programme of biennial screening with FIT for citizens aged 50–69 years. Subjects with a positive FIT result were referred for colonoscopy or sigmoidoscopy plus DCBE. In 2004–2009, the nationwide programme used an organized approach for the delivery of screening tests, and FIT kits were distributed to eligible people by public health units in the municipal districts. Approximately 333 units in 25 municipalities nationwide participate in the programme (Chou et al., 2016). In 2010, with special funds for cancer prevention and control obtained after raising the tax on tobacco, the programme was fully subsidized by the government, and the so-called "in-reach screening services" began (Chou et al., 2016). Both organized and opportunistic screening approaches were used, and the number of subjects who underwent CRC screening increased substantially. In June 2013, the age range for screening was expanded to 50–74 years (Health Promotion Administration, Ministry of Health and Welfare, Taiwan, 2016). The local public health bureau in each municipality audited the screening service. The government in collaboration with the academic sector established a surveillance system for a national-level screening database. The examination coverage in 2004–2009 was 21.4% (Chiu et al., 2015) and in 2015 was 42% in people aged 50–69 years (Health Promotion Administration, Ministry of Health and Welfare, Taiwan, 2016). Although the participation rate increased over time, the referral rate for confirmatory diagnostic examinations declined, from 80.0% in 2004–2009 to 53.3% in 2010–2015 (Chou et al., 2016).

2.6.2 South-East Asia

(a) Brunei Darussalam

In Brunei Darussalam, general knowledge about CRC and screening of CRC is relatively poor (Chong et al., 2015). In 2008–2011, the Ministry of Health of Brunei Darussalam conducted a health screening programme that assessed the general health of civil servants and included CRC screening. People 40 years or older were invited to FIT screening, and those with a

positive FIT result were referred for colonoscopy. Of the eligible adults, 66.9% returned their specimens (Chong et al., 2013). Implementing a CRC screening programme was mentioned as one of the priorities in the Brunei Darussalam National Multisectoral Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2018 (Ministry of Health Brunei Darussalam, 2013).

(b) Malaysia

Malaysia has CRC screening guidelines that recommend gFOBT or sigmoidoscopy for adults 40 years or older; however, there is currently no national organized CRC screening programme. Opportunistic screening is available in private and public hospitals (Academy of Medicine of Malaysia, 2017).

(c) The Philippines

The Philippines Cancer Control Program recommends CRC screening with annual gFOBT and sigmoidoscopy every 3–5 years for people 50 years or older (Ngelangel & Wang, 2002). However, no national programme is in place.

(d) Singapore

The Health Promotion Board of Singapore established CRC screening programmes in July 2011 (Health Promotion Board Singapore, 2017), and the Ministry of Health of Singapore provided practice guidelines for CRC screening (Lee et al., 2010). Annual screening with FIT is recommended for adults 50 years or older; participants with a positive FIT result are referred for further evaluation with colonoscopy (Ministry of Health Singapore, 2017). Before the national programme was implemented, various organizations played an important role in encouraging the public to undergo opportunistic CRC screening. For example, the Singapore Cancer Society has been providing free FIT kits to Singapore citizens and permanent residents 50 years or older (Tan et al., 2013). In September 2017, with enhanced screening subsidies, the government launched the Screen For Life programme to encourage more Singapore citizens to undergo screening and receive the necessary follow-up (Ministry of Health Singapore, 2017). According to the Health Behaviour Surveillance of Singapore, the CRC screening coverage rate was 33.8% in 2013 (Ministry of Health Singapore, 2014). Based on data from the Singapore Cancer Society, the coverage rate of opportunistic screening was 38.9% in 2008 (Tan et al., 2013).

(e) Thailand

In April 2011, Thailand implemented a pilot organized CRC screening programme in Lampang Province for people aged 50–65 years, which provided FIT as the primary screening test and follow-up with colonoscopy through existing government public health services (Khuhaprema et al., 2014). Preliminary results from the pilot study showed a coverage rate of 62.9% in the target population.

Based on the findings of the Lampang Province pilot study, the Thai Ministry of Public Health planned to launch a nationwide CRC screening programme in 2018 (National Health Security Office Thailand, 2017).

2.7 Oceania

This region includes 11 countries: Australia, Fiji, French Polynesia, Guam, Micronesia, New Caledonia (France), New Zealand, Papua New Guinea, Samoa, Solomon Islands, and Vanuatu. CRC screening programmes are well established in Australia and New Zealand (Table 2.6). Apart from these two countries, no organized population-based or opportunistic CRC screening exists in the region (WHO, 2014b).

Table 2.6 Policies and practice for colorectal cancer screening in Oceania

Country	Start year	Type of programme	Target age range (years)	Screening interval (years)	Screening method	Participation rate[a] (%)	References
Australia	2006	Population-based organized	50–74	2	FIT	39.0[b]	Australian Government Department of Health (2017); Australian Institute of Health and Welfare (2017)
New Zealand	2017	Population-based organized	60–74	2	FIT	56.8[c]	Ministry of Health New Zealand (2017)

FIT, faecal immunochemical test.

[a] Participation rate: the number of people screened divided by the eligible number of people invited to screening during the reference period.

[b] In the past 2 years (2014–2015).

[c] In the past 2 years (2012–2013) for people aged 50–74 years in the pilot study.

2.7.1 Australia

After conducting a pilot study in 2002–2004, in 2006 the Australian government introduced the National Bowel Cancer Screening Program, which offered FIT to Australian residents aged 55 years and 65 years (phase 1); all those with abnormal results were referred for appropriate diagnostic evaluation. In 2008, the programme was extended to individuals aged 50 years (phase 2) (Young, 2009; Bobridge et al., 2013). The National Bowel Cancer Screening Program is composed of a centralized federal register that manages invitations, general practitioners who provide patient education, referral and register notifications for positive tests, and hospitals for colonoscopy investigation and patient follow-up (Young, 2009; Bobridge et al., 2013). The Clinical Practice Guidelines 2017 for the prevention, early detection, and management of CRC recommended biennial screening with FIT for people aged 50–74 years. Screening with colonoscopy is endorsed only for people with a family history of CRC (Australian Government Department of Health, 2017). Currently, the National Bowel Cancer Screening Program provides a free FIT kit to all Australians aged 50, 54, 58, 60, 62, 64, 66, 68, 70, 72, and 74 years. The programme will be fully implemented by 2020, inviting all Australians aged 50–74 years to screening every 2 years with a home FIT kit (Cancer Council Australia, 2018). Of the people invited to screening from January 2014 to December 2015, 39% participated in the programme (Australian Institute of Health and Welfare, 2017).

2.7.2 New Zealand

In New Zealand, since late 2011, the Bowel Screening Pilot study has been offering screening with FIT to eligible people aged 50–74 years living in the Waitemata District Health Board area. The interim evaluation report of the first round of screening (January 2012–December 2013) indicated a participation rate of 56.8% in eligible people (Ministry of Health New Zealand, 2017). Evaluation of the pilot screening programme led to the establishment in 2017 of the National Bowel Screening Programme, which offers free screening with FIT every 2 years to eligible people aged 60–74 years. The programme is being rolled out progressively across all District Health Boards, starting in July 2017 (Ministry of Health New Zealand, 2017).

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