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Cost-Effectiveness of Screening for and Early Diagnosis of Breast and Gynecological Cancers in Low-Income Countries

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Abstract

Screening and diagnosis provided for breast and gynecological cancers in the low-resource setting should be based not only on cost-effectiveness but also on affordability to ensure that large-scale implementation is possible. Over the past two decades, with the growing importance of economic evaluations in informing health care planning, a large number of cost-effectiveness assessments have been published for high-income countries, but these studies unfortunately have limited generalizability to low- or even middle-income countries. Only a few studies have been published on cost-effectiveness of screening in the resource-limited setting for breast and cervical cancer. In general, these studies support the use of clinical breast exams for breast cancer screening and the use of visual inspection with acetic acid or human papillomavirus (HPV) DNA testing for cervical cancer screening. HPV vaccination of adolescent girls can also be cost-effective, but the cost of both HPV vaccination and HPV DNA testing has to be quite low to make them affordable in the low-resource setting. No study to date has directly addressed the cost-effectiveness of providing integrated cancer screening, that is, combining breast and cervical cancer screening along with diagnostic evaluation for other gynecological cancers into a single visit. Integrating cancer screening services for women can potentially result in lower costs due to efficiencies for both the provider and the patient. On the provider side, synergies can reduce health care costs as a person is seen once for several screening tests and not multiple times. For the patient, a single trip is efficient and can reduce transportation and child care costs. Targeted screening trials and cost-effectiveness modeling are urgently needed to fully understand the impact of packaging screening for multiple cancers on the overall cost and effectiveness in the low-income setting.

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Introduction

In the low-resource setting, it is essential that screening and diagnosis provided for breast and gynecological cancers are affordable and can be implemented on a large scale. Therefore, it is critical to identify not only the most cost-effective screening tests but also the most efficient screening delivery procedures to make cancer screening viable with very limited funding. Inexpensive but effective screening tests that do not require complicated screening delivery procedures are ideal. Combined screening for multiple cancers has been advocated in the low-resource setting in an attempt to reduce the overall screening delivery cost [1, 2].

In this chapter, we provide an overview of the cost-effectiveness of screening for breast and gynecological cancers and offer recommendations to address the gaps in knowledge in order to move the field forward. We begin with a discussion of the key attributes of economic evaluation with the focus on cost-effectiveness methodology. After that, we provide a review of cost-effectiveness modeling studies that have been performed to evaluate interventions that should be adopted in low-resource countries to screen for breast and cervical cancers. Then we discuss the evidence required to assess the benefits of combining or packaging multiple cancer screening, and, finally, we conclude with a discussion of the role of cost-effectiveness analysis in formulating cancer screening policies in the low-resource setting.

Overview of Cost-Effectiveness Methodology

The impact of cancer screening needs to be measured along the continuum of cancer care to ensure a comprehensive assessment of the benefits and costs. Although much of the costs of cancer screening are experienced in the short term, the benefits, when measured in terms of mortality and health-related quality of life (HRQL), are observed over the entire life span. A framework for assessing the economic costs and effectiveness of cancer-related interventions is provided in Fig. 11.1.

With the initiation of cancer screening, the following benefits and costs can be anticipated:

- Earlier disease stage at diagnosis and better treatment response
- Higher screening/diagnosis cost but lower treatment cost
- Increase in HRQL
- Decrease in morbidity (less burden on family members and community)
- Decrease in mortality

Therefore, although assessment of intermediate costs and outcomes can provide valuable information on the impact of cancer screening, comprehensive and complete assessment of the cost-effectiveness of the interventions requires modeling the impacts over the entire life span.

Cost-effectiveness analysis can be performed using a number of different perspectives. The broadest and most comprehensive is the societal perspective, since it includes all costs and outcomes shown in Fig. 11.1. Analyses performed from the program perspective or the provider perspective consider a narrower range of costs and effectiveness measures. The findings from the economic assessment can differ based on the perspective selected and therefore is a critical methodological decision. All key guidelines on cost-effectiveness assessment have advocated for the use of the societal perspective, and, in instances when other perspectives are required, they should be reported in addition to the societal perspective [3–6]. The major obstacle to reporting the costs and outcomes using a societal perspective is the availability of valid information to populate all the data parameters required for the analysis.

Objectives of Economics Evaluations of Cancer Screening Interventions

The resources available for delivering health care services are finite, and, furthermore, in the case of low-resource countries, the funding available is very limited. Economic assessments play a key

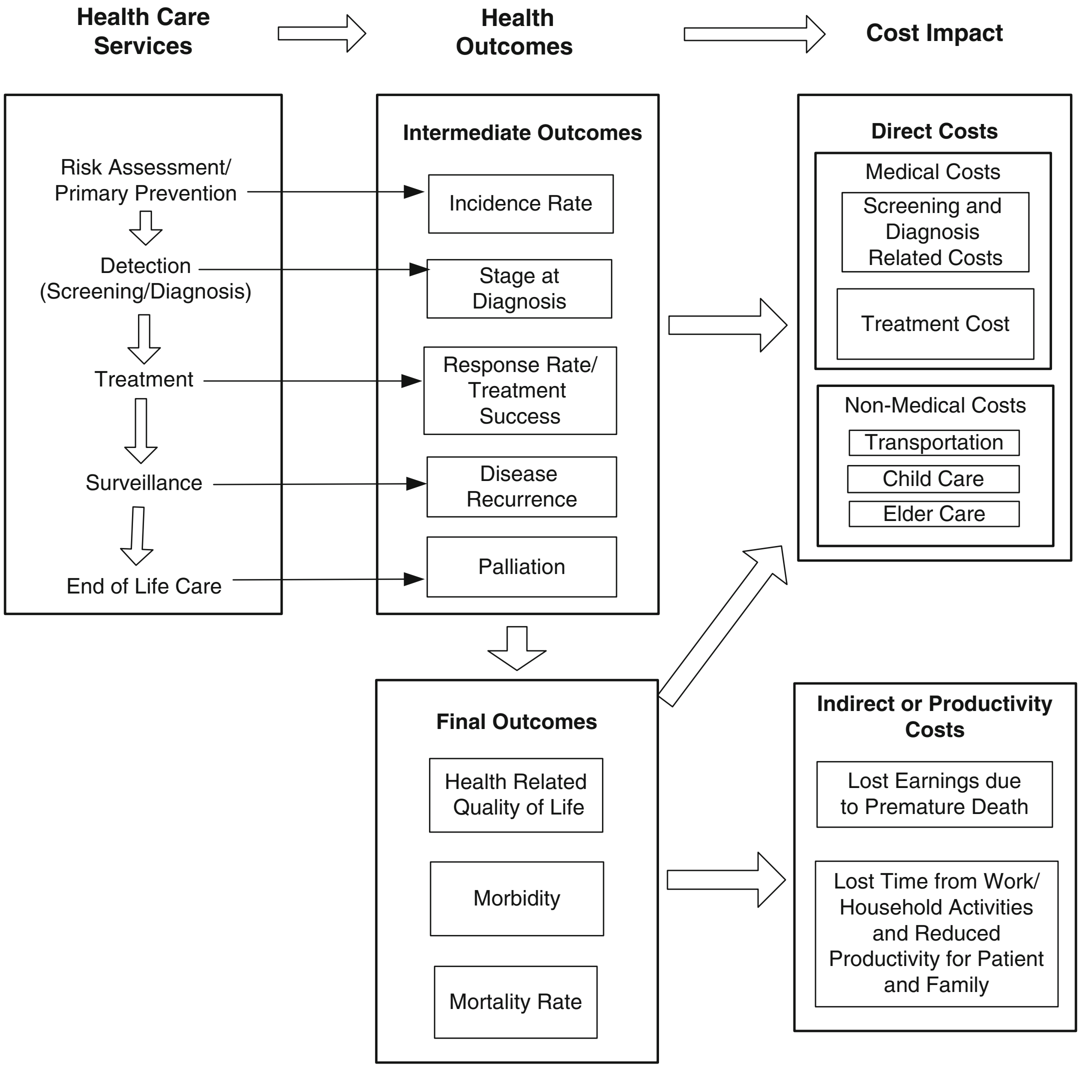

Fig. 11.1 Framework for assessing economic costs of cancer along the continuum of care

role in the selection of interventions and policies to improve cancer care and reduce the burden of cancer. Specifically, the objectives of economic studies are the following:

1. *To allocate resources efficiently*: Cost-effectiveness analysis allows the comparison of interventions in order to identify the ones that are the most cost-effective—that is, the interventions that provide the highest level of benefits for the resources expended
2. *To assess resource requirements*: Budget impact analysis provides information to estimate the costs required in various budget periods—critical for the successful implementation of selected screening tests and interventions
3. *To formulate cancer screening policy*: The information on cost-effectiveness and resource requirements assists policy makers to advocate for and allocate funding for cancer screening programs

In addition to informing the planning process, economic evaluations can be used to monitor the cost-effectiveness of screening programs using data from real-world implementation, and the findings can help to further improve the screening delivery process and make it more efficient whenever possible.

Weighing the Cost Versus Effectiveness

When comparing the cost and effectiveness of interventions, there are several possible scenarios. For instance, if an intervention has lower costs and better outcomes compared to another, then it is favored and should be selected; this principle is called dominance. If an intervention is more costly but yields better outcomes than the other, then additional assessment is required. The intervention is only cost-effective if the additional effectiveness justifies its additional cost. There are three methods to simultaneously consider the cost and effectiveness of an intervention: cost-effectiveness analysis, cost–benefit analysis, and cost–utility analysis. In each of these three approaches, the results are provided as a cost per unit of effectiveness and derived from the ratio of the cost divided by the effectiveness unit. Table 11.1 presents the differences between the three approaches. Cost-effectiveness and cost–utility analysis are commonly used to assess cancer screening intervention, while cost–benefit analysis is seldom used because of the challenges associated with reporting outcomes in monetary units.

Costs reported in cost-effectiveness assessment are presented in the local currency, US dollars, or "international dollar." The international dollar is the most appropriate for comparison between countries as it is a theoretical currency based on the purchasing power parity (PPP) of each country. PPP is the money that would be required to purchase the same goods and services in each country so valid comparisons can be made across countries. The base case comparison for the international dollar is the US PPP which is set to 1. International $1 has the same purchasing power as $1 has in the United States, but PPP adjusted figures are not expressed in US dollars to avoid confusion with nominal figures.

Health metrics that combine mortality, morbidity, and HRQL into a single measure are increasingly used by researchers and policy makers to assess the overall effectiveness. Several summary measures including the following are available: quality-adjusted life years (QALYs), disability-adjusted life years (DALYs), healthy life years (HLY), and years lived with disability (YLDs). All these measures are derived from two components: (1) life-expectancy or mortality estimates and (2) morbidity and HRQL impacts of the disease. The two measures often used in cost-effectiveness models are the QALY and DALY. There is no consensus on which outcome measure is the most appropriate to use in economic evaluation [7, 8].

The incremental cost-effectiveness ratio is required to evaluate the cost and benefits of the proposed intervention against the gold standard or "no intervention." In the case of cancer screening in the low-resource setting, the comparator chosen is usually the scenario with no screening available. When comparing two scenarios, for instance A (screening) and B (no screening), where A is more effective but also more costly, the ratio is simply the change in cost divided by the change in effectiveness of A and B:

$$\frac{\text{Cost}_{\text{Scenario A}} - \text{Cost}_{\text{Scenario B}}}{\text{Effectiveness}_{\text{Scenario A}} - \text{Effectiveness}_{\text{Scenario B}}}.$$

The resulting value is the cost to obtain each unit of increased effectiveness associated with program A. This incremental cost-effectiveness ratio for scenario A needs to be compared with the threshold for cost-effectiveness ratios to recommend adoption.

Based on the recommendations of the World Health Organization (WHO) Commission on Macroeconomics and Health [4], threshold values adopted for cost-effectiveness are based on the gross domestic product (GDP) data as these data are accessible indicators reported by all countries. The commonly accepted threshold values are highly cost-effective if less than GDP per capita, cost-effective if between one and three times GDP per capita, and not cost-effective if more than three times GDP per capita (see http://

Table 11.1 Comparison of cost-effectiveness, cost–benefit, and cost–utility analysis

Method	Cost measure	Effectiveness measure	Ratio
Cost-effectiveness analysis (CEA)	International dollar (Int. $)	Natural units, for example, life years saved (LYS)	Cost per LYS
Cost–benefit analysis (CBA)	Int. $	Monetary value (Int. $)	Cost per Int. $1 of benefit
Cost–utility analysis (CUA)	Int. $	Years of life gained adjusted for quality of life Quality-adjusted life years (QALY) or disability-adjusted life years (DALY)	Cost per QALY or DALY

www.who.int/choice/costs/CER_thresholds/en/index.html). In general, when considering the low-income, high-mortality countries in Asia and Africa, cost less than International $2,000 per unit of effectiveness (such as life years gained) can be considered highly cost-effective and cost between International $2,000 and $6,000 can be considered cost-effective.

Summary of Current Cost-Effectiveness Research

Over the past two decades, with the growing importance of economic evaluations in informing health care planning, a large number of cost-effectiveness assessments have been published. The majority of these studies on cancer screening have been targeted at assessing screening interventions in high-income countries. These studies unfortunately have limited generalizability to low- or even middle-income countries. A few studies though have been published on the cost-effectiveness of screening in the low-resource setting. In this section, we review these studies to understand the types of analyses that have been performed, the findings from these assessments, and their implications for cancer screening policies. We focused our assessment on modeling studies that allow for the inclusion of costs and outcomes over the entire life span. A targeted literature search was performed using PubMed, and citations of the manuscripts initially identified were reviewed to select additional publications. We only included peer-reviewed manuscripts in our final list of studies that were systematically reviewed. When multiple studies were available using the same model or similar studies for the same country, we selected the most up-to-date assessment [9–12]. In addition, we focused on studies related to adolescent girls and women only and excluded any studies that assessed HPV vaccination for boys [13]. The majority of the studies selected performed assessments directly related to low-income countries, but we did include a few models from middle-income countries as these may provide valuable lessons for cancer screening in the low-resource setting. For each study, we present the country or region of relevance, the interventions or tests compared, the intervention identified as the most cost-effective, and the incremental cost-effectiveness ratio of this intervention (generally compared to no screening).

Breast Cancer Screening

We identified seven studies that met our selection criteria, and these studies were published starting in the year 1998 to the present (Table 11.2). Five of the articles reported results based on parameters relevant to a specific country (Taiwan, India, Brazil, and Ghana) [14–18], while two of the studies focused on regions (Asia and Africa) [19, 20]. The interventions assessed ranged from media campaign to increased awareness, screening using either CBE or mammography, and offering only treatment when cancer was diagnosed. The studies varied in the age range recommended for screening, the interval between screens, and the types of interventions compared. A study on

Table 11.2 Cost-effectiveness studies on breast cancer screening and other interventions to reduce disease burden

References	Country	Interventions/tests compared	Most cost-effective intervention	
			Screening schedule	Cost-effective ratio
[14]	Taiwan	2 Rounds of screening mammogram 1 year apart for high-risk and mass screening	High-risk women 2 rounds of mammography 1-year interval age 35 and older	US$4,851 per LYS
[19]	Africa Asia	Treating each stage, all stages, extensive program (treating all stages, awareness program, and mammography)	Extensive program (mammography 2-year interval age 50–70, awareness program, and treatment)	US$75 per DALY averted US$77 per DALY averted
[16]	India	CBE annually age 40–60, CBE every 5 years age 40–60, CBE at age 50, mammography at age 50, mammography at varied time intervals	CBE age 50	Int. $794 per LYS
[17]	Mexico	Varied starting age (40–50 years), covered population, and frequency of mammography	Mammography 2-year interval (age 48 with 25 % coverage; age 40 with 50 % coverage)	Int. $10,027 to $15,508 per LYS
[15]	India	CBE and mammography at various intervals and age ranges	CBE 5-year interval age 40–60	US$450 per LYS
[20]	Sub-Saharan Africa South East Asia	Treating each stage, treating all stages, and optimal program (treatment and screening mammography)	Optimal program (mammography every 2 years age 50–70)	Approx. Int. $2,500 per DALY averted Approx. Int. $4,500 per DALY averted
[18]	Ghana	CBE, mammography, and mass media awareness rising	CBE 2-year interval age 40–69	US$1,299 per DALY averted

CBE clinical breast exam; *DALY* disability-adjusted life years; *Int. $* international dollar; *LYS* life years saved

Taiwanese women [14] was the only model that compared screening high-risk women vs. average-risk women using mammography, and the conclusion reached was that mammography was not a cost-effective option for mass screening. The most cost-effective option was to screen high-risk women 35 years and older using two rounds of mammography with a 1-year interval.

Two models that assessed screening and treatment options for the Asia and Africa regions (note: not specific countries) found programs that included mammography screening to be more cost-effective than providing breast cancer treatment alone. Although these studies reached the same conclusion, incremental cost-effectiveness ratios reported were very different and can be due to the parameter values and model assumptions. The final study on mammography in Mexico concluded that, with incremental cost-effectiveness ratios ranging from Int. $10,027 to $15,508 per life years saved, mammography screening was cost-effective for the Mexican setting. These ratios would not be cost-effective for low-income countries. It is important to note that none of these studies included CBE as a comparator.

The three studies that compared CBE and mammography [15, 16, 18] concluded that CBE was the most cost-effective approach. The CBE screening options reported as cost-effective were once in a lifetime CBE at age 50, CBE at 5-year interval between the ages of 40 and 60 years, and CBE at 2-year intervals from age 40 to 69 years. All the reported incremental cost-effectiveness ratios are below Int. $2,000 and therefore can be considered highly cost-effective in low-income countries.

Since the models did not compare the same interventions, it is not possible to reach firm conclusions based on the seven studies reviewed. CBE appears to be the most cost-effective option, but the most efficient screening schedule using CBE (age range and screening interval) is not clear. Further modeling assessments are required to clarify the optimal CBE schedule, and this schedule may differ among the low-resource countries due to country-level differences, which can include differences in cancer epidemiology and cost.

Cervical Cancer Screening

We identified 14 studies that met our inclusion criteria: two studies included only cytology testing and assessed cost and effectiveness of different schedules [21, 22], four other studies assessed HPV vaccination only [23–26], and the remaining eight studies compared multiple modalities which usually included VIA, cytology, and HPV DNA testing; two studies also included HPV vaccination (Table 11.3) [15, 20, 27–32]. Seven out of eight studies that compared multiple screening modalities concluded that either VIA or HPV DNA were the most cost-effective approach; one found that VIA, when followed by cytology between the ages of 50 and 60, was the most cost-effective [30]. Only one study found cytology to be the most effective option, but this study did not focus on a particular country and developed models for the South East Asian and Sub-Saharan African regions as a whole to represent high child and high adult mortality countries.

Among the studies advocating VIA and HPV DNA, multiple screening regiments were assessed, and there is no consensus on the one standard schedule that is the most cost-effective. The screening scenarios range from single lifetime VIA or HPV DNA testing to repeated testing every 5 years. There is also variation as to whether the screening and diagnosis should be performed in a single visit or multiple visits. All the incremental cost-effectiveness ratios reported are under Int. $2,000, and therefore these screening schedules are very cost-effective even in the low-resource setting. In some countries, cost as low as Int. $10 per life years saved is possible, making cervical cancer screening a highly efficient public health strategy. Multiple studies also found that even once-in-a-lifetime single visit VIA screening can be effective in reducing mortality and this is highly cost-effective and potentially affordable even in the very low-resource setting. Further research though is needed to understand to what extent compliance with screening recommendations will impact the cost-effectiveness of alternate strategies. A few studies did attempt to include patient compliance in the model estimation [21, 22], but this needs to be incorporated more consistently to provide valuable input to guide decisions related to cancer screening policies.

The six studies that modeled the use of HPV vaccination in general concluded that the vaccination would be cost-effective in low-resource countries if the price was favorable. The vaccine would be cost-effective in Asia if the cost of the three-dose HPV vaccination was Int. $10; that is about US$2 per dose. In the Central American and the Caribbean region, a higher vaccination cost of Int. $25 (about US$5 per dose) is cost-effective. The cost of even US$2 may not be affordable for low-income countries, and, therefore, even though the cost-effectiveness has been established, the funding may not be available to implement a program that is estimated to cost millions. The GAVI alliance countries may be eligible for obtaining the HPV vaccine at a subsidized price, and this may make it more affordable for countries to vaccinate adolescent girls.

Other Gynecological Cancers

We did not identify any literature relevant to diagnosing cancers such as ovarian and endometrial cancers in the low-resource setting. Research focused on the use of diagnostic technique to detect these cancers will be valuable in understanding the costs and benefits of encouraging better diagnosis of these gynecological cancers. Potentially, early-stage detection can result in better treatment response and improved outcomes for the patient.

Table 11.3 Cost-effectiveness studies on cervical cancer screening and other interventions to reduce disease burden

References	Country	Interventions/tests compared	Most cost-effective intervention	
			Screening schedule	Cost-effective ratio
Cytology only				
[22]	Vietnam	Cytology	Cytology 5-year interval age 30–55	US$725 per LYS
[21]	Taiwan	Cytology, annual and triennial screening with varying levels of compliance	70 % Compliance 100 % Compliance Cytology 3-year interval age 30–69	US$628 per LYS US$8,174 per LYS
Multiple testing modalities compared				
[27]	Thailand	VIA, HPV, and cytology	VIA 5-year interval age 35–55	US$517 per LYS
[28]	India Kenya Peru Thailand	Once, twice, or thrice per lifetime VIA, HPV DNA, or cytology	Single 1-visit VIA at age 35 Single 1-visit HPV DNA at age 35	Int. $10 per LYS Int. $134 per LYS Int. $124 per LYS Int. $109 per LYS Int. $467 per LYS
[31]	India	HPV vaccination or screening with HPV DNA, cytology, or VIA at various intervals and ages	HPV vaccination (I$10) followed by three 1-visit VIAs	Int. $290 per LYS
[32]	China	HPV DNA and cytology at various number of visits	Single 2-visit HPV DNA	US$50 per LYS
[30]	Thailand	VIA, cytology, and HPV vaccination; start age 30–40 years and 5–10 year interval	VIA (age 30–45) followed by cytology (age 50–60) at 5-year intervals	Cost saving

[15]	Brazil Madagascar Zimbabwe	1-Visit VIA with treatment, 2-visit HPV DNA, and 3-visit cytology	Single 1-visit VIA with treatment	Int. $113 per LYS Int. $167 per LYS Int. $140 per LYS
[29][a]	Kenya Mozambique Tanzania Uganda	VIA and HPV DNA testing at various intervals and ages (over age 30)	HPV DNA testing 3 times in lifetime for older women and adolescence	Int. $1,370 per LYS Int. $720 per LYS Int. $450 per LYS Int. $720 per LYS
[20]	Sub-Saharan Africa[b] South East Asia[b]	VIA, cytology, and HPV vaccination in various frequency and age ranges	Cytology at age 40 with lesion removal	Int. $307 per DALY Int. $142 per DALY
HPV vaccination only				
[25]	Multiple countries in the Asia Pacific region	HPV vaccination	Cost of Int. $10 per vaccinated girl (approx. US$2 per dose)	Int. $30 to Int. $540 per DALY
[26]	Multiple countries in Latin American and the Caribbean	HPV vaccination	Cost of Int. $25 per vaccinated girl (approx. US$5 per dose)	Int. $10 to Int. $390 per DALY
[24]	South Africa	HPV vaccination vs. current screening strategy	HPV vaccination added to current screening strategy	US$1,078 to $1,460 per LYS
[23]	Taiwan	HPV vaccination vs. current screening strategy (cytology)	HPV vaccination at age 12 (US$364 for vaccine administration)	US$13,674 per QALY

VIA visual inspective with acetic acid; *HPV* human papillomavirus; *DALY* disability-adjusted life years; *QALY* quality-adjusted life years; *Int. $* international dollar; *LYS* life years saved

[a]This study also evaluated HPV screening for girls under 12 years and reached similar conclusion as Goldie et al. [25]

[b]High adult and child mortality countries

Integrated Screening for Cancer

Combining cancer screening programs together should intuitively yield cost savings [33]. An example of this approach is the integrated cancer screening offered by Cancer Care Ontario which combines cervical, breast, and colorectal cancer screening in one visit. In Australia, the Victorian bowel, breast, and cervical cancer programs are considering the option of offering combined screening. In the low-resource setting, packaging of breast and cervical cancer screening along with diagnostic evaluation for other gynecological cancers during well women clinical visits has been advocated [2].

No study to date has directly addressed the cost-effectiveness of providing integrated cancer screening, but we did identify one study that evaluated the costs and effectiveness of packaging other services with cervical cancer screening [34]. The other services considered included screening for cardiovascular disease, breast cancer, depression, iron-induced anemia, and sexually transmitted diseases. The findings were that under conditions of constrained resources, lower cost interventions for screening depression and anemia should be packaged with cervical cancer screening.

As indicated on Table 11.4, integrating cancer screening services for women can potentially result in lower cost due to efficiencies for both the provider and the patient. On the provider side, synergies can reduce cost as a person is seen once for several screening tests and not multiple times. For the patient, a single trip is efficient and can reduce transportation and child care costs. Other cost savings can result from providing training to providers for all cancer screening and diagnostic testing in one combined section; funding can also be streamlined to reduce administrative costs, and data collection can also be combined. Furthermore, in addition to cost savings, increased patient compliance with screening recommendations can improve the overall effectiveness of the screening program. Patients may be more likely to obtain screening for multiple cancers and thereby increase overall compliance with cancer screening recommendations [35].

To fully understand the economic impact of implementing combining screening for multiple cancers, targeted studies in the low-income setting are essential. These studies need to be designed to ensure that costs and effectiveness are systematically assessed. An ideal approach would be to begin with a screening study that can be implemented as closely as possible to mimic the real-world setting, and detailed cost data should be collected along with the effectiveness measures. Cost estimation should include both direct and indirect costs in order to ensure a comprehensive assessment of the impacts. The finding from this study can serve as input parameters to a validated cost-effectiveness model that can assess long-term implications of the integrated screening approach. A key challenge would be to develop similar models for each cancer site screened and allocate costs (shared cost of service delivery with integrated screening) to each type of screening (for example, VIA and CBE performed during the same visit).

Cost-Effectiveness Analysis and Cancer Screening Policy

Cost-effectiveness analysis cannot inform cancer screening policy in a vacuum. Cost-effectiveness assessment can identify the most efficient screening approach (type of test, age groups, and testing interval) which needs to be considered in the context of the overall affordability and health care system factors. A screening test or vaccination may be very cost-effective, but the cost in that population may be prohibitive. Targeted interventions aimed at high-risk women may be a viable option that needs further research [36]. In addition, the design of the health care delivery infrastructure may result in barriers that make delivery of the screening test not feasible. There may also be instances when a test is generally low cost and effective but may not be ideal for the low-resource setting. For example, it has been argued that it is challenging to provide high-quality cytology testing in countries like India for mass screening programs [37]. Additionally, screening programs should not be launched without

Table 11.4 Direct and indirect costs related to health care delivery

Cost data elements	Potential impact of integrating cancer screening services
Core direct costs (health services related) • Screening (programmatic and clinical costs) • Hospitalization • Outpatient clinical care • Physician visits • Rehabilitation/home health care • Prescription and nonprescription drugs	• Screening costs related to planning and screening delivery could be reduced • Outpatient clinic costs may also be lower as the number of visits are reduced
Other direct costs (non-health services costs) • Transportation to health care providers • Child care related to obtaining health care services • Special diets • Lodging for remote treatment facilities	• Single visit instead of multiple trips can reduce costs associated with transportation and childcare
Core indirect costs (impact on patient) • Reduced productivity • Lost wages due to premature death	• Less time required to obtain screening translates to less time lost from work and homecare activities
Other related indirect costs (impact on family/friends) • Time lost from work and housekeeping by family members or friends	• Less time commitment needed from family members for child care coverage, etc.

adequate planning for providing follow-up diagnostic testing and treatment.

Even when funding and infrastructure are available to deliver cancer care and screening tests, the penetration rate of the screening program may be low due to barriers faced by women. Some of these barriers include cultural or religious beliefs, language barriers, and not having a regular source of health care [38]. Compliance with screening has been reported in the range of 75–85 % in screening trails, but these may not be reproducible in the real-world setting [39–41]. Compliance generally declines with each additional round of screening [39], and, therefore, this should be an important consideration in designing screening programs.

Sensitivity analysis and hypothetical scenarios are important features of cost-effectiveness modeling that can help inform health policy when true values are not available. Assumptions are often required in modeling, but it is important to follow up after implementation to collect appropriate data to ensure that the assumptions are valid; the model results should be compared with real-world findings to better inform future health care policies. Therefore, it is important that economic studies are not only included in the planning process but also in ongoing program evaluation to provide feedback to further improve the cancer screening delivery process and make the most efficient use of limited resources.

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