



ARTICLE

# Delivering cervical cancer prevention services in low-resource settings

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## KEYWORDS

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**Abstract** The goals of any cervical cancer prevention program should be threefold: to achieve high coverage of the population at risk, to screen women with an accurate test as part of high-quality services, and to ensure that women with positive test results are properly managed. This article focuses on the experiences of the Alliance for Cervical Cancer Prevention (ACCP) in delivery of screening and treatment services as part of cervical cancer prevention projects in Africa, Latin America, and Asia. Research and experience show that cervical cancer can be prevented when strategies and services are well planned and well managed and when attention is paid to program monitoring and evaluation. Coordination of program components, reduction of the number of visits, improvement of service quality, and flexibility in how services are delivered are all essential features of an effective service.

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## 1. Introduction

Well-organized screening and treatment programs can be effective in preventing cervical cancer, and many developed countries that have implemented such programs over the last 40 years have experienced dramatically reduced rates of disease [1–4]. Yet in developing countries, where 80% of the

world's cases of cervical cancer occur, cervical cancer remains a leading cause of death among older women [5]. Most low-resource settings have limited or no screening and treatment services. A recent situation analysis of cervical cancer services in five countries in eastern, central, and southern Africa documented significant gaps in capacity, with screening undertaken at only two of the 159 primary health care facilities assessed. Furthermore, only 46% of provincial hospitals had the basic equipment needed to perform cervical cancer surgery, and 79% of those lacked a gynecologist to perform any surgery [6]. In other parts of the

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developing world, services exist but are inadequately planned and implemented, of poor quality, and not generally well advertised [7]. Consequently, population coverage is often low: in a recent study in South Africa, where screening services are widely available, it was found that 80% of women had never been screened [8], and in an Alliance for Cervical Cancer Prevention (ACCP) project in rural India, 99% of 80,000 women recruited had never been screened [9].

The goals of any cervical cancer prevention program should be threefold: (1) to achieve high coverage of the population at risk, (2) to screen women with an accurate test as part of high-quality services, and (3) to ensure that women with positive test results are properly managed. Other articles in this supplement focus on strategies for attracting and recruiting large numbers of women in the correct age groups [10], consider the merits of novel screening tests [11], evaluate cryotherapy as a treatment method [12], and review pertinent provider training issues [13]. This article discusses the planning and implementation of the high-quality services required to achieve these program goals and describes ACCP experiences in managing cervical cancer prevention projects in Africa, Latin America, and Asia.

In these projects, the ACCP was involved in improving existing programs, as well as initiating new ones; we gained experience in both integrated and vertically managed programs and in using both static and mobile service-delivery mechanisms. We evaluated single-visit and multiple-visit service-delivery models using visual inspection screening methods (visual inspection with acetic acid [VIA], visual inspection with acetic acid and magnification [VIAM], and visual inspection with Lugol's iodine [VILI]), cervical sample-based screening methods (Pap smears/human papillomavirus [HPV] DNA testing), diagnostic testing (colposcopy and biopsy) and treatment (cryotherapy and loop electrosurgical excision procedures [LEEP]). Furthermore, we learned lessons about the service-delivery implications of conventional "screen, diagnose, and treat" programs, as well as "screen-and-treat" programs.

## 2. Program policies and service-delivery implications

The choices that policymakers construct around who is to be screened and treated, how often screening should occur, which screening test and treatment options should be used, and where and by whom screening should be done have conse-

quences for the way that services are organized and managed. This section examines some of those policy issues and reflects on how they affect services.

### 2.1. A public health approach

The way that cervical cancer prevention services are organized depends on a number of factors, including status of current services, available resources, choice of screening test and treatment approaches, target ages and screening interval selected, specific geography, and administrative issues. Program cost-effectiveness should be a key guiding principle in making policy choices. Cervical cancer prevention must use a rational public health approach to recruitment, screening, and treatment in low-resource settings, concentrating resources where program objectives can best be met. The ACCP consensus echoes that of the World Health Organization (WHO), that where resources are limited, programs should focus on (1) screening women between the ages of 30 and 49 years at least once in their lifetime, gradually expanding the program to other age groups and then to more frequent screening [14], and (2) ensuring that women with positive results of testing for pre-cancer are successfully treated. This strategy means that some cases of disease are missed, but in the long term, an approach that adheres to the basic tenets of public health, pays attention to costs and benefits, and targets those most in need will lead to maximum reduction in cervical cancer-related morbidity and mortality.

### 2.2. Screening coverage and frequency

Because cervical cancer generally develops slowly, from precursor lesions, screening can take place relatively infrequently and still reduce mortality: screening every 3 years has almost as great an impact as screening every year, and screening every 10 years can reduce disease by up to 40% [15,16]. Even once-in-a-lifetime screening can have some effect; using a comprehensive mathematical model to project the impact of different types of screening programs in South Africa, it was found that if it were possible to provide a two-visit program in which all women received a once-in-a-lifetime Pap smear with follow-up colposcopy and treatment, a 19% reduction in cervical cancer would result. Single-visit approaches using HPV DNA testing or visual screening methods were found to be more effective and less expensive; once-in-a-lifetime screens using such approaches would reduce lifetime cervical cancer risk by between 26% and 30%,

compared with no screening [17]. In another ACCP model, based on data from Thailand, Mandelblatt et al. [18] estimated that screening every 5 years would reduce cervical cancer incidence by 11% if cytology were used, by 20% if HPV testing were used, and by 31% if visual screening methods were used. Whatever screening and treatment modality is chosen, the ACCP members agree that most strategies have the potential to reduce disease to some extent, provided they are well resourced, well implemented, and appropriately monitored. For maximum benefit, however, and as soon as resources allow, efforts need to be made in all settings to move from a once-in-a-lifetime model to 5- or 10-year screening and to wider target age groups.

Because population coverage is limited in most low-resource settings, and most cervical cancer occurs in women who have never been screened, increasing coverage has the potential to reduce disease incidence far more than using a slightly more sensitive screening test or decreasing screening intervals [14,19]. Achieving high coverage over a wide area, though, is a challenge for fledgling programs, and the ACCP recommends that where resources are limited, programs should begin with a focus on high rates of population coverage in smaller geographical areas, rather than low rates of population coverage over a large area. These smaller pilot programs are more efficient, allow for good monitoring of strategy and impact, and have the added benefit of making it possible to fine-tune interventions and strategies before expansion [20].

### 2.3. Screening and treatment choices

Conventional programs involving cytology repeated at regular intervals, followed by diagnostic tests (colposcopy with or without biopsy) and treatment of dysplasia (most commonly by excisional methods), have been effective in reducing disease in developed countries. Establishing such programs and developing what is a complex structure of services and quality-assured laboratories is, however, untenable in many resource-poor settings. Even where such services exist, ACCP studies have found that the necessity for multiple visits associated with this kind of service results in considerable loss to follow-up (losses of 10%–25% at each visit are not uncommon), excessive cost, and poor cost-effectiveness [17,18,21].

Alternative screening strategies, such as VIA or VILI and HPV DNA testing (discussed in the article by Sankaranarayanan and colleagues in this supplement [11]), provide promising opportunities for increasing cost-effectiveness, mostly through low-

ering the number of visits needed and allowing for immediate treatment (especially after visual screening) [17,18], enhancing sensitivity [22–26], and optimizing use of lower-cost staff and supplies. The drawback of using screening tests with low specificity (studies show a range from 64%–98% for these three methods) [27] as a basis for treatment, without diagnostic tests, is a significant risk of overtreatment. ACCP studies have shown, however, that a service provided along these lines is acceptable to women and not harmful [28–31]. Furthermore, because of their level of subjectivity, visual inspection tests (like cytology) require regular refresher training and/or quality-assurance monitoring to maintain accuracy over time. These aspects could have an impact on service delivery and might, in some circumstances, limit overall cost-effectiveness. However, the ACCP models suggest that if the cost of these components can be kept low, the service will remain reasonably cost-effective [18].

Even though the high cost of currently available HPV tests and associated technology and infrastructure make HPV testing prohibitive in many settings, rapid biochemical HPV tests may in the future provide high sensitivity, low cost, and almost immediate results, allowing same-day treatment and one-visit disease prevention. In such cases, a visual screening test would still be required, but perhaps only to ensure that no cancer is present or that the lesion (if present) is not too large to be treated in a primary-care setting. In 2003, building on the work of the ACCP, the Bill & Melinda Gates Foundation provided funding to PATH for the START project (Screening Technologies to Advance Rapid Testing) to develop and evaluate such a rapid low-cost test.

The choice of screening test might also affect decisions about target age groups, and vice versa. Cytology is thought to be appropriate for all ages, but ACCP studies have shown that visual screening methods are most suitable for women under the age of 50 years, when the squamocolumnar junction is still visible. On the other hand, HPV DNA testing is best restricted to women older than 30 years, an age group in which it has better specificity than among younger women [32].

As discussed elsewhere in this supplement, ACCP studies demonstrated the safety, feasibility, and efficacy of cryotherapy for precancer treatment when performed by midlevel providers in primary-care settings without colposcopy [12,28]. These findings have opened up the possibility of a “single-visit approach,” an approach recently also advocated in a policy statement by several major professional societies [33] and which could dramat-

ically increase the number of women successfully treated after receiving a positive screening test result. Most women could be managed with such an approach, although approximately 10% of lesions may be too large or inappropriate for cryotherapy [34] and would require referral for different management. Country resources will dictate how feasible it will be to equip primary-care centers and train nurses to perform cryotherapy, but such projects have been successfully implemented—for example, by the ACCP in a large province in Thailand [28]. As a result of this, the Thailand Health Ministry has decided that the risks of over-treatment are outweighed by the opportunity to reduce disease through a single-visit approach and is moving to develop more extensive prevention programs based on this model [28]. Further studies are needed to evaluate the long-term prophylactic effects of cryotherapy on future HPV acquisition and lesion development. The extended follow-up period planned in the ACCP India, Peru, and South Africa studies should provide answers to some of these questions in the future.

Any successful cervical cancer prevention program, especially fledgling ones in unscreened populations, will doubtless uncover large numbers of cancer cases. We have to recognize, however, that in most low-resource settings, the only options currently available to women with cervical cancer are radical hysterectomy and palliative care [35]. The ACCP consensus is that screening services should be started even if cancer treatment is unavailable: as long as treatment for precancer is available, then screening is worthwhile and appropriate. The ACCP has developed a guide to treatment options in low-resource settings [20], as well as a palliative care manual for primary-care workers [36].

### 3. Organizing services

#### 3.1. Planning services

Understanding the strengths and weaknesses of the existing cervical cancer prevention program and of health system capacity in general is important in helping to identify and plan what interventions are required and in providing benchmarks against which to measure change. Some of the problems identified at primary-care facilities in South Africa, Peru, and El Salvador are shown in Table 1.

ACCP project staff in many countries found that existing cervical cancer prevention programs suffered from a lack of organization. Rather than

**Table 1** Common barriers to effective implementation of existing screening services at the primary-care level: South Africa, Peru, and El Salvador

- No goals or protocols exist; thus, facility managers and staff are unaware of what they should be doing.
- When protocols exist—for example, for referrals—they are poorly executed.
- Poor supervision and project monitoring lead to inadequate accountability.
- No mechanisms exist to enable managers to identify the appropriate equipment and supplies needed for screening and infection prevention.
- Staff training in screening, treatment, referral, and record-keeping is inadequate.
- Space designated for screening is inadequate.
- Long delays in laboratory reporting erode confidence in screening services.
- Service hours are not always convenient for women.
- Women are unaware that screening services are available at facilities, and staff are not engaged in proactive recruitment.

having a coordinated program with common goals, common understanding of how services should be managed, and shared problem-solving, efforts were often being managed piecemeal by different managers of screening facilities, laboratories, and tertiary-care facilities. Essential linkages, such as referral and feedback systems, between program components were often weak. As a result, there was insufficient information for tracking patients and evaluating programs, and women were lost to follow-up. Particularly in programs that involve multiple service levels or multiple visits, coordinated planning is essential. Here again, highly sensitive screening tests, such as VIA, VILI, and HPV testing, that allow the possibility of a single visit (or few visits) for screening and treatment, reduce the need for referral and feedback that often limits program effectiveness. The systematic planning process that we found useful, regardless of geographical location or screening modalities used, involved a series of steps (Table 2).

#### 3.2. Vertical and integrated services

Which service-delivery model is appropriate (integrated or vertical) is very country-specific and depends on a number of factors, including program stage, current screening practices, existing coverage rates, resource availability, screening modality, screening interval, and geography. ACCP projects explored both vertically managed and integrated service delivery, and the advantages and disadvantages of each are discussed in the ACCP Manual for Managers [20]. We found that some countries with an

**Table 2** Critical steps for planning cervical cancer screening services

- Create buy-in and obtain commitment from all stakeholders and partners to develop and implement an organized prevention program.
- Conduct a critical assessment of the needs of the health service providers and women.
- Set clear goals and develop consensus policies and protocols on the clinical and programmatic approach for screening and management of screen-positive women, including cancer treatment and palliative care.
- Develop a program plan that includes strategies and targets for optimizing screening coverage.
- Designate a program manager at a central administrative level, as well as local program coordinators and supervisors.
- Allocate human and financial resources to the program and ensure rational use of resources to maximize benefit. This may mean starting small and expanding later.
- Build and strengthen human resource capacity by training health and other personnel.
- Establish operational linkages within and between service facilities.
- Develop systems and designate staff to be responsible for ensuring that women who need treatment receive it.
- Ensure infrastructural and equipment support and systems.
- Coordinate service provision with community mobilization efforts.
- Develop monitoring and evaluation strategy and health information systems.

existing and strong health sector, such as South Africa, El Salvador, and Peru, already had a commitment to integrated reproductive health services and opted for integrating cervical cancer prevention into other primary health services. In countries with a once-in-a-lifetime screening policy, where large numbers of women need to be screened, a vertical campaign or camp-type approach might be useful initially to deal with the large reservoir of prevalent cases of high-grade disease.

The ACCP's combined experience has led us to suggest that countries consider a phased approach, using a vertical management model in the early stages of a program, when there are large numbers of prevalent cases, and a more integrated approach (possibly with intermittent targeted interventions, such as mass campaigns) once the program has matured and needs to focus more on detection of incident cases. The ultimate aim should be for screening services to be incorporated into primary health care and viewed as an essential component of well-woman services.

We note, however, that reproductive health services may not be the appropriate service in which to house cervical cancer screening, because the target age group is not entirely the same. Rather, opportunities to incorporate services into clinics frequented by older women (e.g., hyper-

tension clinics) or general curative services should be considered [37].

### 3.3. Dedicated staff

The most successful ACCP projects, in which staff were able to recruit and screen large numbers of women, were research projects, and replicating these efforts is far more difficult in less carefully controlled circumstances. In ACCP projects in which screening was integrated into routine services and in which large numbers of staff had responsibility for screening, however, service quality was inconsistent. We found that in these situations ultimate accountability was lacking, and “everybody but nobody” was responsible. In other settings, where one or two dedicated staff had been designated to manage the services (coordinating facility activities, managing the screening itself, notifying women of test results, and ensuring follow-up care), services functioned much more effectively.

The benefits of having dedicated screening staff can be seen in the following examples. In nine clinics in South Africa, with a total of 40 screening staff, only two clinics had designated personnel to be fully responsible: these two clinics performed 60% of all Pap smears. Furthermore, those staff who performed many Pap smears per month had a much higher rate of smear adequacy than those who performed few [21]. Likewise, in Thailand and Ghana, when the responsibility for both services and quality was assigned to a limited but intermittently dedicated group of doctors and nurses, the project criteria for service quality were met, with 90% agreement, on average, between doctors and nurses on assessment and management plans [28].

As a result of these studies, and for both clinical and programmatic reasons, the ACCP Manual for Managers recommends that at primary-care facilities, the person who is ultimately responsible for screening services should be clearly identified. Moreover, to ensure high-quality screening, it is important that skill levels are maintained, which might necessitate having fewer but dedicated staff rather than a greater number of multipurpose staff [20], although this clearly has implications for service coverage during leave absences or where there is a high rate of staff turnover.

### 3.4. Static and mobile services

The decision to use static or mobile services for screening and treatment depends on the infrastructure and accessibility of static health services, the geography of the country concerned, commun-

ity acceptability, the maturity of the program, and the ability to ensure high-quality services in mobile settings. ACCP studies in many settings found that screening and treatment by midlevel providers is acceptable, feasible, and safe, and this may facilitate the provision of services in a greater number of outreach settings than was previously thought possible [28].

Where mobile services are used, planning around schedules, screening invitations, personnel, and equipment is especially important. For example, in the ACCP El Salvador demonstration project, a 6-month schedule was established for health personnel to visit the various rural health posts, and the schedule was coordinated with all health personnel and administrators in the health district. Health promoters delivered personal letters inviting women to attend the health clinic on a specific day. In a project in India, providers moving from village to village, offering screening in local facilities, enabled hundreds of thousands of women to be screened [38].

### 3.5. Fees and subsidies

The ACCP experience is that making services free of charge, especially in areas where preventive screening represents a new philosophical approach to health care, can contribute to broader population coverage, although this may not be possible in countries with cost-recovery programs. In the ACCP Kenya project, for example, women were asked to pay a small fee for services, and this did not appear to affect attendance; in Ghana, after a project-sponsored period during which services were provided free of charge, a subsequent fee approximating US\$1 appeared to be acceptable to women. Transportation assistance for patients who have to be treated at distant facilities greatly increases the rate of follow-up. Although the cost of providing transportation is usually high, it is nevertheless a cost-effective measure, because it maximizes the number of screen-positive women who get treated—a key program objective.

### 3.6. Involving managers and staff in quality-improvement efforts

A successful ACCP project in South Africa found that primary-care staff became more motivated to screen women once they were involved in discussions about coverage and in calculating the monthly screening targets for their respective facilities [21]. These targets allowed staff to advocate for needed equipment and additional staff and allowed managers to calculate additional budget require-

ments. ACCP project staff also assisted program managers in examining existing services and describing how they could improve access by at least being clear about the times and days on which screening could be done, communicating this to all staff and local populations, and having a policy that, in principle, no woman requesting screening would be turned away.

We also found that managers needed help in establishing systems for case management, triage, and queuing to facilitate fast-track service, especially for receiving results and referring to other reproductive services. An ACCP product, COPE<sup>®</sup> for Cervical Cancer Prevention Services, helps managers and staff self-assess services, identify and solve service-delivery problems, and adopt a quality-of-care approach to services [39]. In El Salvador, an ACCP project noted a long delay in return of laboratory reports to the clinics, which eroded client confidence in the services and contributed to poor follow-up of screen-positive women. This problem, which was caused by many factors, was addressed by quality-improvement methods and improved coordination between laboratories and health centers. The ACCP's El Salvador project experienced a significant reduction in turnaround time for cytology results after implementing a 6-month quality-improvement scheme in the district.

### 3.7. Program evaluation and health information systems

Monitoring and evaluation of cervical cancer prevention programs are essential for effective, efficient planning and service organization, as well as for patient management, yet ACCP experience found them to be weak in many country programs. Core indicators and data sets are required at two levels. First, at the policy/program level, indicators are needed to evaluate overall program performance; second, at the service level, essential data are needed for patient management and monitoring local service performance. In addition to core program indicators, cervical cancer incidence and mortality are the ultimate overall program success indicators. However, information on these is only possible where a comprehensive cancer registry exists, and these are not available in many low-resource countries.

Experience in developed countries has shown that an organized, computerized health information system (HIS) based on unique patient identifiers and call and recall protocols is best able to support high coverage and appropriate screening intervals [3]. However, in many low-resource settings in which ACCP partners work, there is little potential for such

sophistication, and a focus on a limited, paper-based system appears to be more appropriate and feasible [20]. To create the most appropriate HIS for measuring program functioning, ACCP partners agree that managers need to identify the most critical indicators of program performance and establish the most practical and viable information system at different levels (clinic, district, national), with an emphasis on defining essential indicators, minimum data sets, and simplicity, especially in new programs with limited capacity. Basic tenets of cervical cancer health information systems have been developed for the ACCP Manual for Managers [20] and are shown in Table 3.

In countries that already have an HIS, incorporating new health indicators takes time, energy, and a political constituency that is able and willing to make the case for inclusion. In South Africa, the existing national HIS collects cervical cancer screening data only on the number of women screened. An ACCP project in three districts established local task forces to lobby for inclusion of new indicators and data-collection systems but was unsuccessful, in large part because the existing HIS was perceived to be already at maximum capacity, and cervical cancer had to compete with other health issues [21]. On the other hand, ACCP projects in India have led to the development of a large screening project (cervix, oral, and breast) in a population of 300,000 people, using a simple but computerized HIS. Development of parallel or nonintegrated information systems may be a possibility in some countries, but this too requires committed lobbyists and potentially external support for the system to function effectively.

**Table 3** Principles of health information systems

- Keep it simple—collect only essential data that will be used for management of patients and monitoring of the screening program.
- Ensure that data are high-quality—this requires training of staff in the collection and analysis of cervical cancer screening data.
- Link outputs to planning—action must be taken where problems are identified.
- Start with a small, vertical pilot health information system, then try to integrate into routine services—to ensure long-term sustainability, the health information system for cervical cancer screening must become part of routine service provision.
- Ensure appointment of a system administrator who can establish linkages between various service facilities, supervisory levels, and central administration (district, regional, or national); manage the data-collection system; organize staff data-collection training; generate queries and reports; and liaise with the cervical cancer screening program management.

## 4. Conclusions

The collective experience of the ACCP has been that cervical cancer prevention is possible when strategies are in place to ensure high coverage of women at risk, when the number of visits can be reduced, and when services are of high quality, well planned, and well managed. ACCP experience has led to the following service-delivery recommendations for low-resource settings:

- *Design services to meet local needs.* There are a variety of service-delivery options for nearly all components of a cervical cancer prevention program. Program managers need to select what best suits their settings and program goals. Whatever model is selected, organization, planning, and coordination of all service components are essential.
- *Ensure optimal access.* An effective program should ensure that screening and treatment services are available and accessible to eligible women. The fewer visits women have to make, the more cost-effective and woman-friendly the program will be; thus, all efforts should be made to reduce visits. Single-visit approaches, managed by midlevel providers, have been successful and acceptable.
- *Strive for high quality.* Services should be well planned and well implemented, with a woman-centered, high-quality approach, to maximize use. Involving providers in quality improvement is important.
- *Reach the unscreened first.* It is important to focus services on reaching women who have never been screened and to focus on the age group most likely to have high-grade but treatable precancerous lesions (optimally, women aged 30–49 years of age). This might mean taking mobile services to the women in the community.
- *Start focused, then expand.* New programs will increase their likelihood of success by limiting the geographic scope of their activities—starting in a well-defined area and then gradually expanding to other regions as technical capabilities and financial resources allow. The first phase (pilot) allows program managers to assess the feasibility and performance of the service-delivery strategy chosen before expanding to other areas.
- *Use phased strategies.* New programs can be implemented by using a phased approach—using vertical services at the start of a program when there may be large numbers of prevalent cases of high-grade disease and moving toward inte-

grated services as the program matures and focuses more on detection of incident cases.

- *Use basic data for better management.* Monitoring and evaluation are essential and should focus on essential indicators for gathering data that can be used for patient management and project monitoring through simple data-collection mechanisms.

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## References

- [1] Smith J, Parkin DM. Evaluation and monitoring of cancer screening. Time trends. Evaluation and monitoring of screening programmes. Brussels–Luxemburg: European Commission, Europe Against Cancer Programme; 2000.
- [2] Sankaranarayanan R, Budukh AM, Rajkumar R. Effective screening programmes for cervical cancer in low and middle income developing countries. *Bull World Health Organ, Suppl* 2001;79:954-62.
- [3] Hakama M. Screening for cervical cancer: experience of the Nordic countries. In: Franco E, Monsonego J, editors. *New developments in cervical cancer screening and prevention*. London: Blackwell Science, Ltd.; 1997. p. 190-9.
- [4] Anderson GH, Boyes DA, Benedet JL, Le Riche JC, Matisic JP, Suen KH, et al. Organization and results of the cervical cytology screening programme in British Columbia, 1955–85. *BMJ* 1988;296:975-8.
- [5] Parkin DM, Whelan SL, Ferlay J, Raymond L, Young J, editors. *Cancer incidence in five continents, vol. 7*. IARC Scientific Publications No 143. Lyon, France: IARC Press; 1997.
- [6] Chirenje ZM, Rusakaniko S, Kirumbi L, Ngwalle EW, Makuta-Tlebere P, Kagwa S, et al. Situation analysis for cervical cancer diagnosis and treatment in east, central and southern African countries. *Bull World Health Organ*, 2001; 79(2):127-32.
- [7] Lazcano-Ponce EC, Moss S, Alonso de Ruiz P, Salmeron Castro J, Hernandez Avila M. Cervical cancer screening in developing countries: why is it ineffective? The case of Mexico. *Arch Med Res* 1999;30:240-50.
- [8] Fonn S, Bloch B, Mabina M, Carpenter S, Cronje H, Maise C, et al. Prevalence of pre-cancerous lesions and cervical cancer in South Africa: a multicentre study. *S Afr Med J* 2002;92(2):148-56.
- [9] Personal communication. C. Mahé, International Agency for Research on Cancer; 2004.
- [10] Agurto I, Arrossi S, White S, Coffey P, Dzuba I, Bingham A, et al. Involving the community in cervical cancer prevention programs. *Int J Gynecol Obstet* 2005;89S2:S938-45 (this issue).
- [11] Sankar R, Gaffikin L, Jacob M, Sellors J, Robles S. A critical assessment of screening methods for cervical neoplasia. *Int J Gynecol Obstet* 2005;89S2:S4-12 (this issue).
- [12] Jacob M, Broekhuizen FF, Castro W, Sellors J. Experience using cryotherapy for treatment of cervical precancerous lesions in low-resource settings. *Int J Gynecol Obstet* 2005;89S2:S13-20 (this issue).
- [13] Blumenthal PD, Lauterbach M, Sellors JW, Sankaranarayanan R. Training for cervical cancer prevention programs in low-resource settings: focus on VIA and cryotherapy. *Int J Gynecol Obstet* 2005;89S2:S30-7 (this issue).
- [14] Miller AB. *Cervical cancer screening programmes: managerial guidelines*. Geneva: World Health Organization; 1992.
- [15] International Agency for Research on Cancer (IARC). *Working group cervical cancer screening*. In: Hakama M, Miller AB, Day NE, editors. *Screening for cancer of the uterine cervix, vol. 7*. Lyon, France: IARC Scientific Publications; 1986. p. 133-44.
- [16] Kim JJ, Wright TC, Goldie SJ. Cost-effectiveness of alternative triage strategies for atypical squamous cells of undetermined significance. *JAMA* 2002;287:2382-90.
- [17] Goldie SJ, Kuhn L, Denny L, Pollack A, Wright TC. Policy analysis of cervical cancer screening strategies in low-resource settings: clinical benefits and cost-effectiveness. *JAMA* 2001;285(24):3107-15.
- [18] Mandelblatt JS, Lawrence WF, Gaffikin L, Limpahayom KK, Lumbiganon P, Warakamin S, et al. Costs and benefits of different strategies to screen for cervical cancer in less-developed countries. *J Natl Cancer Inst* 2002;94(19):1469-83.
- [19] Wright TC, Denny L, Pollack A. Strategies for overcoming the barriers to cervical cancer screening in low-resource settings. In: Sciarra J, editor. *Clinical gynecology, vol. 1(33)*. Philadelphia: Lippincott, Williams & Wilkins; 2004. p. 1-25.
- [20] Alliance for Cervical Cancer Prevention (ACCP). *Planning and implementing cervical cancer prevention and control programs: a manual for managers*. Seattle: ACCP; 2004.
- [21] EngenderHealth. *Cervical Health Implementation Project, South Africa. Technical Report*. Cape Town: University of the Witwatersrand, University of Cape Town and EngenderHealth; 2003.
- [22] Kuhn L, Denny L, Pollack A, Lorincz A, Richart RM, Wright TC. Human papillomavirus DNA testing for cervical cancer screening in low-resource settings. *J Natl Cancer Inst* 2000;92(10):818-25.
- [23] Wright Jr TC, Denny L, Kuhn L, Pollack A, Lorincz A. HPV DNA testing of self-collected vaginal samples compared with cytologic screening to detect cervical cancer. *JAMA* 2000;283(1):81-6.
- [24] Denny L, Kuhn L, Pollack A, Wright Jr TC. Direct visual inspection for cervical cancer screening: an analysis of factors influencing test performance. *Cancer* 2002;94(6):1699-707.
- [25] Sankaranarayanan R, Wesley R, Thara S, Dhakad N, Chandralekha B, Sebastian P, et al. Test characteristics of visual inspection with 4 percent acetic acid (VIA) and Lugol's iodine (VILI) in cervical cancer screening in Kerala, India. *Int J Cancer* 2003;106(3):404-8.
- [26] Gaffikin L, Lauterbach M, Blumenthal PD. Performance of visual inspection with acetic acid for cervical cancer screening: a qualitative summary of evidence to date. *Obstet Gynecol Surv* 2003;58(8):543-50.
- [27] Alliance for Cervical Cancer Prevention (ACCP). *The Case for Investing in Cervical Cancer Prevention. Issues in Depth #3: ACCP, Seattle. Nov. 2004*.
- [28] Royal Thai College of Obstetricians and Gynaecologists and the JHPIEGO Corporation Cervical Cancer Prevention Group. Safety, acceptability, and feasibility of a single-visit approach to cervical cancer prevention in rural Thailand: a demonstration project. *Lancet* 2003;361:814.
- [29] Corneli A, Kleine A, Salvador-Davila G, Gaffikin L, Lewis R, Adu-Amanakwah A. A qualitative evaluation of the accept-

- ability and feasibility of a single visit approach to cervical cancer in Ghana. Baltimore: JHPIEGO; 2004.
- [30] Corneli A, Gaffikin L, Baldwin L. A qualitative evaluation of the acceptability and feasibility of a single visit approach to cervical cancer; Roi-et province, Thailand. Baltimore: JHPIEGO; 2003.
- [31] EngenderHealth. Women's perspectives on cervical cancer screening and treatment: participatory action research in Khayelitsha, South Africa. New York: EngenderHealth; 2002.
- [32] IARC Working Group on the Evaluation of Cancer-Preventive Strategies. Cervix Cancer Screening. Lyon: IARC Press. 2005. IARC Handbooks of Cancer Prevention, Vol. 10.
- [33] American College of Obstetricians and Gynecologists. Statement of policy: Cervical cancer prevention in low-resource settings. *Obstet Gynecol* 2004;103:607-9.
- [34] Alliance for Cervical Cancer Prevention (ACCP). Effectiveness, safety and acceptability of cryotherapy: a systematic literature review. *Cervical Cancer Prevention Issues in Depth*, vol. 1. Seattle: ACCP; 2003.
- [35] PATH. Planning appropriate cervical cancer prevention programs, 2nd ed. Seattle: PATH; 2000.
- [36] PATH, EngenderHealth. Palliative care for women with cervical cancer: a field manual. Seattle: PATH/EngenderHealth; 2003.
- [37] Bradley J, Risi L, Denny L. Widening the cervical cancer screening net in a South African township: who are the underserved? *Health Care Women Int* 2004;25(3):227-41.
- [38] Sankaranarayanan R, Rajkumar R, Theresa R, Esmey PO, Mahé C, Bagyalakshmi KR, et al. Initial results from a randomized trial of cervical visual screening in rural south India. *Int J Cancer* 2004;109(3):461-7.
- [39] EngenderHealth. COPE® for cervical cancer services. New York: EngenderHealth; 2004.