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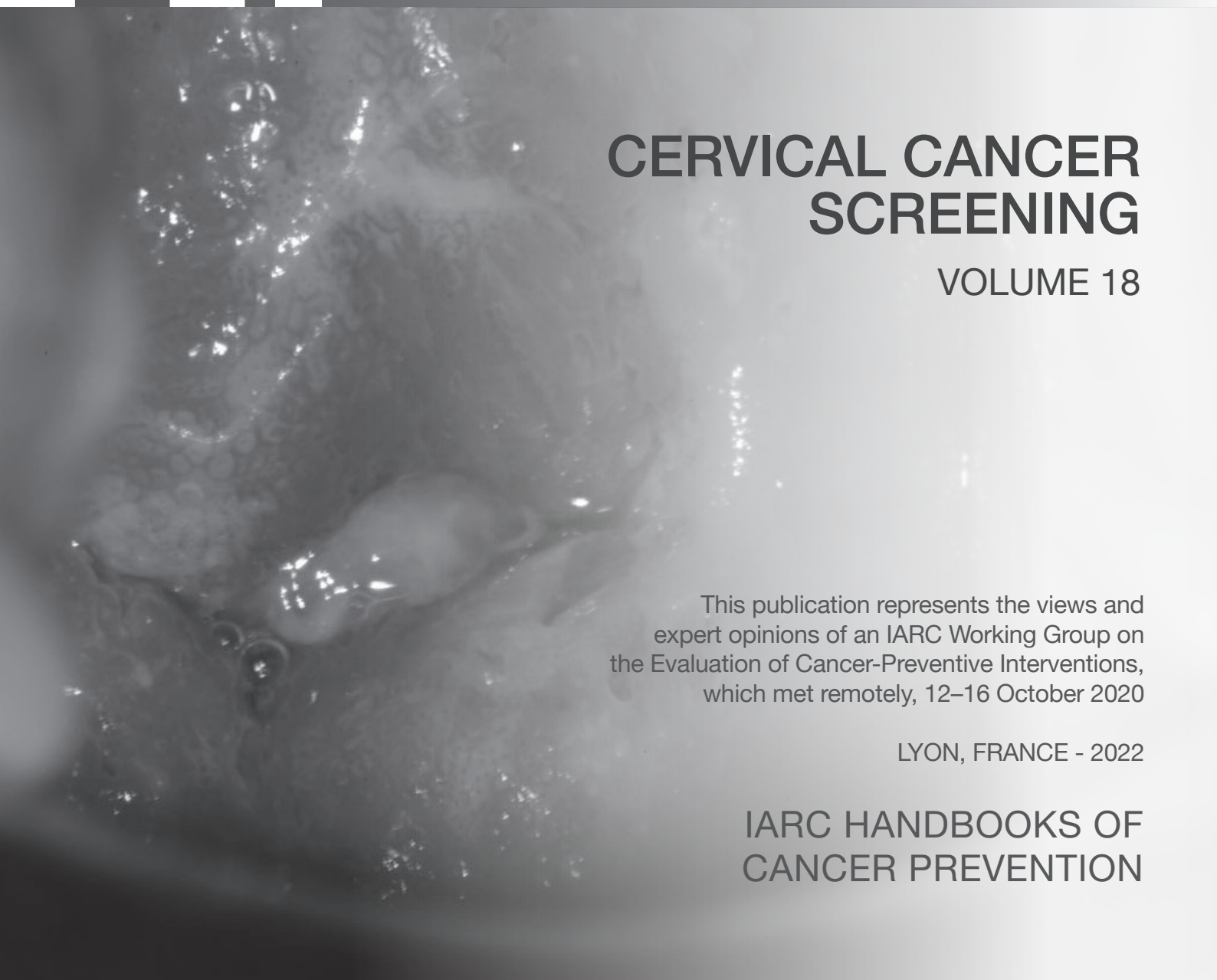

CERVICAL CANCER SCREENING

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2. CERVICAL CANCER SCREENING PROGRAMMES

2.1 Introduction

The purpose of cervical cancer screening and treatment is to reduce the incidence of and mortality from cervical cancer by identifying women with precancerous cervical lesions and early invasive cancer and treating them appropriately.

Broadly, there are two main categories of screening: (i) organized population-based programmes and (ii) opportunistic screening and non-population-based screening; the latter may be conducted within the framework of screening programmes that have different levels and methods of coordination and organization (Basu et al., 2019).

A screening programme provides a detailed pathway that starts by identifying the people who are eligible for screening and ends by reporting the programme outcomes. This pathway includes the following steps: invitation and information, administration of the screening test or tests, communication of the screening test results, management of women with a positive screening test result, and provision of treatment and care of detected precancers and cancers. Adherence to and high quality of the entire screening and management pathway are central to the effectiveness of a screening programme; measures should be in place to ensure high participation of the target population, high quality of the primary screening test, effective follow-up of women with positive screening test results, and appropriate subsequent treatment and care (IARC, 2005).

An organized screening programme is defined as one that has "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" (IARC, 2005). An organized population-based programme is further defined as an organized programme that has a mechanism to identify the eligible individuals and send personal invitations to the eligible individuals to attend screening (Basu et al., 2019). It involves a higher degree of programme management and requires quality control of all steps of the screening and management pathway: planning and implementation, coordination of the delivery of services, invitation and recall, administration of the screening test, further assessment and follow-up of women with a positive screening test result, and performance monitoring and evaluation, which involve the development of standardized indicators (Arbyn et al., 2010; Vale et al., 2019a; see also Section 2.3).

In contrast, in opportunistic screening, women are screened because they have asked

to be screened or have been offered the test by a health professional in the context of the patient–practitioner relationship. Opportunistic screening is often characterized by high participation in selected parts of the population, which are screened too frequently, combined with low participation in other population groups with lower socioeconomic status, and heterogeneous quality (Arbyn et al., 2010). Studies indicate that organized population-based screening programmes are more effective, more cost-effective, and more equitable than opportunistic screening (Arbyn et al., 2009; Palència et al., 2010). They also offer greater protection against the harmful effects associated with poor-quality screening or screening that is carried out too frequently (Miles et al., 2004).

In practice, cervical cancer screening is performed in many ways, and perceptions of what constitutes a screening programme vary widely; differentiation between organized and unorganized screening programmes is, to a certain extent, arbitrary and does not take into account the continuous gradient from poorly organized to highly organized programmes (von Karsa et al., 2008). Furthermore, characterization of a screening programme or screening activity is sometimes not reported properly, which hinders comparison between countries. The description of the availability of cervical cancer screening programmes and activities in the different countries in this section relies mostly on the available publications and may not always reflect the reality. The existence of a programme does not necessarily mean that it is covered by a health insurance programme and accessible to all. In most countries, screening is still opportunistic. The lack of adequate individualized data sources that can be used to identify eligible individuals to be invited (Vale et al., 2019a), the difficulty of ensuring appropriate follow-up after a positive screening test result, and the limited access to treatment and care are major practical and ethical issues for the implementation of cervical cancer screening in low- and middle-income countries (LMICs).

The screening tests currently used in existing programmes globally include human papillomavirus (HPV) testing alone, HPV and cytology co-testing, cytology, and visual inspection.

2.2 Availability and use of cervical cancer screening worldwide

The countries included in each WHO region are listed in the Glossary.

2.2.1 WHO African Region

In low-resource settings such as some African countries, screening programmes are very difficult to implement and WHO recommends a method based on a screen-and-treat approach, in which the treatment decision is based on the result of a screening test and treatment of precancerous lesions is initiated immediately after a positive screening test result (WHO, 2013; see Section 5.1).

Several African countries are in the early stages of exploring and developing tailored strategies in cervical cancer prevention and control. Sustainable programmes are usually lacking because of poor medical infrastructures and funding. In the WHO African Region, most countries have started to implement national guidelines and recommendations (Table 2.1). Most follow the WHO screen-and-treat guidelines and use visual inspection with acetic acid (VIA) with cryotherapy, whereas others continue to use cytology-based screening or are exploring HPV testing (Sahasrabuddhe et al., 2012; Oluwole & Kraemer, 2013; Makura et al., 2016). With the exception of South Africa, which has had an organized population-based programme since 2003, most countries in Africa have no organized cervical cancer screening (Table 2.1). Several countries, such as Algeria, Cameroon, and

Table 2.1 Policies and practice for cervical cancer screening in countries of the WHO African Region

Country[a]	Type of programme or setting	Start year or period	Screening method	Target age range (years)	Interval (years)	Target age range for HIV+ women (years)	Interval for HIV+ women (years)	References
Algeria	Non-population-based	1997	Cytology	30–60	3	–	–	Sancho-Garnier et al. (2013); République Algérienne Démocratique et Populaire (2014); Giordano et al. (2016)
Angola	Pilot project	2002–2006	VIA/VILI	25–59	–	–	–	Muwonge et al. (2010)
Benin	Opportunistic	–	Cytology	–	–	–	–	Bruni et al. (2019a)
Botswana	Pilot project	2009–2011	VIA	30–49	–	–	–	Grover et al. (2015); Johnson et al. (2020)
	Scaling up	2014	VIA	30–49	5	–	3	
Burkina Faso	Pilot project	2010–2014	VIA	25–59	3	–	1	Sawadogo et al. (2014); Ouedraogo et al. (2018); WHO (2020e)
Cameroon	Non-population-based	2007	VIA/VILI	> 25	3–5	> 21	–	DeGregorio et al. (2017)
	Pilot project	2015	HPV self-sampling + VIA/VILI	30–49	5 for HPV– women	_	–	Kunckler et al. (2017)
Congo	Pilot project	1999–2003	VIA/VILI	25–65	–	–	–	Muwonge et al. (2007)
Côte d'Ivoire	Pilot project	2009–2012	VIA	30–50	3–5	–	1	Anderson et al. (2015); Bruni et al. (2019a); Sengayi-Muchengeti et al. (2020)
Eswatini	Pilot project	2010	VIA or cytology	25–45	2	–		Jolly et al. (2017)
Ethiopia	Pilot project	2010–2014	VIA	NS	30–45		1	Shiferaw et al. (2016); WHO (2020f)
Gabon	Non-population-based	2014	VIA	> 25	3	–	–	Fondation Sylvia Bongo Ondimba, Ministère de la Santé gabonais (2014); Assoumou et al. (2015)
Gambia	Pilot project	–	VIA	–	–	–	–	Bruni et al. (2019a)
Ghana	Pilot project	2005	VIA	25–45	3–5	–	–	Ministry of Health Ghana (2011)
			Cytology	> 45	–	–	–	
Guinea	Pilot project	2003–2005	VIA	–	–	–	–	Bruni et al. (2019a)
Kenya	Non-population-based	2013	VIA	25–49	5	18–65	1	Ministry of Public Health and Sanitation Kenya, Ministry of Medical Services Kenya (2012); Khozaim et al. (2014); Sengayi-Muchengeti et al. (2020)
			Cytology	> 50	5			

Table 2.1 (continued)

Country[a]	Type of programme or setting	Start year or period	Screening method	Target age range (years)	Interval (years)	Target age range for HIV+ women (years)	Interval for HIV+ women (years)	References
Lesotho	Unknown	–	VIA	–	–	–	–	Bruni et al. (2019a)
Madagascar	Non-population-based	2007	VIA or cytology	25–49	3	–	–	Ministère de la Santé Publique Madagascar (2011); Broquet et al. (2015); République de Madagascar, OMS (2016); Benski et al. (2019); Dumont et al. (2019)
Malawi	Non-population-based	2004	VIA	25–50 21–25 (sexually active women)	3	All HIV+ women	2	Maseko et al. (2014); Maseko et al. (2015); Msyamboza et al. (2016); Ministry of Health Malawi (2018); Bruni et al. (2019a); Malawi Ministry of Health and Population (2019)
			Cytology or HPV test	50–65 (never screened)	One screen	–		
Mali	Pilot project	1999–2003	VIA/VILI	25–65	3–5	–	–	Muwonge et al. (2007); Bruni et al. (2019a)
Mauritius	Pilot project	2003	VIA	35–55	5			Bruni et al. (2019a); Sengayi-Muchengeti et al. (2020)
Mozambique	Non-population-based	2009	VIA	30–55	1	–		Moon et al. (2012); Brandão et al. (2019)
Namibia	Pilot project	NA	VIA or cytology	21–64	1	–	–	Bruni et al. (2019a); Sengayi-Muchengeti et al. (2020)
Niger	Pilot project	1999–2003	VIA/VILI	25–65		–	–	Muwonge et al. (2007)
Nigeria	Pilot project	2011–2014	VIA	30–50	3–5	–	–	Anorlu et al. (2003); Adepoju et al. (2016); Chigbu et al. (2017)
Rwanda	Non-population-based	2013	HPV test + VIA	35–45	7 (HPV– women) 3 (HPV+ women)	30–50	1	Binagwaho et al. (2013)
Senegal	Pilot project	2016	VIA or cytology	20–64	2	–	–	Gabrielli et al. (2018)
Seychelles	Non-population-based	2013–2014	Cytology	Sexually active women	2	–	–	Bovet et al. (2013); Bruni et al. (2019a)

Table 2.1 (continued)

Country[a]	Type of programme or setting	Start year or period	Screening method	Target age range (years)	Interval (years)	Target age range for HIV+ women (years)	Interval for HIV+ women (years)	References
South Africa	Population-based	2003	Cytology	30–50	10	–	3	Bruni et al. (2019a); National Department of Health South Africa (2020); WHO (2020g)
Togo	Pilot project		VIA or cytology	35–65		–	–	Bruni et al. (2019a)
Uganda	Opportunistic	–	VIA	–	–	–	–	Paul et al. (2013); Kumakech et al. (2014); Ndejjo et al. (2017)
United Republic of Tanzania	Pilot project	2009–2012	VIA	30–50	3–5	–	1	Kahesa et al. (2012); Plotkin et al. (2014); Anderson et al. (2015); Masalu et al. (2017); Tsu et al. (2018)
Zambia	Non-population-based	2006	VIA	30–50	5	25–59	3	Mwanahamuntu et al. (2009, 2011); Ministry of Community Development, Mother and Child Health Zambia, Ministry of Health Zambia (2015); Bruni et al. (2019a)
Zimbabwe	Pilot project	2002–2003	VIA	25–59	3	–	–	Bruni et al. (2019a); Sengayi-Muchengeti et al. (2020)

HPV, human papillomavirus; NS, not specified; VIA, visual inspection with acetic acid; VILI, visual inspection with Lugol's iodine.

[a] Burundi, Cabo Verde, Chad, Comoros, Eritrea, Guinea-Bissau, Liberia, Mauritania, Sao Tome and Principe, and Sierra Leone have no programme (Bruni et al., 2019a).

Zambia, have implemented national non-population-based screening programmes.

In Algeria, the national cervical cancer screening programme has been based on cytology since 1997. It was revamped in 2015–2020, taking into account organizational and financial aspects, including plans to evaluate the programme, additional training for staff involved in cytology screening, and the introduction of HPV triage. Currently, the Pap test is offered for women aged 30–60 years and repeated every 3 years (Sancho-Garnier et al., 2013; République Algérienne Démocratique et Populaire, 2014; Giordano et al., 2016).

The Zambian Ministry of Health has integrated a cervical cancer screening programme, called the Cervical Cancer Prevention Program in Zambia (CCPPZ), into the existing infrastructure dedicated to HIV/AIDS care. Since the launch of the programme in 2006, women have been screened, regardless of their HIV status, by the VIA test and then treated immediately with cryotherapy after a positive screening test result, according to the screen-and-treat approach (Mwanahamuntu et al., 2009, 2011). The CCPPZ is the largest screen-and-treat programme in Africa (DeGregorio et al., 2017).

Cameroon's largest cervical cancer screening programme, called the Women's Health Program, was founded in 2007 by Cameroon Baptist Convention Health Services and integrated into an existing HIV/AIDS care system, modelled on the CCPPZ. The screening programme is based on the screen-and-treat approach and targets women aged > 25 years (> 21 years for HIV-positive women). It uses the VIA screening test coupled with same-day cryotherapy treatment for women with a positive screening test result (DeGregorio et al., 2017).

A few other countries have also implemented national non-population-based programmes, but many countries still rely on pilot projects (Table 2.1). In the past decade, several large initiatives have been set up through public–private partnerships. These initiatives, such as the Pink Ribbon Red Ribbon campaign, which was launched in September 2011, and Go Further, which was launched in 2018, invest in partner countries to integrate and scale up cervical cancer screening and treatment services within existing platforms for HIV/AIDS care and women's health (Sahasrabuddhe et al., 2012; Oluwole & Kraemer, 2013; George W. Bush Presidential Center, 2017; Go Further, 2019; 2020a, b, c).

Scale-up of cervical cancer screening remains challenging; very few countries have achieved nationwide coverage of their target population and this has been difficult to measure. Most countries in the WHO African Region rely on self-reported surveys such as the STEPwise approach to Surveillance (STEPS) method (WHO, 2020a), Demographic and Health Surveys, or Facility Surveys to assess their coverage. For example, Benin conducted a survey in 2015 and reported that only 0.9% of women aged 30–44 years had been screened for cervical cancer (WHO, 2020a), whereas Botswana reported in 2015 that about 50.6% of women aged 30–44 years had been screened (WHO, 2020a). Within its organized programme, South Africa determined that in 2013–2014 the median Pap test coverage was 33% overall and 31% in HIV-positive women across the country's 52 districts. Most districts had coverage below 50%, and very few districts (3 of 52) reached the target of > 70% coverage (Makura et al., 2016).

2.2.2 WHO Eastern Mediterranean Region

In the WHO Eastern Mediterranean Region, most countries practise opportunistic screening based on cytology; still, a few have implemented non-population-based screening programmes within a national cancer control plan. No countries have an active invitation mechanism for screening; women are typically offered cervical cancer screening when they visit a primary health-care unit or their gynaecologist. Because

of this, the participation rates remain low (Table 2.2).

(a) *North Africa (Djibouti, Egypt, Libya, Morocco, Somalia, Sudan, and Tunisia)*

In 2010, Morocco initiated a non-population-based screening programme for women aged 30–49 years as part of the National Plan for Prevention and Control of Cancer. By 2017, the programme had been implemented in eight of the 12 regions in Morocco. This programme was integrated with primary health care in the public sector and used the VIA screening test, which was offered every 3 years. In 2015, coverage of the target population was measured to be low (30.8%). In the private sector, screening using cytology is provided, but no valid data are available (Giordano et al., 2016; CIRC, Ministère de la Santé, Fondation Lalla Salma, 2017; Bruni et al., 2019a; Selmouni et al., 2019).

In Tunisia, a non-population-based screening programme based on cytology has been implemented and offers screening every 5 years to women aged 35–65 years in primary care centres, hospitals, and family planning clinics (Sancho-Garnier et al., 2013; Ministère de la Santé Tunisien, 2015; Giordano et al., 2016; Bruni et al., 2019a). Coverage has been reported to be consistently very low between 2003 and 2015 (14%) because of a lack of human resources, poor awareness of cancer risk in the population, and challenges related to quality control and achieving timely follow-up (Sancho-Garnier et al., 2013; Ministère de la Santé Tunisien, 2015). Opportunistic Pap testing in the private sector is available, but it is not supported by the national health insurance system and no data are available (Sancho-Garnier et al., 2013; Giordano et al., 2016).

In Egypt, opportunistic screening using Pap testing is offered to women aged 20–50 years who attend health-care facilities on an in- and outpatient basis for other gynaecological problems, primarily through universities and teaching hospitals (Sancho-Garnier et al., 2013; Giordano et al., 2016; Bruni et al., 2019a).

No cervical cancer screening programmes are in place in the other North African countries (i.e. Djibouti, Libya, Somalia, and Sudan) (Bruni et al., 2019a).

(b) *Gulf countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates) and Yemen*

None of the Gulf countries have an organized nationwide screening programme for cervical cancer (Sancho-Garnier et al., 2013; Al-Othman et al., 2015). Opportunistic screening using Pap testing is available in the public and private sector (generally free of charge in the public sector). In Yemen, there is no organized national screening programme and cytology-based screening is available in the private sector only. Target populations include women aged 20–69 years in Oman, 30–64 years in the United Arab Emirates, and 35–64 years in Bahrain (and were not specified in other countries). In Saudi Arabia and Kuwait, target populations for cervical cancer screening include married women only. Screening coverage varies, ranging from 5–17% in Saudi Arabia (as reported in 2009) to about 70% in Oman (as reported in 2012) (Sancho-Garnier et al., 2013).

(c) *Other countries (Afghanistan, Islamic Republic of Iran, Jordan, Lebanon, Pakistan, West Bank and Gaza Strip, and Syrian Arab Republic)*

The Syrian Arab Republic has a non-population-based screening programme based on cytology for women aged 15–55 years (Giordano et al., 2016; Bruni et al., 2019b; WHO, 2020b). In Jordan and Lebanon, opportunistic screening is performed in the public and private sector using cytology, and both countries organize nationwide calls inviting women to cervical cancer screening (Sancho-Garnier et al., 2013; Giordano et al., 2016; Sharkas et al., 2017; Bruni et al., 2019b). Between 2002 and 2010, population coverage was

Table 2.2 Policies and practice for cervical cancer screening in countries of the WHO Eastern Mediterranean Region

Country or territory[a]	Type of programme or setting	Start year	Screening method	Target age range (years)	Interval (years)	References
Afghanistan	Opportunistic	–	VIA or cytology	15–49	5	Bruni et al. (2019b)
Bahrain	Opportunistic	–	Cytology	35–64	3–5	Sancho-Garnier et al. (2013); Al-Othman et al. (2015)
Egypt	Opportunistic	–	Cytology	20–50	–	Giordano et al. (2016)
Iran (Islamic Republic of)	Opportunistic	–	Cytology	35–54 (married women)	3 yr after 3 consecutive annual negative tests	Farshbaf-Khalili et al. (2015); Aminisani et al. (2016); Khazaee-Pool et al. (2018); Refaei et al. (2018); Bruni et al. (2019b)
Jordan	Opportunistic	–	Cytology	25–35	–	Bruni et al. (2019b)
Kuwait	Opportunistic	–	Cytology	Married women	5	Al Sairafi & Mohamed (2009); Sancho-Garnier et al. (2013); Al-Othman et al. (2015)
Lebanon	Opportunistic	–	Cytology	3 yr after becoming sexually active	2–3	Sancho-Garnier et al. (2013)
Morocco	Non-population-based	2010	VIA or cytology	30–49	3	Sancho-Garnier et al. (2013); Giordano et al. (2016); CIRC, Ministère de la Santé, Fondation Lalla Salma (2017); Selmouni et al. (2019)
Oman	Opportunistic	–	Cytology	20–69	3	Sancho-Garnier et al. (2013); Al-Othman et al. (2015)
Pakistan	Opportunistic	–	VIA	30–60	5	Bruni et al. (2019b)
Qatar	Opportunistic	–	Cytology	21–65	1	Al-Meer et al. (2011); Sancho-Garnier et al. (2013); Al-Othman et al. (2015)
Saudi Arabia	Opportunistic	–	Cytology	21–65 (married women)	3	Sait (2009); Sancho-Garnier et al. (2013); Al-Othman et al. (2015); Bruni et al. (2019b)
Syrian Arab Republic	Non-population-based	–	Cytology	15–55	–	Bruni et al. (2019b); WHO (2020b)
Tunisia	Non-population-based	1990	Cytology	35–59	5	Sethom et al. (1989); Ben Aissa et al. (2002); Sancho-Garnier et al. (2013); Ministère de la Santé Tunisien (2015); WHO (2020i)

Table 2.2 (continued)

Country or territory[a]	Type of programme or setting	Start year	Screening method	Target age range (years)	Interval (years)	References
United Arab Emirates	Opportunistic	–	Cytology	30–64	3	Sancho-Garnier et al. (2013); Al-Othman et al. (2015); Badrinath et al. (2004)
Yemen	Opportunistic	–	Cytology	–	–	Sancho-Garnier et al. (2013); Al-Othman et al. (2015)

VIA, visual inspection with acetic acid; yr, year or years.

[a] Djibouti, Libya, Somalia, Sudan, and West Bank and Gaza Strip have no programme (Halahleh & Gale, 2018; Bruni et al., 2019a, b; WHO, 2020h).

reported to be about 25% in Lebanon (Sancho-Garnier et al., 2013); these data are not available for Jordan.

In the Islamic Republic of Iran, opportunistic screening is based on cytology, targeting married women aged 35–54 years. Although robust national coverage estimates are not available, regional estimates from 2014 suggest coverage rates of about 30–50% among eligible women (Farshbaf-Khalili et al., 2015; Aminisani et al., 2016).

There is opportunistic screening in Pakistan based on VIA (Bruni et al., 2019b). There is no cervical cancer screening activity for the other countries in the region.

2.2.3 WHO European Region

In Europe, the first organized cervical cancer screening programmes were initiated in the late 1950s and early 1960s: 1959 in Østfold county, Norway; 1960 in Grampian region, Scotland; 1962 in Frederiksberg municipality, Denmark (Macgregor et al., 1985; Magnus et al., 1987; Bigaard et al., 2000). In the following years, screening based on the Pap test was introduced in most European countries, either in organized population-based programmes or as an opportunistic activity initiated by individual women or their physicians (Ronco & Anttila, 2009).

Information about cervical cancer screening policies, strategies, implementation status, coverage, and participation is available from several recent reviews and surveys (von Karsa et al., 2008; Elfström et al., 2015; Ponti et al., 2017; Basu et al., 2018; Vale et al., 2019b; see also Section 2.3).

(a) Policies and guidelines

The first European guidelines for quality assurance in cervical cancer screening were published in 1993, as part of the Europe Against Cancer programme; they outlined the principles of organized population-based screening (Coleman et al., 1993). In 2003, the European Union (EU) Council recommended the implementation of organized screening programmes with quality assurance processes (Ronco & Anttila, 2009). The second edition of the European guidelines for quality assurance in cervical cancer screening was published in 2008, with considerable attention given to organized population-based programme policies that maximize the health benefits of screening and minimize the harms (Arbyn et al., 2010; see also Section 2.3.2). Specifically, the guidelines recommended cytology screening at 3- to 5-year intervals when test results are normal, generally starting at age 20–30 years (but preferentially not before age 25 or 30 years) and ending at age 60–65 years. The guidelines were updated in 2015 to incorporate advances in screening technologies and prevention strategies (von Karsa et al., 2015). The updated guidelines recommend primary testing for HPV at an interval of at least 5 years starting at age 30–35 years (von Karsa et al., 2015). They also recommend against co-testing (i.e. HPV and cytology primary testing) at any age.

(b) Implementation

(i) Type of programme and implementation status

In the EU, progress in the implementation of the EU Council recommendations on cancer screening was first assessed in a report published in 2008 (von Karsa et al., 2008) and subsequently in a second report published in 2017 (updated to July 2016) (Ponti et al., 2017). The findings of the second report showed that the approach to cervical cancer screening has been variable across the EU Member States, with many improvements in the implementation of population-based screening since the previous report. For instance, by July 2016, 22 EU Member States (which included the United Kingdom at that time) had implemented, piloted,

or planned population-based cervical cancer screening programmes (Table 2.3), compared with only 17 countries in 2007 (Ponti et al., 2017; Basu et al., 2018). All 22 Member States with population-based programmes had documented policies on cervical screening, although such policies were mandated by law in only six of them. Nationwide rollout of population-based cervical cancer screening was complete in 10 countries (Denmark, Estonia, Finland, Lithuania, the Netherlands, Poland, Portugal, Slovenia, Sweden, and the United Kingdom), partial in nine countries (Belgium, Croatia, Czechia, France, Hungary, Ireland, Italy, Latvia, and Romania), planned in two countries (Germany and Slovakia), and in the pilot phase in one country (Malta) (Basu et al., 2018; Vale et al., 2019b). Among age-eligible women in the EU, 72.3% were residents of Member States that had implemented or planned population-based screening for cervical cancer in 2016, compared with 51.3% in 2007 (Basu et al., 2018). All EU Member States with population-based cervical cancer screening programmes, except Lithuania, have a team responsible for programme implementation (no information was provided for Croatia) (Basu et al., 2018). All programmes are publicly funded, with screening tests provided free of charge (except in Croatia). Screening registries exist in all population-based programmes (except in Lithuania).

In non-EU countries in Europe, some organized population-based programmes were implemented nationwide as early as the 1960s (Iceland) and 1990s (Norway) and as recently as 2004 (Turkey) and 2011 (North Macedonia) (Davies & Dimitrievska, 2015; Gultekin et al., 2018; Gultekin et al., 2019; Partanen et al., 2019; Table 2.3).

In the countries of the former Soviet Union (with the exception of the Baltic States, which are part of the EU), cervical cancer screening is mostly opportunistic and uses cytology based on Romanowsky–Giemsa staining (see Section 4.3.4; Rogovskaya et al., 2013; Altobelli et al., 2019; Aimagambetova et al., 2021). In most countries, screening is paid for by the government and is available to residents free of charge. Although the screening programmes in most countries do have some organized features, these programmes are not population-based, because they lack widespread call–recall systems, have low coverage, and do not have quality assurance systems with centralized screening registries (Rogovskaya et al., 2013). In the Russian Federation, Moscow was the first region to implement a cervical cancer screening programme with call–recall system elements in 2002, followed by similar efforts in selected regions on an irregular basis. In the Caucasus region, Armenia and Georgia have cytology-based cervical cancer screening programmes; coverage rates are very low. Although Pap testing is performed at different levels of the health-care system in Azerbaijan, it is not widely accessible and no national screening programme exists (Rogovskaya et al., 2013). In all the Central Asian countries, cytology-based cervical cancer screening is currently available (Aimagambetova et al., 2021). However, screening is mainly opportunistic, with no active invitation process, and coverage has been low or unreported.

(ii) Screening method

Cytology, which has been the cornerstone of cervical cancer prevention for decades, remains the screening test used in most European countries. However, HPV testing is being gradually introduced as the primary screening test. By July 2016, primary HPV screening had already been introduced in some regions in several EU Member States as a stand-alone test followed by triage with cytology (Denmark, Finland, Italy, and Sweden), as co-testing combined with cytology (Romania and Malta), and both as a stand-alone test and as co-testing (Portugal) (Ponti et al., 2017; Basu et al., 2018).

Table 2.3 Policies and practice for cervical cancer screening in countries of the WHO European Region

Country or region	Type of programme	Start year	Target age range (years)	Primary screening method (age group)	Triage test[a]	Interval (age group) (years)	Invitation coverage (%)[b] (year)	Examination coverage (%) (year)	Participation rate (%) (year)	References
Albania	Opportunistic	NR	> 20	Cytology		2–3		2.7 (2002)		Altobelli et al. (2019)
Andorra	Opportunistic	NR	> 18	Cytology		1		61.4 (2011)		Altobelli et al. (2019)
Armenia	Non-population-based	NR	30–60	Cytology		3		9.3 (2010)		Altobelli et al. (2019)
Austria	Opportunistic	1970	> 18	Cytology		1		86.6 (2014)		Ponti et al. (2017); Altobelli et al. (2019)
Azerbaijan	None		NR	VIA				1.1 (2001)		Altobelli et al. (2019)
Belarus	Opportunistic	NR	> 18	Cytology		1		75 (2015)		Altobelli et al. (2019)
Belgium (Flanders)[c]	Population-based	2013	25–64	Cytology	HPV test	3	58.9 (2013)	41.3 (2013)	11.4 (2013)	Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018); Vale et al. (2019b)
Bosnia and Herzegovina	Opportunistic	NR	21–70	Cytology		1		39.8 (2003)		Altobelli et al. (2019)
Bulgaria	Opportunistic	NR	30–59	Cytology		3		46.8 (2008)		Altobelli et al. (2019)
Croatia	Population-based	2012	25–64	Cytology	HPV test	3			10.3 (2013)	Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018); Vale et al. (2019b)
Cyprus	Opportunistic	NR	24–65	Cytology		NR		67.4 (2012)		Altobelli et al. (2019)
Czechia	Population-based	2008	≥ 15	Cytology	HPV test	1		49.3 (2013)		Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018); Vale et al. (2019b)
Denmark	Population-based	2006	23–64	Cytology (23–29) HPV test and cytology (30–59)[d] HPV test (60–64)	HPV test	3 (23–49) 5 (50–64)	67.1 (2013)	82.1 (2013)	64.4 (2013)	Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018); Partanen et al. (2019); Vale et al. (2019b)

Table 2.3 (continued)

Country or region	Type of programme	Start year	Target age range (years)	Primary screening method (age group)	Triage test[a]	Interval (age group) (years)	Invitation coverage (%)[b] (year)	Examination coverage (%) (year)	Participation rate (%) (year)	References
Estonia	Population-based	2006	30–59	Cytology	HPV test or repeat cytology at 12 months	5	77.1 (2014)	44.4 (2013)	57.5 (2013)	Ponti et al. (2017); Basu et al. (2018); Partanen et al. (2019); Vale et al. (2019b)
Finland	Population-based	1963	30–64[e]	HPV test or cytology[f]	Cytology or HPV test[g]	5	97.9 (2012)	66.0 (2013)	67.4 (2013)	Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018); Partanen et al. (2019); Vale et al. (2019b); Maver & Poljak (2020)
France[h]	Population-based	1991	25–65	Cytology (25–29) HPV test (30–65)	HPV test Cytology	3[i] (25–29), cytology 5 (30–65), HPV test	56.0 (2012)	64.8 (2013)	21.1 (2013)	Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018); Vale et al. (2019b); French Government (2020)
Georgia	Non-population-based	NR	25–60	Cytology		3		9.0 (2011)		Altobelli et al. (2019)
Germany[j]	Opportunistic; population-based planned	1971	≥ 20	Cytology		1				Basu et al. (2018); Chrysostomou et al. (2018)
Greece	Opportunistic	1991	≥ 20	Cytology		1		75.5 (2014)		Altobelli et al. (2019)
Hungary	Population-based	2003	25–65	Cytology		3	15.2 (2013)	50.6 (2013)	29.6 (2013)	Ponti et al. (2017); Basu et al. (2018); Vale et al. (2019b)
Iceland	Population-based	1964	23–65	Cytology	HPV test	3				Sigurdsson (2010); Partanen et al. (2019)
Ireland	Population-based	2008	25–65	HPV test		3 (25–29) 5 (30–65)		80.2 (2013)		Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018); Vale et al. (2019b); HSE (2020)
Israel	Opportunistic		25–65	Cytology		3		32.0 (2008)		Altobelli et al. (2019)
Italy	Population-based	1989	25–64	Cytology (25–30) HPV test (30–64)	HPV test[k] Cytology or HPV16/18 genotyping[l]	3 (25–30), cytology 5 (30–64), HPV test	65.1 (2013)	30.6 (2013)	41.5 (2013)	Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018); Vale et al. (2019b); Maver & Poljak (2020)
Kazakhstan	Opportunistic	2006	18–49	Cytology		4		45.9 (2016)		Aimagambetova et al. (2021)

Table 2.3 (continued)

Country or region	Type of programme	Start year	Target age range (years)	Primary screening method (age group)	Triage test[a]	Interval (age group) (years)	Invitation coverage (%)[b] (year)	Examination coverage (%) (year)	Participation rate (%) (year)	References
Kyrgyzstan	Opportunistic	2013	NR	Cytology		5		10–50 (2015)		Altobelli et al. (2019); Aimagambetova et al. (2021)
Latvia	Population-based	2009	25–69	Cytology		3	92.7 (2013)	26.0 (2013)	35.1 (2013)	Ponti et al. (2017); Basu et al. (2018)
Lithuania	Population-based	2004	25–59	Cytology		3	75.5 (2013)	48.3 (2013)	47.9 (2013)	Ponti et al. (2017); Basu et al. (2018)
Luxembourg	Opportunistic	1990	> 15	Cytology		1				Ponti et al. (2017); Altobelli et al. (2019)
Malta[m]	Population-based	2015	25–35	Cytology and HPV test		3				Basu et al. (2018)
Monaco	Opportunistic	NR	21–65	Cytology		1				Altobelli et al. (2019)
Montenegro	Opportunistic	NR	25–64	Cytology		3				Altobelli et al. (2019)
Netherlands	Population-based	1970	30–60[n]	HPV test	Cytology	5 (30–40) 10 (≥ 40)	96.7 (2013)		66.3 (2013)	Ponti et al. (2017); Basu et al. (2018); Maver & Poljak (2020)
North Macedonia[o]	Population-based	2011	30–55 (24–60)[p]	Cytology		3				Poljak et al. (2013); Davies & Dimitrievska (2015); Altobelli et al. (2019)
Norway	Population-based	1992	25–69	Cytology (25–33) HPV test (34–69)	HPV test or cytology	3 (25–33) 5 (34–69)				Partanen et al. (2019)
Poland	Population-based	2006	25–59	Cytology (25–29) Cytology and HPV test (30–59)	HPV test	3	97.7 (2013)	21.1 (2013)	18.2 (2013)	Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018)
Portugal	Population-based	1990	25–< 60	Cytology and HPV test		3	18.6 (2013)	23.9 (2013)		Ponti et al. (2017); Basu et al. (2018); Vale et al. (2019b); Ministério da Saúde de Portugal (2021)
Republic of Moldova	Opportunistic	NR	> 20	Cytology		2		70.0 (2015)		Rogovskaya et al. (2013); Altobelli et al. (2019)

Table 2.3 (continued)

Country or region	Type of programme	Start year	Target age range (years)	Primary screening method (age group)	Triage test[a]	Interval (age group) (years)	Invitation coverage (%)[b] (year)	Examination coverage (%) (year)	Participation rate (%) (year)	References
Romania[q]	Population-based	2012	25–64	Cytology and HPV test		5	65.0 (2013)	9.2 (2013)	14.2 (2013)	Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018); Vale et al. (2019b)
Russian Federation	Non-population-based	2002	> 18	Cytology		1		72.0 (2012)		Rogovskaya et al. (2013); Altobelli et al. (2019)
San Marino	Population-based	2006	25–65	Cytology (20–30) HPV test (30–65)		3 (25–30), cytology 5 (30–65), HPV test		82.0 (2017)		Altobelli et al. (2019)
Serbia	Population-based	2008	25–65	Cytology		3		57.1 (2013)		Poljak et al. (2013); Altobelli et al. (2019)
Slovakia	Population-based, planned	2008	23–64	Cytology	HPV test	3[l]				Basu et al. (2018); Chrysostomou et al. (2018)
Slovenia	Population-based	2003	20–64	Cytology	HPV test	3[l]		77.4 (2013)		Ponti et al. (2017); Basu et al. (2018); Chrysostomou et al. (2018)
Spain	Opportunistic	NR	25–65	Cytology (25–65) HPV test (30–65)		3, cytology 5, HPV test		72.7 (2014)		Ponti et al. (2017); Altobelli et al. (2019)
Sweden	Population-based	1967	23–64	Cytology (23–29) HPV test (30–64)	HPV test Cytology	3 (23–49) 7 (50–64)	80.7 (2013)	86.3 (2013)	52.7 (2013)	Ponti et al. (2017); Basu et al. (2018); Maver & Poljak (2020); Partanen et al. (2019)
Switzerland	Opportunistic	Late 1960s	> 20	Cytology		3		74.5 (2012)		Burton-Jeangros et al. (2017); Altobelli et al. (2019)
Tajikistan	Opportunistic	2009	> 20	Cytology		NR		10–50 (2015)		Altobelli et al. (2019); Aimagambetova et al. (2021)

Table 2.3 (continued)

Country or region	Type of programme	Start year	Target age range (years)	Primary screening method (age group)	Triage test[a]	Interval (age group) (years)	Invitation coverage (%)[b] (year)	Examination coverage (%) (year)	Participation rate (%) (year)	References
Turkey	Population-based	2004	30–65	HPV test	HPV16/18 genotyping and cytology	5		35 (2017)		Altobelli et al. (2019); Gultekin et al. (2019); Maver & Poljak (2020)
Turkmenistan	Opportunistic	2007	> 20	Cytology		1				Altobelli et al. (2019); Aimagambetova et al. (2021)
Ukraine	Opportunistic	NR	18–65	Cytology		1		73.7 (2003)		Rogovskaya et al. (2013); Altobelli et al. (2019)
United Kingdom	Population-based	1988	25–64	HPV test	Cytology	3 (25–49) 5 (50–64)	102.1 (2013)	62.5 (2013)	48.2–58.7[r] (2013)	Ponti et al. (2017); Basu et al. (2018); Maver & Poljak (2020)
Uzbekistan	Opportunistic	2010	25–49	Cytology		NR				Altobelli et al. (2019); Aimagambetova et al. (2021)

HPV, human papillomavirus; NR, not reported.

[a] Information not available for all countries. In countries with primary HPV screening, the triage strategy for women with a positive primary HPV screening test result generally involves two-step (follow-up or delayed) triage. Only the first step (reflex triage) is shown in the table.

[b] Invitation coverage for the age group 30–59 years for European Union Member States.

[c] In Belgium, only the Flemish region has a programme.

[d] In Denmark, HPV screening is gradually being implemented nationwide.

[e] Some municipalities target women younger than 30 years.

[f] Primary screening is predominantly cytology but can also be HPV testing.

[g] HPV triage after abnormal cytology; cytology triage after positive HPV test.

[h] In France, programmes were introduced in a few departments as from 1991; a national programme was launched in 2018. France transitioned to HPV primary screening in 2020. Data for examination coverage, screening coverage, and participation rate are from 13 departments.

[i] The screening interval is 3 years if the first two tests done 1 year apart are normal.

[j] In Germany, the Cancer Screening and Registry Act of 2013 created a legal framework to turn the current opportunistic screening for cervical cancer into organized population-based programmes. The Cancer Screening and Registry Act regulates data linkage between screening programmes and cancer registries (epidemiological or clinical). Since 2018, Germany has been transitioning to an organized population-based screening programme.

[k] HPV triage after abnormal cytology.

[l] Cytology or HPV16/18 genotyping after positive HPV test.

[m] Malta is implementing a pilot programme that targets a narrow age group.

[n] Age range: 30–60 years (65 years if HPV-positive at the last HPV test).

[o] In North Macedonia, a pilot programme with invitation letters was first introduced in four municipalities; this was rolled out nationally in 2012.

[p] Different target ages are reported by Davies & Dimitrievska (2015).

[q] In Romania, there is an organized population-based programme in some regions.

[r] Participation rate in the United Kingdom: England, 58.7%; Northern Ireland, 48.2%.

As of July 2019, the Netherlands and Turkey were the only two European countries with fully implemented national primary HPV-based cervical cancer screening (Maver & Poljak, 2020). In the Netherlands, the new primary HPV-based programme (established in 2017) covers all women aged 30–60 years (65 years if they were HPV-positive at the previous screening). Turkey redesigned its screening programme in 2014, introducing a revamped call–recall system and the use of primary HPV screening with a well-defined protocol outlining the management algorithms (Gultekin et al., 2019; Maver & Poljak, 2020). Finland, Italy, Sweden, and the United Kingdom (Wales) have implemented regional primary HPV screening (Maver & Poljak, 2020). Several other countries, including Belgium, Denmark, France, Germany, Ireland, Malta, and Norway, are in the process of implementing primary HPV screening (Haute Autorité de Santé, 2019; Hillemanns et al., 2019; Partanen et al., 2019; French Government, 2020; HSE, 2020; Maver & Poljak, 2020).

Some countries offer self-sampling kits for HPV testing to underscreened women. In the Netherlands, women who do not respond to the invitation letter within 4 months can request a self-sampling kit (van der Veen, 2017). Furthermore, women who are eligible for screening but do not want to visit their physician for a cervical sampling can request a self-sampling kit as a primary cervical cancer screening tool (van der Veen, 2017; RIVM, 2020). In Sweden, a self-sampling kit is offered to long-term non-attenders (Regionala Cancercentrum, 2019). In Denmark, self-sampling will be offered on an opt-in basis to all women as part of their second reminder for screening (sent 6 months after the initial invitation) (Tranberg & Andersen, 2018; Tranberg et al., 2018). In France, the national guidelines on primary HPV screening recommend that self-sampling should be offered to underscreened women (Haute Autorité de Santé, 2019).

(iii) Target age range and screening interval

In the EU, as recommended in the European guidelines, most countries have stopped cervical screening in women younger than 25 years and have increased the screening intervals to 3–5 years (Ponti et al., 2017; Basu et al., 2018). However, some heterogeneity still exists. In countries with population-based programmes, Czechia is the only country to screen women younger than 20 years. Most countries with cytology-based primary screening programmes use an interval of 3 or 5 years, except for Czechia and Germany, which have continued with yearly screening. Programmes based on primary HPV screening generally start at a later age and use 5-year intervals, although a 3-year interval has been retained in Sweden and the United Kingdom (for women younger than 50 years) and in Ireland (for women younger than 30 years).

Annual cytology was introduced in the former Soviet Union in the early 1960s and is still performed to a certain extent in Belarus, Ukraine, and the Russian Federation (Rogovskaya et al., 2013). The latest guidelines issued in the Russian Federation in 2017 are mostly in line with international recommendations (cytology every 3 years from age 30 years to age 60 years) (Barchuk et al., 2018). However, detailed information on quality, actual screening interval, and coverage is not currently available.

(iv) Invitation coverage, screening coverage, and participation rate

A survey among EU and European Free Trade Association (EFTA) Member States showed that organized efforts for quality assurance, monitoring, and evaluation are implemented to a different extent across European countries and that key performance indicators, such as coverage and participation, are not estimated in a comparable manner between most countries (Elfström et al., 2015). Cross-country comparisons should therefore be interpreted with caution.

In 12 of the European countries with population-based cervical cancer screening programmes, women who have undergone opportunistic screening within the recommended interval are excluded from invitations to screening; this reduces wastage of resources and improves programme efficiency (Ponti et al., 2017; Vale et al., 2019b). By design, these countries will have invitation coverage below 100%; because of this, comparisons of invitation coverage between countries could be misleading unless due consideration is given to the presence of opportunistic screening and related invitation strategies. The mean invitation coverage of women aged 30–59 years in the population-based cervical cancer screening programmes was 59.2%. The rate increased to 78.2% after adjusting for the population of the regional programmes (Vale et al., 2019b).

In the 15 European countries that have implemented population-based programmes and have provided data, the screening coverage (for the index year 2013) was 45.5% overall and ranged from 9.2% (Romania) to 86.3% (Sweden).

The participation rate in the European countries that provided data was 40.8% overall and ranged from 10.3% (Croatia) to 67.4% (Finland) (Ponti et al., 2017). However, as mentioned above, these results must be interpreted in the context of differing invitation strategies between the countries and the fact that opportunistic activity is frequently substantial in Europe.

2.2.4 WHO Region of the Americas: North America

Although Mexico is considered to be part of North America, most Pan American Health Organization (PAHO) reports consider Mexico as part of Latin America (PAHO, 2019, 2020a, b), and so Mexico is presented in Section 2.2.5. Puerto Rico, defined as a self-governing commonwealth in association with the USA, is presented independently for some reports, although it is sometimes excluded from analyses because the data are insufficient.

(a) Health systems, policies, and guidelines

The Canadian federal government is the single payer for health services in the country and, through the Canada Health Act, defines the basic principles and rules that the provincial and territorial health insurance plans must follow to receive public funding (Martin et al., 2018). Provincial and territorial governments determine coverage of medically necessary services in consultation with their respective physician colleges and groups (Government of Canada, 2019).

At the national level, two major initiatives support cervical cancer screening in Canada: the Canadian Strategy for Cancer Control, launched in 2006, and the Canadian Partnership Against Cancer (CPAC), launched in 2007. They developed a strategy to implement organized screening programmes and to monitor cancer system performance (Canadian Strategy for Cancer Control, 2006; Canadian Partnership Against Cancer, 2020).

CPAC launched an updated strategy for the period 2019–2029, in which a main priority was to "diagnose cancer faster, accurately and at an earlier stage" and a key action was to strengthen existing screening efforts to ensure that the right people are getting screened and to eliminate barriers to participation in screening, particularly in hard-to-reach communities. For these communities, CPAC suggested that self-sampling for HPV testing for cervical cancer screening should be pursued as a strategy in Canada (Canadian Partnership Against Cancer, 2019).

The cervical cancer screening guidelines were updated in 2013 by the Canadian Task Force on Preventive Health Care (Canadian Task Force on Preventive Health Care, 2019). In these guidelines cytology-based screening was recommended every 3 years for women aged 25–69 years (Dickinson et al., 2013). More recently, the

Canadian Agency for Drugs and Technologies in Health recommended the replacement of primary cytology screening with HPV testing using 5-year testing intervals for women aged 25–69 years, and using a test with genotyping capability (CADTH, 2019). Nonetheless, cytology remains the primary screening test in Canada.

In the USA, citizens obtain health insurance through employers, independently through private purchase, or through government programmes (Zhao et al., 2020). The delivery of cervical cancer screening is mostly opportunistic and generally occurs in private-practice settings or through medical practitioners operating in federal, state, and local programmes (Kim et al., 2015). Although there are pockets of integrated health-care delivery systems that serve populations, there are few linkages between them, resulting in care that is often fragmented and is not coordinated at state or national levels (Habbema et al., 2012). The National Breast and Cervical Cancer Early Detection Program (NBCCEDP), operated by the Centers for Disease Control and Prevention (CDC), fully or partially funds breast and cervical cancer screening, diagnostic, and treatment services for eligible low-income, uninsured, and underinsured women. NBCCEDP also provides patient navigation services to help women overcome barriers and get timely access to high-quality care (Centers for Disease Control and Prevention, 2019). In addition, Medicare and Medicaid beneficiaries are covered for routine cervical cancer screening (American Cancer Society, 2021).

The Patient Protection and Affordable Care Act (ACA) (U.S. Legislative Counsel, 2010), a major health system reform signed into law in 2010, carried significant implications for access to cancer screening by way of health insurance expansion and changes in health insurance coverage. Health insurance expansion included coverage to dependents until the age of 26 years, extended income thresholds for Medicaid eligibility, and the establishment of mechanisms to increase the affordability of health insurance for the general population. Changes in health insurance coverage involved the inclusion of preventive services as part of the essential health benefits and the elimination of cost-sharing for certain preventive services (Sabik & Adunlin, 2017; Zhao et al., 2020). Several medical or cancer societies provide independent clinical guidelines. The most prominent cervical cancer screening guidelines include those of the American Cancer Society, the American Society for Colposcopy and Cervical Pathology, the American Society for Clinical Pathology, the American College of Obstetricians and Gynecologists, and the United States Preventive Services Task Force (USPSTF) (Table 2.4).

(b) Screening programmes and practices

Cervical cancer screening is well established in the USA and Canada. An overlap of organized and opportunistic screening exists in the USA, whereas in Canada cervical cancer screening is provided mostly through organized programmes with invitation and reminder systems. Thus, with some variability, population-based screening is available in most Canadian provinces, and for provinces and territories without organized programmes (Northwest Territories, Nunavut, Quebec, and Yukon), opportunistic screening is available through primary care providers (Canadian Partnership Against Cancer, 2018; Table 2.5). Cervical cancer screening is considered to be a medically necessary service in all provinces and territories and is free to Canadian citizens and residents at the point of care (Kiran et al., 2015).

In the USA, interpretation of and adherence to guidelines by primary care physicians vary widely, which has relevant impact on individual practices (e.g. overscreening, geographical and sociodemographic differences) (Yabroff et al., 2009; Hirth et al., 2013; Kepka et al., 2014; Porter Novelli, 2015; Cooper & Saraiya, 2017; Goding Sauer et al., 2020).

Table 2.4 Cervical cancer screening guidelines from cancer societies in the USA

Recommendation	Reference		
	American College of Obstetricians and Gynecologists (2016)	US Preventive Services Task Force (2018)	American Cancer Society (2020)
Age range			
Starting age (years)	21	21 Recommend against screening at younger ages	25
Stopping age (years)	65 if adequate negative screening within the past 10 yr[a]	65 if adequate negative screening within the past 10 yr[a]	65 if adequate negative screening within the past 20 yr[a]
Screening tests	HPV and cytology co-testing (ages 30–65) Cytology (ages 21–65)	Primary HPV testing (ages 30–65) HPV and cytology co-testing (ages 30–65) Cytology (ages 21–65)	HPV (preferred test) (ages 25–65) HPV and cytology co-testing (acceptable) (ages 25–65) Cytology (acceptable) (ages 25–65)
Screening interval for primary test			
HPV testing	Not more frequent than every 3 yr	Every 5 yr	Every 5 yr
Co-testing	Every 5 yr	Every 5 yr	Every 5 yr
Cytology	Every 3 yr	Every 3 yr	Every 3 yr
Screening for HPV-vaccinated women	As per the general guidelines	As per the general guidelines	As per the general guidelines
Screening for HIV-positive women	As per DHHS–CDC guidance	As per DHHS–CDC guidance	As recommended by CDC, NIH, and HIVMA

CDC, Centers for Disease Control and Prevention; DHHS, Department of Health and Human Services; HIVMA, HIV Medicine Association of the Infectious Diseases Society of America; HPV, human papillomavirus; NIH, National Institutes of Health; yr, year or years.

[a] Adequate negative screening could be either 3 consecutive Pap smears or 2 consecutive HPV tests. Guidance by the DHHS and the CDC for HIV-positive women comprises first screening 1 year after sexual onset and no later than age 21 years, or first screening on HIV diagnosis for women 21 years and older. Screening to be done with annual cytology or triennial HPV–cytology co-testing within the same age ranges as the general population.

Table compiled by the Working Group.

Table 2.5 Policies and practice for cervical cancer screening in the provinces and territories of Canada

Province or territory	Screening method	Start year of organized programme	Starting age (years)	Stopping age (years)	Interval (years)
Alberta	Cytology	2000	25	69	3
British Columbia	Cytology	1960	25	70	3
Manitoba	Cytology	2000	21	69	3
New Brunswick	Cytology	2014	21, or 3 yr after sexual onset	69 if ≥ 3 negative tests in 10 yr	1–1–1–2 or 3
Newfoundland and Labrador	Cytology	2003	21	70 if ≥ 3 negative tests in 10 yr	1–1–1–3
Northwest Territories	Cytology	NA	21	69	1–1–1–2
Nova Scotia	Cytology	1991	21	70	3
Nunavut	Cytology	NA	21 if sexually active	69	3
Ontario	Cytology	2000	21 if sexually active	70 if ≥ 3 negative tests in 10 yr	3
Prince Edward Island	Cytology	2001	21 if sexually active	65 if ≥ 3 negative tests in 10 yr	2
Quebec	Cytology	NA	21	65 if ≥ 2 negative tests in 10 yr	2 or 3
Saskatchewan	Cytology	2003	21, or 3 yr after sexual onset	69	2–2–2–3
Yukon	Cytology	NA	No data		

NA, not applicable; yr, year or years.
Adapted from Canadian Partnership Against Cancer (2018).

Table 2.6 Coverage of cervical cancer screening in North America

Age group (years)	Coverage (%)[a]	
Canada (2011–2013)		
	Hysterectomy corrected	Not hysterectomy corrected
21–29	73.6	77.9
30–39	76.6	76.3
40–49	77.2	68.6
50–59	71.9	59.9
60–69	63.7	47.6
Overall	73.5	67.1
USA (2018) (hysterectomy corrected[b])		
	All states and District of Columbia (without territories)	Puerto Rico
21–30	66.6	60.2
31–40	84.9	82.5
41–50	83.4	85.7
51–60	81.6	80.5
61–65	75.6	77.9
Overall	79.5	80.6

[a] Coverage is defined as women having at least one test in a 3-year period.
[b] Hysterectomy correction indicates the exclusion of women with history of hysterectomy from the analysis.
Data from: Canada (Canadian Partnership Against Cancer, 2016); USA (Centers for Disease Control and Prevention, 2015).

(c) Performance of screening programmes

On the basis of the 2006 Strategy for Cancer Control and under the guidance of the performance monitoring indicators defined by the Public Health Agency of Canada in 2009 (PHAC, 2009), the Pan-Canadian Cervical Cancer Screening Network, established in 2010, has produced three reports on performance measures for cervical cancer screening, for the periods 2006–2008, 2009–2011, and 2011–2013 (Canadian Partnership Against Cancer, 2016). Age-adjusted coverage of cervical cancer screening in Canada for 2011–2013 is summarized in Table 2.6.

In the USA, monitoring of Healthy People 2020 goals is done through the National Health Interview Survey, which is a household survey with national representation, and surveillance of cytology coverage at the state level is done mainly through the Behavioral Risk Factor Surveillance System, which is a telephone survey; both surveys allow self-reporting of participation in cervical cancer screening (Centers for Disease Control and Prevention, 2015; Centers for Disease Control and Prevention, National Center for Health Statistics, 2020). In addition, the NBCCEDP and Medicare report cervical cancer screening participation on the basis of claims made to each funding programme (Centers for Disease Control and Prevention, 2019); likewise, several studies have analysed the impact of ACA on the use of cancer screening services based on national surveys and administrative claims (Zhao et al., 2020).

Cervical cancer screening coverage in the USA in 2018 is summarized in Table2.6. Coverage was highest in women aged 31–40 years (84.9%) and lowest in women younger than 30 years (66.6%) (Table 2.6). Puerto Rico reported higher coverage than the average for the USA (80.6%). In 2012, women aged 18–64 years were eligible for the NBCCEDP; the percentage of screened women aged 40–64 years, by state, ranged from 5.0% to 73.2% (Tangka et al., 2015). Medicare follows the guideline recommendations and eligible

women are those aged 21–64 years; coverage by state ranges from 35.3% to 72.0% (Medicaid/CHIP, 2019). As noted earlier, despite the high self-reported coverage in national surveys, the percentage of underserved screened women eligible for government-funded programmes remains low.

2.2.5 WHO Region of the Americas: Latin America and the Caribbean

(a) Health systems, policies, and guidelines

Most Latin American countries have segmented health systems, characterized by the coexistence of different organizational structures serving different population groups, under different rules and benefit packages, typically divided by socioeconomic and employment conditions (Frenk & Gómez-Dantés, 2018). Under segmented models, health care is provided to the lowest-income populations through public hospitals, employees are served by social security institutions, and the highest-income population is privately insured (Frenk & Gómez-Dantés, 2018; Kanavos et al., 2019).

Some countries, such as Cuba and Costa Rica, have universal health systems with public funding and health care delivered by a single public institution (Frenk & Gómez-Dantés, 2018; Kanavos et al., 2019). Other countries, such as Brazil and Colombia, have universal health systems with public contract models, in which health care is delivered by public and private institutions via direct contract with the public funding agency (as in Brazil) or via intermediary, mostly private, insurance companies (as in Colombia) (Frenk & Gómez-Dantés, 2018; Kanavos et al., 2019).

In addition, some countries have adopted health benefit packages with explicit inclusion of cervical cancer screening and treatment of precancerous lesions and invasive cancer (Giedion et al., 2014).

Stewardship, which involves setting the rules for all actors and defining strategic directions for the health system as a whole (including cancer control), is separated and unequal in segmented models; in universal systems, this function is served by the ministry of health (Frenk & Gómez-Dantés, 2018). Despite limited stewardship to align rules and priorities *between* population segments, segmented models may have more coordinated health-care delivery *within* population segments than public contract models with indistinct participation of private and public institutions (Frenk & Gómez-Dantés, 2018). Together, the limitations of both model types make implementing organized cervical cancer screening a challenge in most Latin American countries.

Up to 2019, all countries in the Latin American region had defined recommendations or policies for cervical cancer screening, and 16 of 19 had updated their recommendations during the previous decade (Table 2.7). Furthermore, according to the WHO Cancer Country Profile survey, only two of 19 Latin American countries (Bolivia and Honduras) reported that they did not have a cervical cancer screening programme to implement recommendations, whereas 12 reported that they had organized population-based screening (WHO, 2020c). In the English-speaking Caribbean region, information on cervical cancer screening policies is available for only 12 of 21 countries (Table 2.7).

Some countries in the region have government institutions, departments, or official networks dedicated to the assessment of health technology and the development of clinical guidelines: Chile, ETESA (Ministério de Salud de Chile, 2017); Brazil, REBRATS (Ministério da Saúde do Brasil, 2020); Colombia, IETS (IETS, 2020); and Mexico, CENETEC (Secretaría de Salud de México, 2020). However, current recommendations for cervical cancer screening are derived mainly from national consensus, led

Table 2.7 Policies and practices for cervical cancer screening in countries of Latin America and the Caribbean

Country	Programme characteristics				Coverage[a]				References
	Year of last update to programme	Screening method	Target age range (years)	Interval (years)	Age range (years)	Coverage (%)	Coverage definition (years)	Year of report	
Latin America									
Argentina	2015	Cytology HPV test	25–29 30–64	1–1–3 5	25–64 35–49	70.3 72.5	2	2019	Arrossi et al. (2015); Ministerio de Salud de Argentina (2019)
Bolivia (Plurinational State of)	2009	Cytology VIA	25–64 NA	1–1–3 NA	25–64 35–44	NA 47.3	3	2008	Ministerio de Salud y Deportes Bolivia (2009a, b)
Brazil	2016	Cytology	25–64	1–1–3	25–64 35–44	79.4 91.6	3	2016	Ministério da Saúde do Brasil (2016, 2017)
Chile	2015	Cytology HPV test	25–29 30–64	3 5	25–64 35–44	72.9 76.0	3	2017	Ministerio de Salud de Chile (2015); Ministerio de Desarrollo Social de Chile (2018); Ministerio de Desarrollo Social y Familia de Chile (2018)
Colombia	2018	Cytology HPV test VIA/VILI	25–29 30–65 30–50	3 5 3	21–69 30–49	76.2 81.9	3	2015	Ministerio de Salud y Protección Social de Colombia (2015, 2018, 2019)
Costa Rica	2007	Cytology	≥ 20	2	25–64 35–44	74.1 78.3	3	2006	Ministerio de Salud de Costa Rica (2006, 2007); Hernández Villafuerte & Sáenz Vega (2006)
Cuba	2018	Cytology	25–64	3	25–64 30–44	NA 85.0	3	2014	Ministerio de Salud Pública de Cuba (2018); Bonet Gorbea & Varona Pérez (2014)
Dominican Republic	2010	Cytology	35–64	1–1–3	35–64 15–49	NA 54.8	2	2014	Rojas Gómez et al. (2010); CESDEM & ICF International (2014)
Ecuador	2017	Cytology HPV test	21–65 30–65	3 5	21–65 15–49	NA 55.9	2	2015	Espinosa et al. (2017); Freire et al. (2015)
El Salvador	2015	Cytology HPV test	20–29, 60–65 30–59	2 NA	20–65 30–49	NA 70.9	2	2008	Ministerio de Salud de El Salvador (2015); ADS CCI, CDC (2009)

Table 2.7 (continued)

Country	Programme characteristics				Coverage[a]				References
	Year of last update to programme	Screening method	Target age range (years)	Interval (years)	Age range (years)	Coverage (%)	Coverage definition (years)	Year of report	
Guatemala	2014	Cytology HPV test VIA	25–54 30 25–54	3–5 5 3–5	NA	NA	NA	NA	Ministerio de Salud Pública y Asistencia Social de Guatemala (2020)
Honduras	2015	VIA HPV test	25–30 30–64	3 5	25–64 35–44	NA 60.3	3	2002	Secretaría de Salud de Honduras (2015); Secretaría de Salud, Instituto Nacional de Estadística & ICF International (2013)
Mexico	2013	Cytology HPV test	25–64 35–64	3 5	25–64 35–44	36.4 38.7	1	2018	Secretaría de Salud de Mexico (2013); CNEGSR (2015); CIEE (2019)
Nicaragua	2010	Cytology VIA	25–64 30–50	1–1–1–3 1	25–64 35–44	NA 60.4	2	2014	Ministerio de Salud de Nicaragua (2010); PAHO (2010); INIDE & MINSA (2014)
Panama	2017	Cytology HPV test VIA	21–70 25–64 NA	2 3 NA	NA	NA	NA	NA	Ministerio de Salud & Caja de Seguro Social de Panamá (2017)
Paraguay	2015	Cytology HPV test	21–65 30–65	1–1–3 5	21–65 35–44	NA 57.2	2	2008	Barrios Fernández et al. (2015); Ministerio de Salud Pública y Bienestar Social de Paraguay, (2017a, b); CEPEP (2009)
Peru	2017	Cytology HPV test VIA	30–49 50–64 30–49	5 3 3	30–64 30–59	NA 57.4	3	2014	Ministerio de Salud de Perú (2019); INEI (2014)
Uruguay	2014	Cytology	21–69	1–1–3	21–64	78.4	3	2013	Muniz et al. (2015); Ministerio de Salud Pública de Uruguay (2018)
Venezuela	NA	Cytology	25–64	1–1–3	NA	NA	NA	NA	Murillo et al. (2016)
Caribbean									
Antigua and Barbuda	NA	Cytology HPV test	21–65 ≥ 30	5 NA	NA	NA	NA	NA	Bruni et al. (2019c)

Table 2.7 (continued)

Country	Programme characteristics					Coverage[a]			References
	Year of last update to programme	Screening method	Target age range (years)	Interval (years)	Age range (years)	Coverage (%)	Coverage definition (years)	Year of report	
Bahamas	NA	Cytology	≥ 21	1	20–64 30–49	66.2 66.3	2	2011	PAHO (2013); Bahamas Ministry of Health (2011); WHO (2020a)
Belize	2016	Cytology VIA	> 25 25–49	3 3	NA	NA	NA	NA	Ministry of Health Belize (2016)
Dominica	NA	Cytology	18–65	NA	NA	NA	NA	NA	Luciani et al. (2017)
Grenada	NA	Cytology	> 21	1–1–1–3	NA	NA	NA	NA	Bruni et al. (2019c)
Guyana	2010	Cytology VIA	Sexually active 25–49	NA	NA	NA	NA	NA	Maternal and Child Health Integrated Program (2012); PAHO (2013); Ministry of Health Guyana (2020)
Jamaica	2011	Cytology	18–65	1–1–3	18–65 35–44	NA 56.4	3	2010	Ministry of Health Jamaica (2011); Serbanescu et al. (2010)
Saint Kitts and Nevis	NA	Cytology	18–55	1–1–3	18–55 35–44	NA 72.3	2	2008	PAHO (2013); Luciani et al. (2017); WHO (2020a)
Saint Lucia	NA	Cytology	18–55	1	NA	NA	NA	NA	Luciani et al. (2017); Bruni et al. (2019c)
Saint Vincent and the Grenadines	NA	Cytology VIA	18–60 NA	1–1–3 NA	18–69 30–49	58.6 70.9	Ever	2015	PAHO (2013); Luciani et al. (2017); WHO (2020a)
Suriname	2012	Cytology VIA	Postmenopausal women 23–55	2 2	NA	NA	NA	NA	PAHO (2013)
Trinidad and Tobago	NA	Cytology	> 18	1	> 18 35–44	NA 36.6	2	2012	PAHO (2013); Luciani et al. (2017); WHO (2020a)

HPV, human papillomavirus; NA, not available; VIA, visual inspection with acetic acid; VILI, visual inspection with Lugol's iodine; VIA/VILI, VIA followed by VILI in case of positive VIA result.

[a] Coverage is defined as the percentage of women with a history of participation in screening within the indicated period for the corresponding age range.

by the ministries of health, without systematic development. Chile and Colombia have national guidelines based on systematic review of scientific evidence (Ministerio de Salud y Protección Social de Colombia, 2014; Ministério de Salud de Chile, 2015), and in Mexico, the Mexican Institute of Social Security has developed systematic guidelines for its affiliated institutions (Instituto Mexicano del Seguro Social, 2011).

(b) Screening programmes and practices

Latin American countries have a long-standing tradition in cervical cancer screening. Initially led by nongovernmental organizations (NGOs) in the 1950s and 1960s (mainly Leagues Against Cancer), the first national programmes were introduced in the early 1990s (Murillo et al., 2008). Today, cervical cancer screening is available in all Latin American countries; however, the region contends with large social disparities, and a significant number of women do not have access to proper health care (Murillo, 2019). Most countries in the region have updated their screening recommendations during the past decade and have made significant progress in introducing either molecular testing or screen-and-treat approaches (Table 2.7).

Screen-and-treat approaches are recommended for hard-to-reach women in eight Latin American countries. Most of these are based on VIA, but in Colombia a combination of VIA and visual inspection with Lugol's iodine (VILI) is recommended, in El Salvador HPV test-and-treat is recommended, and in Paraguay colposcopy followed by large loop excision of the transformation zone (LLETZ) is recommended (Table 2.7).

Most countries in Latin America start screening at age 25 years; in the Caribbean, screening generally starts at adulthood (18 years and older) or onset of sexual activity. Nonetheless, some countries in Latin America endorse screening in adolescents, depending upon assessment of individual risk. Currently, three of the six countries that recommend screening women younger than 25 years – Costa Rica, El Salvador, and Panama – also recommend a more frequent screening interval (2 years) (Table 2.7).

(c) Performance of screening programmes

Comprehensive programme reports are not available for Latin America and the Caribbean. The data on cervical cancer screening coverage reported in Table 2.7 are derived from population-based surveys, and data on other programme performance indicators are from published studies in scientific journals. In several countries, the surveys are not aligned with screening programmes, because target ages and screening intervals are not concordant. Some countries may have reached or may be close to reaching the target of the WHO Global Strategy for the Elimination of Cervical Cancer as a Public Health Problem (70% coverage for women aged 35–45 years); coverage ranges from 66.3% in the Bahamas to 85.0% in Cuba. For Argentina and Brazil, information is available for similar age ranges, but these require careful interpretation because the data are restricted to urban populations (Arrossi et al., 2015; Ministério da Saúde do Brasil, 2017).

A major challenge in the region is the compliance with follow-up for women with a positive screening test result. Some studies show that follow-up compliance has a greater impact than population screening coverage on cervical cancer mortality (Murillo et al., 2008; Chocontá-Piraquive et al., 2010). Follow-up rates for women with a positive screening test result in selected studies in Latin American countries are given in Table 2.8; however, differences in settings, populations, and methods make comparisons between countries difficult (Austad et al., 2018; Arrossi et al., 2019).

Table 2.8 Follow-up rates[a] for women with a positive screening test result from selected studies in countries in Latin America

Country	Study level	Sector	Screening method	Follow-up rate (%)	References
Programme data					
Argentina	Regional	Public	Cytology	65.5	Arrossi et al. (2019)
			HPV (clinician)	79.2	
			HPV (self-sampling)	75.0	
Brazil	Local	Public	Cytology	35.0	Araújo et al. (2014)
Chile	Local	Public	HPV and cytology triage	71.1	Melo et al. (2014)
Guatemala	Regional – Indigenous	Public	Cytology	88.7	Austad et al. (2018)
Nicaragua	Local	Public	Cytology	58.0	Vastbinder et al. (2010)
Self-reported					
Colombia	Regional	All	Cytology	72.2	Wiesner et al. (2010)
Guatemala	Regional – Indigenous	Public	Cytology	42.6	Austad et al. (2018)

HPV, human papillomavirus.

[a] Follow-up rates are estimates based on women at risk for every step in the screening algorithm as reported in the original source: screening-positive to triage or colposcopy or biopsy, triage-positive to colposcopy or biopsy, diagnosis of cervical intraepithelial neoplasia grade 2 or worse (CIN2+) or high-grade squamous intraepithelial lesion (HSIL) to treatment. Usually follow-up increases in the later phases of the algorithm.

2.2.6 WHO South-East Asia Region

The data on screening activities are limited for some countries in this region (Table 2.9). Four countries – Bhutan, Maldives, Sri Lanka, and Thailand – have population-based cervical cancer screening programmes. Other countries have initiated screening activities on an opportunistic basis, using mostly VIA but also cytology as a primary screening test. Where screening is available, participation rates are usually low.

(a) Bangladesh

In 2004, the Government of Bangladesh initiated a VIA-based screening programme in collaboration with the United Nations Population Fund and Bangabandhu Sheikh Mujib Medical University (BSMMU) (Basu & Majid, 2008). VIA is used at upazila (subdistrict) health complexes, maternal and child welfare centres, district hospitals, medical college hospitals, and BSMMU and is provided by trained family welfare visitors, senior staff nurses, and physicians (Basu & Majid, 2008; Basu et al., 2010; Nessa et al., 2010).

(b) Bhutan

In 2000, the Ministry of Health Bhutan launched a national cytology-based screening programme; Pap tests are provided free of charge by trained female health assistants, nurses, and physicians in district, regional, and national referral hospitals through maternal and child health clinics, and in basic health units, where primary care services are offered. The screening coverage varies across the country, ranging from about 20% to 60% of the target population in different provinces (Baussano et al., 2014; Dhendup & Tshering, 2014; Ministry of Health Bhutan, 2014).

(c) Democratic People's Republic of Korea

The Democratic People's Republic of Korea has a national public health system that provides health-care services at no direct cost to the patient (UNICEF DPRK, 2006). Physicians, midwives, and nurses have the responsibility to carry out these services, but there is no published information on how this policy is implemented (Tran et al., 2011).

Table 2.9 Policies and practice for cervical cancer screening in countries of the WHO South-East Asia Region

Country	Type of programme or setting	Year of programme or guidelines	Target age range (years)	Interval (years)	Screening method	Participation rate (%)	References
Bangladesh	National	2004	> 30	NA	VIA	NA	Basu & Majid (2008)
Bhutan	National	2010	20–60	3	Cytology	20–60	Dhendup & Tshering (2014); Ministry of Health Bhutan (2014)
Democratic People's Republic of Korea	National	NR	30–60	1	Cytology	NA	Tran et al. (2011)
India	Opportunistic	2016	30–65	5	VIA	22	Ministry of Health and Family Welfare, Government of India (2016); Monica & Mishra (2020)
Indonesia	Pilot	2007	30–50	3–5	VIA	7.3	WHO (2017); Ministry of Health Indonesia (2019)
Maldives	Population-based	2014	30–50	5	VIA	NA	Ministry of Health Maldives (2016); Maldives UNFPA (2014)
Myanmar	National	2020 (expected)	30–49	3–5	VIA or HPV test	NA	WHO (2020b)
Nepal	Opportunistic	2010	30–60	5	VIA	2.8	Darj et al. (2019); ICO/IARC Information Centre on HPV and Cancer (2019)
Sri Lanka	National	1998	> 35	5	Cytology	34.6	Ministry of Health Sri Lanka (2014, 2019); Kumara & Dasanayake (2017)
Thailand	National	2005	30–60	5	Cytology or VIA	61	Khuhaprema et al. (2012); Department of Medical Services Thailand (2019); Ploysawang et al. (2021)
		2020	30–60	5	HPV test	NA	

HPV, human papillomavirus; NA, not applicable; NR, not reported; VIA, visual inspection with acetic acid.

(d) India

The 2016 operational guidelines for implementation of cancer screening in India recommended VIA screening every 5 years for women aged 30–65 years (Ministry of Health and Family Welfare, Government of India, 2016). Opportunistic screening using VIA is currently administered by female staff medical officers and staff nurses at primary health centres, alongside screening for oral cancer and breast cancer. Screening coverage in India remains low, and the average participation rate across districts has been reported to be about 22% (Monica & Mishra, 2020). As a result, cancers are detected primarily through opportunistic screening or after the onset of symptoms (Ministry of Health and Family Welfare, Government of India, 2016).

(e) Indonesia

The Indonesian Ministry of Health launched the Cervical and Breast Cancer Prevention project in 2007 as a pilot study in Karawang District (Kim et al., 2013). Women aged 30–50 years are eligible, and VIA is provided by trained healthcare providers, including nurses, general practitioners, and midwives in primary health centres (Kim et al., 2013; WHO, 2017; Wahidin, 2018). Screening is covered by the national health insurance system and is provided free of charge (BPJS Kesehatan, 2014). From 2007 to 2016, the programme was running in all 34 provinces (100%), 393 of 514 districts or municipalities (76%), and 3706 of 9813 primary health centres (38%) (Wahidin, 2018). The coverage of screening is low; in 2018, only 7.3% of the target population was screened (Ministry of Health Indonesia, 2019).

(f) Maldives

A population-based cervical cancer screening programme was launched in Maldives in 2014 by the ministry of health and gender with support from the United Nations Population Fund (Maldives UNFPA, 2014). The programme offers screening to women aged 30–50 years at an interval of 5 years using VIA as the primary screening test. Women with a positive test result are referred for diagnostic testing using colposcopy and subsequent treatment (Ministry of Health Maldives, 2016). In the absence of diagnostic facilities, women with a positive VIA test result are treated with cryotherapy in the same visit.

(g) Myanmar

Myanmar is one of the six LMICs selected by the United Nations Joint Global Programme on Cervical Cancer Prevention and Control (UNJGP) for support to implement a national cervical cancer screening programme between 2018 and 2021 (WHO, 2020d). As recommended by the UNJGP, National Guidelines on Secondary Prevention of Cervical Cancer for Public Health Sector Facilities were developed in 2018 and the National Programme for Secondary Prevention of Cervical Cancer is expected to run between 2020 and 2024. Currently, opportunistic screening services are offered in selected hospitals and pilot programmes are carried out mostly by NGOs.

(h) Nepal

The national guidelines for cervical cancer prevention in Nepal were formulated in 2010 (Darj et al., 2019). There is no organized national screening programme; however, the government actively organizes health camps and screening campaigns across the country (Global Giving, 2021). In addition, NGOs such as the Nepal Network for Cancer Treatment and Research (NNCTR) support cervical cancer screening by forming mobile teams of specialist nurses and community volunteers that travel to communities within the Kathmandu Valley area. Despite the efforts of the government and other parties, the coverage of cervical cancer screening in 2003 was very low, with only 2.8% of eligible women

screened (ICO/IARC Information Centre on HPV and Cancer, 2019).

(i) Sri Lanka

Cervical cancer screening by Pap test was established in Sri Lanka as a national programme in 1998 (Gamage, 2017). Pap test screening services are provided through the Well Woman Programme and the Family Health Bureau, Ministry of Health Sri Lanka. Sri Lanka has successfully implemented the Well Women Programme at the primary health care level through a network of more than 800 well woman clinics (Ministry of Health Sri Lanka, 2019). Public health midwives identify women aged 35–45 years and motivate them to attend the well woman clinics for routine primary and reproductive health care. Those with positive Pap test results are referred to a consultant gynaecologist for colposcopy (Ministry of Health Sri Lanka, 2019). In 2014, 34.6% of the target population received a Pap test at a well woman clinic (Ministry of Health Sri Lanka, 2014). The overall proportion of women aged 35 years who had attended a well woman clinic increased steadily, from 34.6% in 2014 to 61.6% in 2018 (Ministry of Health Sri Lanka, 2019).

(j) Thailand

After a pilot demonstration project implemented from 1999 to 2002, the National Cancer Institute of Thailand launched a national cervical cancer screening programme in 2005, in cooperation with the National Health Security Office, Department of Medical Services, and Department of Health (Khuhaprema et al., 2012; Department of Medical Services Thailand, 2019). Women aged 30–60 years receive cytology screening free of charge every 5 years through more than 10 000 primary care units and community-based health centres. VIA-based screening is also available in 29 provinces for women aged 30–45 years. Women with abnormal screening test results are referred for colposcopy, biopsy, and treatment in provincial hospitals. Before the launch of the national screening programme, only 25% of Thai women had ever received screening. In 2014, 61% of the target population received screening; 98.9% of these received a Pap test and 1.1% received VIA. The National Health Security Office introduced HPV testing as primary screening in 2020, in place of Pap testing, at 5-year intervals for women aged 30–60 years (Department of Medical Services Thailand, 2019; Ploysawang et al., 2021).

2.2.7 WHO Western Pacific Region

The WHO Western Pacific Region includes countries with very different resource levels. Some high-income countries, such as Australia, New Zealand, the Republic of Korea, Singapore, and Taiwan, China, have well-established population-based cervical cancer screening programmes and use either HPV testing or cytology as the primary screening test. Other countries in the region have national guidelines and strategies in place, but no population-based screening programmes. These countries rely on opportunistic screening using VIA or cytology. Some countries, such as the Pacific Island nations, have implemented pilot screening projects (Table 2.10).

(a) Australia

A national cervical screening programme was established in Australia in 1991 to provide organized population-based cervical screening using biennial Pap tests for women aged 18–69 years (Cancer Council Australia, 2018; AIHW, 2019). In 2017, the programme transitioned from cytology-based to primary HPV-based testing with partial HPV genotyping and reflex liquid-based cytology (LBC) at 5-year intervals in a target population of women aged 25–74 years, in accordance with the Medical Services Advisory Committee recommendations. HPV self-sampling facilitated by a medical practitioner, nurse

Table 2.10 Policies and practice for cervical cancer screening in countries of the WHO Western Pacific Region

Country or territory	Type of programme or setting	Start year	Target age range (years)	Interval (years)	Screening method	Participation rate (%)	References
Australia	Population-based	1991 2017	18–69 25–74	2 5	Cytology HPV test	56.4 NA	Cancer Council Australia (2018); AIHW (2019)
Brunei Darussalam	National	2010	20–65	3	Cytology	56.3	Government of Brunei Darussalam (2020); Suhaimi et al. (2020)
Cambodia	Opportunistic	2014	30–49	NA	VIA	NA	WHO (2015)
China	National	2009	35–64	3	Cytology or VIA	31.4	Kang & Qiao (2014); Wang & Qiao (2015)
Hong Kong Special Administrative Region	Organized	2004	25–64	1–1–3	Cytology	60.5	Centre for Health Protection (2004, 2017)
Japan	Organized	1983	> 20	2	Cytology	33.7	Ministry of Health, Labour and Welfare Japan (2017); Hamashima (2018)
Malaysia	National	1998 2019	20–65 30–49	1–1–3 5	Cytology HPV test	12.8 NA	Ministry of Health Malaysia (2019)
Mongolia	Project	2012	30–60	3	Cytology	28	WHO (2014a)
New Zealand	Population-based	1990	25–69	3	Cytology and HPV co-testing	70.4	Ministry of Health New Zealand (2019); National Screening Unit New Zealand (2020a, 2021)
Philippines	Organized	2006	25–55	5–7	VIA or cytology	NA	Domingo & Dy Echo (2009)
Republic of Korea	Population-based	1999	> 30	2	Cytology	57	Lee et al. (2002); Kim et al. (2011); Hong et al. (2020)
Singapore	Population-based	2004 2019	25–69 > 30	3 5	Cytology HPV test	50.7 NA	Jin et al. (2013); Ministry of Health Singapore (2019); Government of Singapore (2020)
Taiwan, China	Population-based	1995	> 30	3	Cytology	72.1	Su et al. (2013); Ministry of Health and Welfare, Health Promotion Administration (2018)
Viet Nam	Pilot	2008	30–54	NA	Cytology	NA	Pham et al. (2019)

HPV, human papillomavirus; NA, not applicable; VIA, visual inspection with acetic acid.

practitioner, or other health-care professional is also available for underscreened or never-screened women. Data in the Australian population-based cancer registries are collected by state and territorial governments and compiled into the Australian Cancer Database. Women with test results positive for HPV16 or HPV18 are referred for colposcopy. If a woman's results are positive for other carcinogenic HPV types (not HPV16 or HPV18), LBC is used for triage to determine whether she should undergo colposcopy or repeat HPV testing in 12 months.

(b) Brunei Darussalam

A cervical cancer screening programme in Brunei Darussalam was established in 2010 as part of a national health screening programme for major noncommunicable diseases (Lee et al., 2012; Government of Brunei Darussalam, 2020). Women aged 20–65 years who have not undergone screening in the previous 3 years are offered Pap testing in health centres or well woman clinics (Government of Brunei Darussalam, 2020). Screening tests are provided free of charge. Coverage was 56.3% in 2016 (Suhaimi et al., 2020).

(c) Cambodia

Currently, no cervical cancer screening programme is available at the national level. In 2013, VIA screening and on-site treatment with cryotherapy was implemented at selected health centres after provision of training for midwives the previous year (WHO, 2015; Hav et al., 2016).

(d) China

Between 2009 and 2011, the ministry of health, the ministry of finance, and the All-China Women's Federation made a first step towards nationwide provision of cancer screening with the launch of the National Cervical Cancer Screening Program in Rural Areas (NCCSPRA), which made cervical cancer tests available free of charge to 10 million women in 221 sites in rural China (Kang & Qiao, 2014; Wang & Qiao, 2015; Di, 2017). The programme was expanded to 1140 sites for 30 million women in rural areas between 2012 and 2015 (Wang & Qiao, 2015). Through the NCCSPRA, women aged 35–59 years were offered Pap testing or VIA at 3-year intervals (Kang & Qiao, 2014). Despite strong support for the screening programme from central government, only 8.4% of the target population received cervical cancer screening between 2009 and 2011 (Di, 2017). In 2015, the proportion of women aged 35–64 years who received screening increased to 31.4% (Zhang et al., 2018).

(e) Hong Kong Special Administrative Region, China

A territory-wide organized cervical screening programme was launched by the Department of Health in collaboration with health-care providers in the public and private sectors in 2004. Through this programme, sexually active women aged 25–64 years are invited to undergo Pap testing every 3 years after having two consecutive normal annual Pap tests (Centre for Health Protection, 2004, 2019). The Cervical Screening Information System serves as the central registry for results from the cervical screening programme (Centre for Health Protection, 2004). Between 2014 and 2015, about 60.5% of the target population reported ever having a cervical Pap test (Centre for Health Protection, 2017).

(f) Japan

In 1983, national organized cancer screening programmes were introduced in Japan based on the Health Service Law for the Aged; initially these included screening for cervical and gastric cancers, and breast, colorectal, and lung cancers were added later (Hamashima, 2018). According to the most recent National Cancer Center of Japan guidelines update (2013), cytology every 2 years is the primary test for cervical cancer

recommended for women aged 20 years and older. Since 1998, municipal governments have been responsible for implementing cancer screening programmes and collaborating with prefectural and national governments; this has resulted in deviations from national screening guidelines and differing approaches to programme organization at the municipal level (Sano et al., 2014; Sauvaget et al., 2016; Hamashima, 2018). Furthermore, because cancer preventive services are not included in the national health insurance system and are financed instead through municipal budgets, the extent of subsidy for screening tests varies (Sauvaget et al., 2016). In a 2016 national survey, the self-reported participation in cervical cancer screening in the previous 2 years in women aged 20–69 years was 33.7%; this figure includes both organized and opportunistic screening (Ministry of Health, Labour and Welfare Japan, 2017).

(g) Malaysia

The ministry of health launched a national Pap test screening programme in Malaysia in 1998 (Ministry of Health Malaysia, 2019). Through this programme, all eligible women aged 20–65 years can undergo Pap testing at 3-year intervals if they have had normal results for the first two annual tests. Screening is opportunistic; women are offered Pap tests when attending clinics for health screenings. About 75% of Pap tests are publicly funded and administered free of charge, whereas the remaining 25% are provided for a fee by university hospitals, private facilities, and NGOs. The guidelines were updated in 2019 to include primary HPV testing for sexually active women aged 30–49 years at 5-year intervals for those with a negative HPV test result. HPV self-sampling kits are available. Women with a positive test result for HPV16 or HPV18 are referred for colposcopy assessment. LBC is used for triage in women with a positive test result for other carcinogenic HPV types (not HPV16 or HPV18).

According to the National Health and Morbidity Survey, only 26% of eligible women received cervical cancer screening in 1996, 43.7% in 2006, and 12.8% in 2011 (Ministry of Health Malaysia, 2019).

(h) Mongolia

With support from the United States Millennium Challenge Corporation (MCC), cervical cancer screening via Pap testing at 3-year intervals was made available in Mongolia in 2012 for women aged 30–60 years through family clinics. The MCC project supported training for nurses and cytologists to administer and interpret Pap tests and provided equipment. In 2013, more than 70 000 women from the target group underwent cervical cancer screening; however, screening participation dropped to 56 000 (28%) in 2014, when the MCC project funding ended (WHO, 2014a).

(i) New Zealand

The New Zealand organized national cervical screening programme was established in 1990 (National Screening Unit New Zealand, 2020a). Although cytology remains the primary cervical cancer screening test, national guidelines for HPV and Pap co-testing were introduced in New Zealand in 2010. There are plans to adopt HPV testing (with self-sampling options) as the primary modality within the national cervical screening programme (National Screening Unit New Zealand, 2020b). The results of all cytology, colposcopy, and HPV tests are recorded in the national cervical screening programme register (National Screening Unit New Zealand, 2020a). In January 2021, it was reported that 70.4% of the target population had had a cervical cancer screening test in the previous 3 years (National Screening Unit New Zealand, 2021).

(j) The Philippines

The Philippines Department of Health established an organized cervical screening programme in February 2006 (Domingo & Dy Echo, 2009). In a target population of women aged 25–55 years, the programme recommended using VIA at least once in a 5- to 7-year interval in rural health units with no Pap test capability and using VIA as a triage tool before Pap test at district, provincial, and regional hospitals with Pap test capability. Women with positive or suspicious test results are referred for diagnosis and treatment in tertiary facilities. The organized programme includes sustainable capacity-building, training, education, and hiring of health workers.

(k) Republic of Korea

The Republic of Korea has a single-payer public insurer, the National Health Insurance Corporation (NHIC) (Kim et al., 2011). The NHIC operates the medical aid programme to cover health services for low-income individuals. The Korean organized national cancer screening programme was introduced in 1999 to provide cancer screening free of charge to medical aid recipients; in 2005, it was expanded to serve those in the lower 50% of the NHIC premium. People within the upper 50% of the NHIC premium receive screenings at 20% out-of-pocket cost. The national cervical screening programme is managed and monitored by the National Cancer Center, in cooperation with the NHIC. The national cervical screening programme Support and Evaluation Council developed screening guidelines in 2001, recommending Pap testing to women aged 30 years and older at 2-year intervals (Lee et al., 2002; Kim et al., 2011). The overall proportion of women up to date with cervical cancer screening has remained relatively stable: in 2004, 58% of eligible women had had a Pap test in the previous 2 years and in 2018, the figure was 57% (Hong et al., 2020).

(l) Singapore

CervicalScreen Singapore, the national cervical cancer screening programme for Singapore, was launched in 2004 (Jin et al., 2013). Women aged 25–69 years are invited to attend for subsidized Pap testing at 3-year intervals at government-funded polyclinics. The CervicalScreen Singapore registry was set up in 2004 to monitor the quality and evaluate the effectiveness of the screening programme; however, the registry does not capture screening data from outside the government-funded polyclinics or public hospitals (i.e. Pap tests performed at private clinics or hospitals). More women receive Pap testing at private clinics than at publicly funded polyclinics; this may be because private clinics have a greater market share in the provision of primary care services than the public polyclinics. The 2016 Health Behaviour Surveillance Survey showed that 50.7% of women in Singapore aged 25–69 years had had a Pap test in the previous 3 years (Government of Singapore, 2020). In 2019, the ministry of health introduced the HPV test as the primary screening test (in place of the Pap test) for women aged 30 years and older (Ministry of Health Singapore, 2019).

(m) Taiwan, China

The Bureau of Health Promotion of the Department of Health initiated a national cervical cancer screening programme in Taiwan, China, in 1995 (Chen et al., 2002; Su et al., 2013). The screening programme includes an information system, a quality control and monitoring system, and public health education for the general public. In 2017, 72.5% of women aged 30–69 years had received cervical cancer screening within the previous 3 years (Ministry of Health and Welfare, Health Promotion Administration, 2018).

(n) Viet Nam

There is no national cervical screening programme in Viet Nam; women are expected to seek out screening on an opportunistic basis, without reimbursement from the national health insurance system. Between 2008 and 2015, pilot screening programmes for cervical, breast, oral, and colorectal cancer were implemented with the support of various domestic and international partners. More than 100 000 women aged 30–54 years received a Pap test between 2008 and 2010. Opportunistic screening is generally available in hospitals, particularly in Hanoi and Ho Chi Minh City (Pham et al., 2019).

(o) Pacific Island nations

In the 21 Pacific Island nations, 11 countries and territories have cytology-based screening programmes, including Pap testing alone, HPV and Pap co-testing, or VIA and Pap co-testing (Obel et al., 2015). Ten of the countries and territories do not have formal screening policies; Papua New Guinea does have a screening programme with 1% coverage of the eligible population. Coverage rates vary widely: about 8% in Fiji, 50% in New Caledonia, and 100% in Tokelau. [However, it should be noted that these estimates have been self-reported by the countries and that monitoring mechanisms for screening are often weak in the region.]

2.3 Quality assurance of screening programmes

2.3.1 Description and role of quality assurance in screening programmes

According to the Institute of Medicine, quality is the extent to which health services for individuals and populations increase the likelihood of desired health outcomes that is consistent with the current scientific evidence (Institute of Medicine, 1990). Quality assurance measures the quality of the service delivered, ensuring that delivery of the screening programme provides beneficial outcomes to participants along the continuum of screening participation, recall, follow-up of abnormal results, and treatment of cervical precancers. Measuring the performance of a programme enables variability in service to be identified and adjustments to be made so that all participants in a screening programme have adequate care and outcomes (Institute of Medicine, 2001).

Quality assurance is particularly important in cancer preventive programmes, such as cervical cancer screening, in which very large populations of apparently healthy women are invited to participate to detect asymptomatic disease. Because of this, in addition to reducing the incidence of invasive cervical cancer (i.e. achieving health benefits), cervical cancer screening programmes have to consider an optimal benefit–harm balance, according to the best current scientific evidence (Gray et al., 2008).

Cancer prevention programmes are implemented within national health systems (WHO, 2014b). In 2007, WHO published a framework for health system strengthening, which included six health system building blocks: health service delivery; health workforce; health information systems; medical products, vaccines, and technologies; health financing; and leadership and governance. The achievements of a programme are then monitored with regard to the goals of improved health, responsiveness, social and financial risk protection, and improved efficiency (WHO, 2007). According to WHO, in addition to considering the health system building blocks, development and implementation of national cervical cancer prevention and control programmes includes the following phases: national policy and establishment of a programme management structure, programme planning and preparation, programme implementation, and programme monitoring and evaluation (WHO, 2014b).

Organized screening programmes have centralized responsibility for the performance of the programme and are responsible for carrying out programme monitoring and evaluation. According to WHO, monitoring is defined as the continuous oversight of an activity, whereas evaluation is defined as the systematic and objective assessment of the adequacy and effectiveness of the programme as it relates to its objectives (WHO, 2014b).

Performance standards are a means to improve outcomes. A standard defines the level of desired performance for a specific service on the basis of scientific evidence and best practices (WHO/PAHO, 2013). Performance indicators, also known as quality indicators or quality measures, are measurable evaluations of the ability of a screening programme to successfully deliver the desired level of performance (Table 2.11). Characteristics of a desirable performance measure include relevance, measurability, accuracy, and feasibility. Through monitoring and evaluation, the quality assurance process within a screening programme determines and measures performance indicators against desired targets (Institute of Medicine, 2001). For a screening programme to carry out comprehensive quality assurance measurements, timely data collection is required. Information technology infrastructure is necessary to facilitate this data collection, including a screening registry, which maintains screening records for individual participants and is linkable to a population-level cancer registry. The ability to create and maintain a robust data collection system may be challenging in LMICs. WHO has provided guidance documents for cervical cancer surveillance and monitoring in various health system environments (WHO, 2018).

An extensive list of suggested quality indicators has been provided by WHO; these are organized into global, core, and optional categories. The indicators are generally focused on screening, screening test results and referrals, treatment and referrals, programme and service delivery, facility and laboratory linkages, and HIV service integration (WHO, 2018).

2.3.2 Examples of quality assurance within screening programmes

(a) European Union

The 2008 European guidelines for quality assurance in cervical cancer screening programmes serve to inform EU Member States about how to create a robust screening programme and how to measure performance (Arbyn et al., 2008). Specifically, the guidelines state that attention should be paid not only to communication and technical aspects, but also to training and qualification of personnel, performance monitoring and audit, and evaluation of the impact of screening on the burden of the disease. The guidelines suggest 20 performance indicators, which are grouped into three categories: screening intensity, screening test performance, and diagnostic assessment and treatment. Organized efforts for quality assurance, monitoring, and evaluation differ across the EU, and key performance indicators, such as programme coverage and participation, are not comparable across countries (Elfström et al., 2015).

In 2017, Public Health England (PHE) published a guidance document for quality assurance of the National Health Service (NHS) cervical screening and colposcopy programme, which includes components of the programme, key stakeholders, data collection tools, and frequency of evaluation of the screening and colposcopy sites (Public Health England, 2017). Quality assurance of NHS programmes involves (i) assurance, in which the quality of screening services is measured against agreed-upon standards; and (ii) quality improvement, in which screening programmes are supported in increasing the quality of their services. Quality assurance is the responsibility of the PHE

Table 2.11 Performance indicators of cervical cancer prevention programmes

Screening intensity
• Participation is the percentage of eligible women who underwent cervical screening within a specified interval
• Retention is the percentage of eligible women re-screened after a negative screening test result within a specified interval
• Coverage of a target population
• Screening test consumption (Arbyn et al., 2008; Anttila et al., 2015)
Screening test performance
• Unsatisfactory specimen rate (applies to cytology)
• All screening test results, including abnormal results (PPV)
Descriptive indicators or burden of disease
• Pre-cancer detection rate is defined as the number of precancerous lesions, including HSIL, detected per 1000 women in a previous time frame
• Cancer incidence
• Screening history of cases of invasive cervical cancer
• Disease extent at diagnosis of invasive disease: cancer stage
Follow-up and management of screen-positive results
• Percentage of participants with high-grade screen results who are referred to and undergo colposcopy services
System capacity
• Turnaround time
• Time to colposcopy for participants with high-grade cytology results (± HPV results)
Colposcopy services
• Colposcopy referral rate
• Failure to attend colposcopy
• Retreatment proportion
• Biopsy rate: percentage of participants with a positive high-grade screen result who receive a histological diagnosis
• Number of new referral evaluations by colposcopist, number of colposcopies for high-grade referrals
• Proportion of women treated for LSIL or CIN1 (appropriateness)
• Reporting requirements at the time of colposcopic evaluation (Mayeaux et al., 2017): reason for referral, technical adequacy of colposcopic examination, colposcopic examination description, biopsy and proposed follow-up or management
• Timeliness

CIN1, cervical intraepithelial neoplasia grade 1; HPV, human papillomavirus; HSIL, high-grade squamous intraepithelial lesion; LSIL, low-grade squamous intraepithelial lesion; PPV, positive predictive value.

Screening Quality Assurance Service, and the quality assurance process consists of peer-review visits of screening sites every 3–5 years, production of data reports, expert advice and support of investigations, educational meetings, and targeted support to providers (Public Health England, 2017).

(b) USA and Canada

The United States Department of Health and Human Services Health Resources and Services Administration monitors cervical cancer screening as a measure of clinical quality. This measure is defined as the proportion of women aged 21–64 years who received at least one Pap test in the previous 1–2 years (U.S. Department of Health and Human Services Health Resources and Services Administration, 2019). The American Society for Colposcopy and Cervical Pathology has developed recommendations for colposcopy and biopsy for cervical cancer prevention, which include 11 quality indicators spanning documentation, biopsy protocols, and time intervals between index screening tests and completion of diagnostic evaluation (Mayeaux et al., 2017).

In Canada, the Cervical Cancer Prevention and Control Network (CCPCN) has developed a set of pan-Canadian performance indicators to inform the performance monitoring of provincial and territorial cervical cancer screening programmes (PHAC, 2009). The programme performance indicators encompass the following domains: coverage, cytology performance, system capacity, follow-up, and outcomes. The CCPCN has also recommended 10 colposcopy quality indicators, ranging from referral rates and participation to operating room treatment rates (Decker et al., 2019).

(c) South-East Asia

Although countries in the WHO South-East Asian Region have poor access to cervical cancer screening and treatment services, the WHO Regional Office for South-East Asia and its Member States have compiled a strategic framework for comprehensive control of cervical cancer with training packages for health-care workers on screen-and-treat approaches (WHO/SEARO, 2015).

(d) Other regions

Cervical cancer screening programmes with integrated quality assurance frameworks exist in Australia (Government of Australia, 2018) and New Zealand (National Screening Unit New Zealand, 2005).

As of 2017, the national cervical cancer screening programme has been implemented in eight of 12 regions of Morocco, where women are screened opportunistically. The current programme has a technical committee responsible for implementation and monitoring. Areas needing improvement have been noted to be: an organized identification and invitation mechanism for the target population; availability of histopathology and treatment facilities for retaining patients at follow-up; improved health-care provider training; and effective data collection and health information systems with appropriate linkages for quality assurance, monitoring, and evaluation (Selmouni et al., 2019). These findings from Morocco highlight the challenges faced in establishing cervical cancer prevention programmes in LMICs.

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