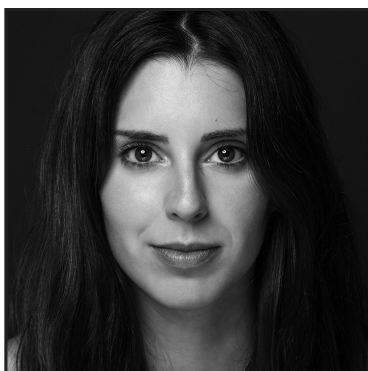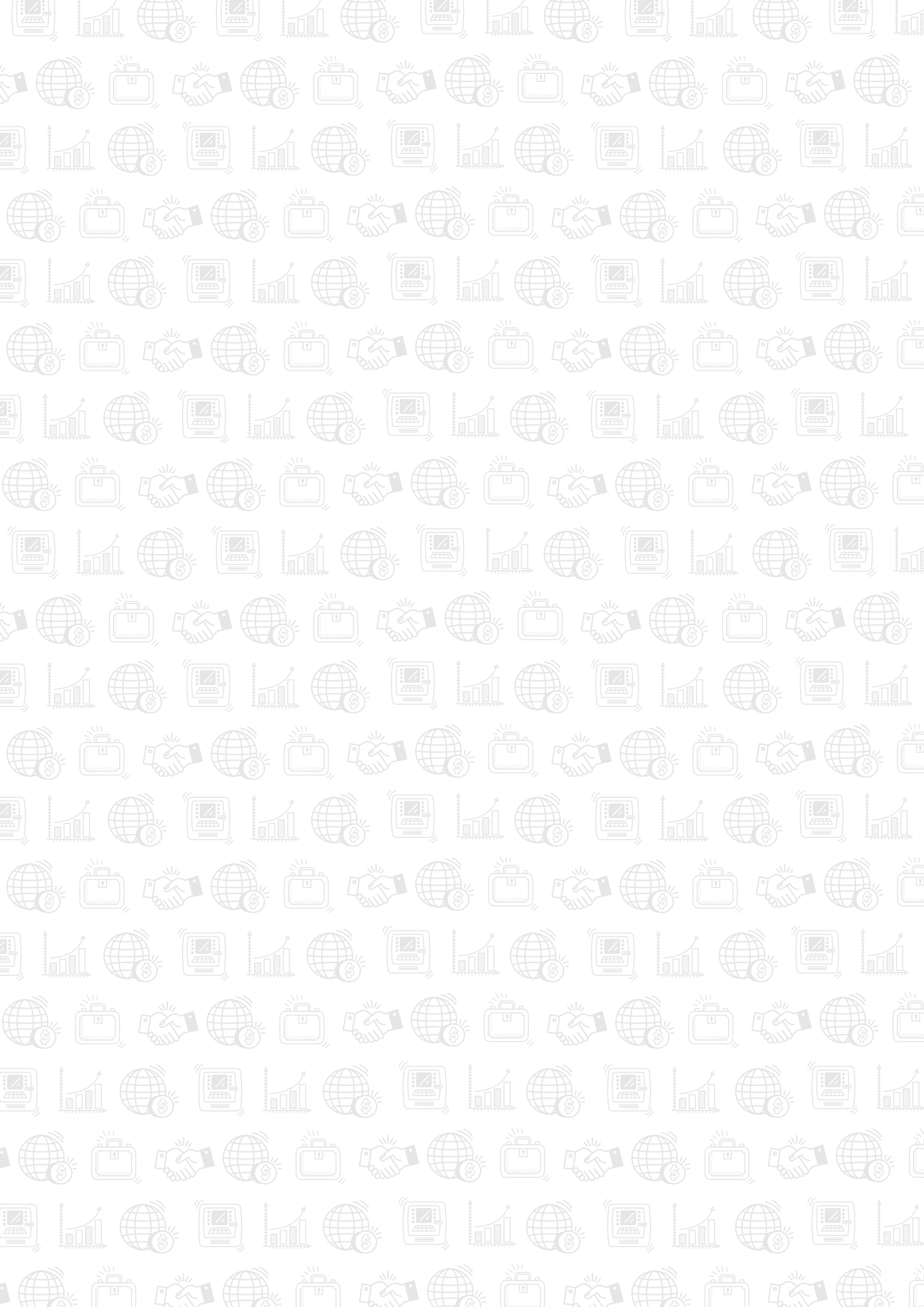# Women's cancer in the WHO Eastern Mediterranean Region

Situation analysis and investment case report

World Health Organization

Eastern Mediterranean Region

Women's cancer in the WHO Eastern Mediterranean Region

Situation analysis and investment case report

World Health Organization

Eastern Mediterranean Region

WHY INVEST?

SIGNIFICANT PUBLIC HEALTH ISSUE

In 2020,

60 000

women died from breast or cervical cancer in the Eastern Mediterranean Region

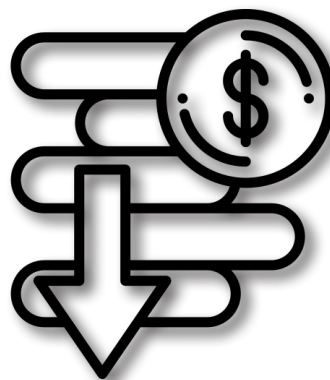In the **next 20 years**, the number of deaths will reach

2 million

Huge economic burden

In 2020, breast and cervical cancer cost the Eastern Mediterranean Region

## US$ 15 billion

or **0.44% of the GDP** of the Region

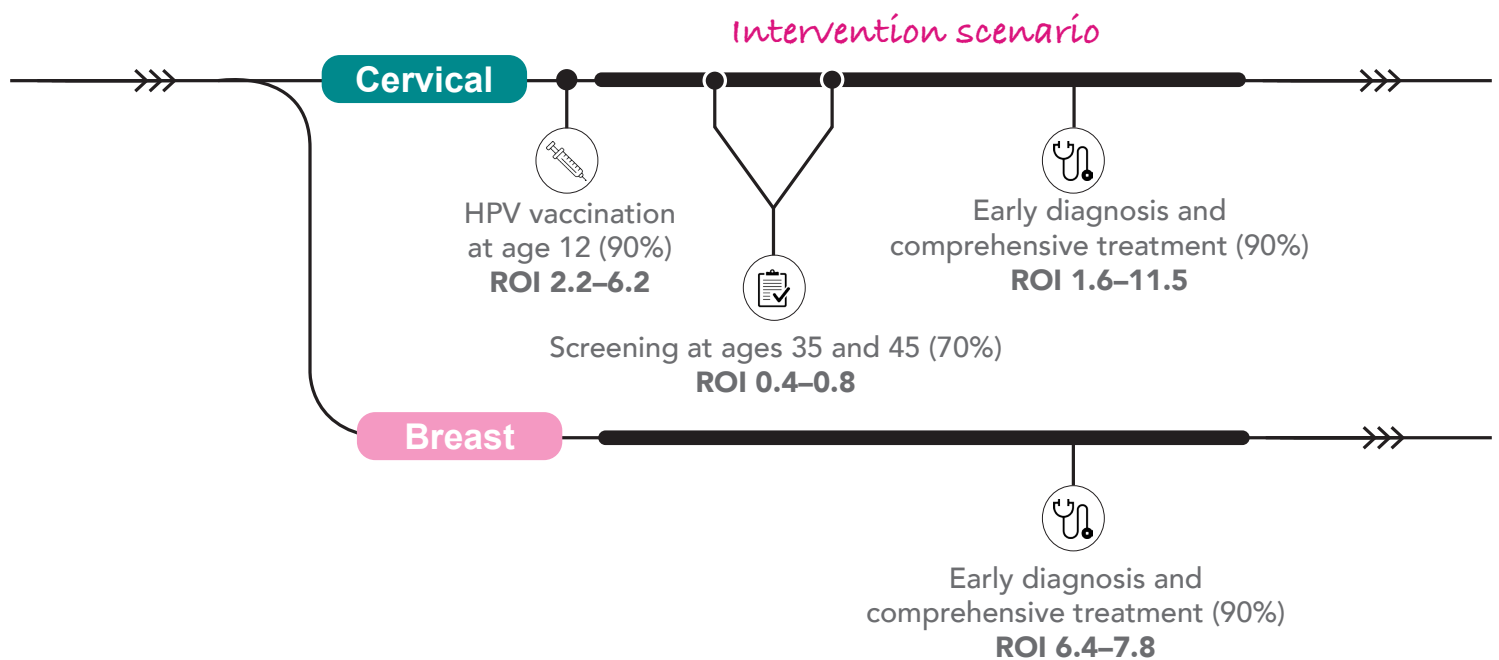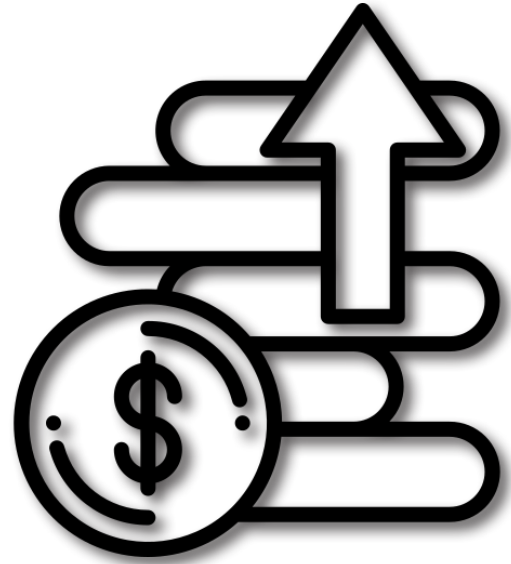By 2040, Member States will have **lost**

US$ 379 billion

Governments in the Eastern Mediterranean Region are only aware of the **direct health care costs**, **0.7%** to **3.9%** of the total economic burden

However, **loss of productivity due to premature death** accounts to **96.1%** to **99.3%** of the economic burden

What governments see

What governments DO NOT see
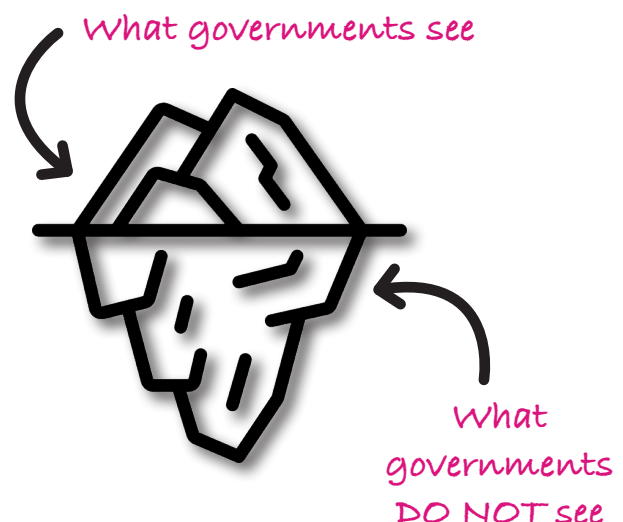
INVESTING NOW

Four proven and highly cost-effective interventions would **prevent 73 000 deaths** across the lifetime of a cohort of women

Intervention scenario

Cervical

HPV vaccination at age 12 (90%)
ROI 2.2–6.2

Screening at ages 35 and 45 (70%)
ROI 0.4–0.8

Early diagnosis and comprehensive treatment (90%)
ROI 1.6–11.5

Breast

Early diagnosis and comprehensive treatment (90%)
ROI 6.4–7.8

Contents

Acknowledgements

Acronyms and abbreviations

GBCI	Global Breast Cancer Initiative
GDP	gross domestic product
HPV	human papillomavirus
LEEP	loop electrosurgical excision procedure
NCD	noncommunicable disease
NGO	nongovernmental organization
PHC	primary health care
ROI	return on investment
VSLY	value of a statistical life-year
YLL	years of life lost

Executive summary

The WHO Eastern Mediterranean Region is grappling with a significant public health issue: women's cancers, especially cervical and breast cancer. These diseases not only have severe health implications but also place substantial burdens on health systems and the broader economy. They affect productivity and result in the loss of women's societal contributions due to premature mortality.

The WHO Regional Office for the Eastern Mediterranean has developed this regional investment case which provides economic arguments for health ministries to implement and scale up cost-effective interventions. The investment case combines situation and economic analyses: the situation analysis maps available services for women's cancer prevention and control, outlining opportunities for scaling up relevant interventions, while the economic analysis details the economic and social costs of women's cancers, including health care costs and costs associated with reduced productivity, including premature death. This analysis also estimates the costs of implementing WHO-recommended cost-effective interventions and calculates the economic returns.

Integrated approach for women's health

Placing women's cancer prevention and control within a broader cancer control plan and a comprehensive health strategy is essential. For early detection to be effective, it must be integrated into primary health care, supported by efficient and coordinated referral systems. Women's cancers should not be addressed through siloed programmes alone. The multistep process of cancer detection and management calls for effective care through the continuum and stronger communication between the public and private health care sectors.

Expanding maternal and child health policies and delivery platforms to include "women's cancers" would allow maximization of resources. Insurance must be regulated to cover preventive and early detection services and ensure sufficient coverage for treatment services, in line with national guidelines, keeping any co-payments to a minimum.

Advocacy and communication

Health communication and education should be appropriate for each target group (both men and women) and should consider culture, language, age, education level, and existing beliefs and attitudes. Community health workers could play an important role in supporting health communication and education, and help overcome cultural barriers due to their understanding of their communities.

Primary prevention

HPV vaccination is a cost-effective intervention, with high ROI and low cost per death prevented. Coupling HPV vaccination with other routine vaccine schedules improves programme efficiency. Schools have been shown to be the most successful platform for delivering HPV vaccination.

Primary prevention of breast cancer is more challenging. Only about one third of cases can be prevented by addressing known risk factors. Several of these risk factors, such as the low number of children, have complex personal, societal and economic influences that are difficult to modify. However, reducing excess body weight, avoiding tobacco and alcohol, increasing physical activity and prolonging breastfeeding could decrease the incidence of breast cancer and other cancers and noncommunicable diseases. These measures should be encouraged at both the individual and societal levels, supported by policies that encourage the design of walkable cities, ensure women's safety, institute paid maternity leave and support breastfeeding mothers in the workplace.

Screening and early detection

The results of the economic analysis indicate that cervical cancer screening may not be the most effective intervention, with an ROI below 1 across different country groups, perhaps due to the low incidence of cervical cancer reported in most countries in the Region. This indicates the need to reassess resource allocation and consider alternative interventions with higher cost–effectiveness and greater impact on reducing mortality. In designing screening programmes, countries are recommended to consider different cancer burdens and current capacities.

WHO recommends, for well-resourced settings, screening women at average risk of breast cancer every two years between age 50 and 69. Clinical breast examination may be beneficial in countries and territories where mammography screening is not yet feasible due to cost and lack of trained radiologists. However, clinical breast examination has lower sensitivity and specificity than mammography and very low positive predictive value for breast cancer.

Treatment

The treatment of both breast and cervical cancer is cost-effective and shows a positive ROI, underscoring the importance of prioritizing and expanding treatment initiatives. The focus should be on ensuring enough high-quality treatment facilities that are accessible at low or no cost to all women within a short time (maximum 60 days from initial presentation). Essential cancer medicines with proven efficacy and cost-effectiveness should be included in the national essential medicines lists, and their availability should be ensured without interruption. Treatment guidelines for middle- and low-income settings should include interventions providing the highest benefit within realistic cost levels. The role of primary health care in cancer care should be clearly defined, including in terms of services, essential medicines and equipment, guidelines and protocols, referral systems, and mandatory cancer registration.

1. Introduction

In the WHO Eastern Mediterranean Region, women's cancer, notably cervical and breast cancer, represents a formidable public health challenge. Annually, there are 120 000 new cases of breast cancer in the Region, and breast cancer accounts for 49 000 annual deaths. Cervical cancer compounds this burden, with roughly 15 000 new cases each year, according to the latest estimates of the International Agency for Research on Cancer.

Breast cancer is the most prevalent cancer in the Region, and there are wide disparities in cervical cancer rates. Mortality rates are higher in countries with lower Human Development Index levels, reflecting challenges in access to diagnosis and treatment. Survival rates vary widely and are also influenced by the same access challenges. Risk factors for these cancers include human papillomavirus (HPV) infection, tobacco use, obesity, inactivity, alcohol consumption, infertility and short breastfeeding.

These diseases not only impact health but also result in significant economic burdens on health systems and the wider economy. Beyond direct health care costs, cervical and breast cancer profoundly affect the productivity of the people affected by them and can result in the loss of societal contributions due to premature mortality.

In response to these challenges, many countries in the Region have established national cancer control plans and policies focusing on breast and cervical cancer. Efforts are under way to enhance screening, early diagnosis and HPV vaccination initiatives.

These efforts are crucial in the fight against these prevalent cancers. However, the need for a strengthened regional response to women's cancers remains. Targeted interventions, improved data collection and coordinated policy efforts are required to effectively address breast and cervical cancers in the Region.

WHO has initiated two pivotal programmes in response to the challenges posed by these cancers globally. The Global Breast Cancer Initiative (GBCI), established in 2021, aims to achieve a 2.5% annual reduction in breast cancer incidence, potentially saving 2.5 million lives over the next two decades (*1*). This initiative underscores the importance of early detection, timely diagnostics and comprehensive breast cancer management. The Cervical Cancer Elimination Initiative, launched in 2020, endeavours to eliminate cervical cancer as a public health issue by 2120 (*2*). It focuses on global targets related to vaccination, screening and comprehensive treatment for pre-cancerous lesions and invasive cervical cancer. Within the Eastern Mediterranean Region, the Regional Cervical Cancer Elimination Strategy is tailored to these global objectives, emphasizing health system strengthening and enhanced communication and advocacy (*3*).

A deeper understanding of the situation in the Region reveals disparities in access to care and in survival rates for cervical and breast cancer compared with in countries with more advanced health care systems. Factors such as limited palliative care, financial and psychosocial support challenges, and stigma exacerbate the suffering associated with these cancers. Despite heightened awareness and advances in understanding cancer symptoms, significant barriers to early diagnosis and treatment persist, including misconceptions, fear, lack of clear information and systemic access issues. Moreover, screening uptake remains critically low, underscoring the need for robust health system interventions and public health campaigns.

Addressing the dual burden of cervical and breast cancer requires a multifaceted approach. It involves educating women about early signs and symptoms, ensuring timely access to diagnostic and treatment services, and guaranteeing the availability of essential cancer medicines. Expanding access to radiotherapy, strengthening primary health care (PHC) and leveraging innovative approaches, like HPV self-testing, are vital components of a comprehensive strategy to combat these cancers.

This investment case supports and expands on the work previously done to promote a holistic approach to breast and cervical cancer and includes a wider range of themes relevant to these two cancers. The situation analysis section of the investment case outlines the available resources and the strengths and weaknesses of existing programmes for women's cancers across the Region, while outlining the significant burden of breast and cervical cancer across its countries and territories. It provides a baseline for monitoring and evaluating the implementation of the GBCI and the regional cervical cancer elimination strategy and measuring their impact on women's cancers in the Region. It also provides recommendations for strengthening the regional response to women's cancers.

By estimating the economic burden of cervical and breast cancer from 2020 to 2040 and assessing the return on investment (ROI) for WHO-recommended interventions, this investment case aims to underscore the importance of targeted investment in the prevention and treatment of these cancers across the 22 countries and territories in the Region.

This investment case is designed to elucidate the economic impact of cervical and breast cancer, as well as the economic advantages of strategic interventions within the Region. It offers a comprehensive, Region-specific understanding of the economic implications of these cancers and the potential ROI for strategic interventions. It aims to provide policy-makers with a clear economic rationale for prioritizing investments in the prevention and treatment of women's cancers, highlighting the cost of inaction and the potential benefits of targeted efforts.

The ultimate objective is to inform and guide policy decisions, support the implementation of global and regional initiatives, and contribute to the improved health and well-being of women in the Eastern Mediterranean Region.

2. Methodology

To devise comprehensive strategies for improving control of breast and cervical cancer in the Eastern Mediterranean Region, a methodology was established that combined a situation analysis with an economic analysis.

This combined methodology involved integrating an assessment of existing programmes, policies and resources with an analysis of the economic burden of breast and cervical cancers and an ROI analysis of cancer interventions.

2.1. Situation analysis

As the first step of the situation analysis, a questionnaire based on the aims and key performance indicators of the GBCI and the regional cervical cancer elimination strategy was developed and sent to the health ministry and/or WHO country office of the 22 countries and territories in the Region. It included questions on:

- existing programmes, policies and strategies for breast and cervical cancer control in the country or territory;

- the capacity and availability of human resources, financial resources, and equipment and supplies necessary for implementation of the GBCI and the regional cervical cancer elimination strategy;

- the health services available for breast and cervical cancer prevention and control and access to health care (such as referral pathways and infrastructure).

In addition, four countries and territories were selected for in-depth interviews with key personnel to document the successes and challenges experienced with related programmes, explore views and perceptions of the burden of breast and cervical cancer and the need to invest in various aspects of their control, and map the stakeholders relevant for the implementation of the GBCI and the regional cervical cancer elimination strategy.

A literature review was also carried out on peer-reviewed articles, WHO reports and, at the country level, health ministry and cancer registry reports.

During a regional expert consultation organized by the WHO Regional Office, held from 20 to 21 November 2023, in Cairo, Egypt, input was gathered about the interventions and other requirements needed to address women's cancers in the countries and territories of the Region, according to their diverse contexts. The final draft of this input was sent to country focal points and experts for verification.

2.2. Economic analysis

The detailed economic analysis focused on the economic burden of cervical and breast cancer in the Region and the ROI of four selected cancer interventions.

2.2.1 Classification of countries and territories

The 22 countries and territories of the Region were categorized into three groups based on the WHO classification (Table 1). The economic burden analysis was performed for each country and territory individually; the ROI analysis of cancer interventions was conducted at the group level.

Table 1. WHO Regional Office for the Eastern Mediterranean classification of countries and territories

Group 1	Group 2	Group 3
Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates	Egypt, Iran (Islamic Republic of), Iraq, Jordan, Lebanon, Libya, Morocco, occupied Palestinian territory, Syrian Arab Republic, Tunisia	Afghanistan, Djibouti, Pakistan, Somalia, Sudan, Yemen

2.2.2 Economic burden analysis

The economic burden analysis projected annual deaths from cervical and breast cancer from 2020 to 2040 using baseline mortality rates from 2020 and future trend projections for the 2020–2040 period, sourced from the Global Cancer Observatory database (4). These rates were applied to future population estimates from the United Nations World Population Prospects 2022 database (5) to account for population growth. This method was similarly used to estimate and project the annual prevalence of cervical and breast cancer cases, analysing data for each country or territory by five-year age groups to provide a detailed understanding of the cancer burden across different age demographics.

Estimating years of life lost due to cervical and breast cancer

The following formula was used to estimate the years of life lost (YLL) due to cervical and breast cancer mortality:

$$YLL_{t,a} = D_{t,a} \times LE_a$$

Where

$YLL_{t,a}$ is the years of life lost for cancer type t and five-year age group a

$D_{t,a}$ is the number of deaths for cancer type t and five-year age group a

LE_a is the life expectancy at five-year age group a.

The life expectancy figures for each of the 22 countries and territories in the Region were sourced from the Global Health Observatory (6).

Estimating the economic burden of cervical and breast cancer

The comprehensive analysis of the economic burden of cervical and breast cancer evaluated the economic and social value lost due to premature mortality, the productivity losses due to absenteeism and presenteeism, and the direct health care costs (the immediate costs incurred by the health care system) attributable to cervical and breast cancer.

The analysis used both the full-income approach and the human capital approach to estimate the economic and social value lost due to premature mortality. It used the human capital approach to estimate the productivity lost due to absenteeism and due to presenteeism.

Economic and social value lost due to premature mortality

The economic and social cost of women's cancer-related mortality was calculated by multiplying the value of a statistical life-year (VSLY) by the number of potential life-years lost due to women's cancer-related deaths, based on the life expectancy of those women at the time of death. The value of a statistical life is an economic measure that reflects society's willingness to pay to prevent a single death, considering life's value beyond workforce participation. This approach accounts for the broader economic and social contributions of individuals, crucial in those contexts with significant female unemployment rates and reliance on the informal economy in the Region. The formula for calculating the net present value of the economic and social value lost due to women's cancer-related mortality was as follows:

$$CD_{t,a} = D_{t,a} \times \left(\frac{LE_a \times VSLY}{(1 + r)^{LE_a}} \right)$$

Where

$CD_{t,a}$ is the cost of deaths

$D_{t,a}$ is the number of deaths for cancer type t and five-year age group a

LE_a is the life expectancy at five-year age group a

$VSLY$ is the value of a statistical life-year

r is the discount rate.

The VSLY was derived by dividing the value of a statistical life (7) by the median age of the workforce, obtained from the International Labour Organization's Modelled Estimates database (8).

Productivity lost due to absenteeism

In the context of this investment case, absenteeism refers to the work days missed by employees due to cervical and breast cancer. The annual economic losses attributable to absenteeism were calculated as follows:

$$CABS_{t,a} = \left(C_{t,a} \times LFPR \right) \times \left(\frac{GDP}{LF} \right) \times CRABS_t$$

Where

$CABS_{t,a}$ is the cost of absenteeism

$C_{t,a}$ is the number of cases for cancer type t and five-year age group a

$LFPR$ is the labour force participation rate in women

GDP is the gross domestic product

LF is the labour force population

$CRABS_t$ is the coefficient reduction for absenteeism-related productivity for cancer type t.

The analysis used data from the International Labour Organization (*8*) and the World Bank (*9*) to obtain information on female labour force participation rates, total labour force population and gross domestic product (GDP) for 2020. Based on evidence from the literature (*10–14*), the average annual number of missed work days was estimated to be 28.1 for cervical cancer and 30.7 for breast cancer. Country-specific absenteeism-related productivity reduction coefficients were calculated, considering the country-specific average number of working days per year.

Two key assumptions were made: first, that the working-age population for women is aged 15–70 years; second, due to data limitations, that the proportion of women working is the same among those affected by cervical or breast cancer as among those who are free of these diseases.

Productivity lost due to presenteeism

Unlike absenteeism, where employees are absent from work, presenteeism occurs when employees are present at work but operate at lower productivity levels due to disease-related impairment and disability. The annual economic losses attributable to presenteeism were calculated as follows:

$$CPRES_{t,a} = (C_{t,a} \times LFPR) \times \frac{(GDP)}{LF} \times CRPRES_t$$

Where

$CPRES_{t,a}$ is the cost of presenteeism

$C_{t,a}$ is the number of cases for cancer type *t* and five-year age group *a*

LFPR is the labour force participation rate in women

GDP is the gross domestic product

LF is the labour force population

$CRPRES_t$ is the coefficient reduction for presenteeism-related productivity for cancer type *t*.

The parameters and assumptions for this calculation, except for the presenteeism-related productivity reduction coefficient, align with those used to estimate the productivity losses associated with absenteeism. Drawing on the research by Łyszczarz and Nojszewska (*15*), a 29.8% productivity reduction rate was used to estimate the impact of breast cancer on worker productivity. In the absence of specific data for cervical cancer, this same reduction rate was applied to estimate the associated presenteeism costs.

Direct health care costs

Direct health care costs refer to the financial expenditures incurred by the health care system in managing cervical and breast cancer cases. In this investment case, these costs were calculated by multiplying the estimated number of individuals treated by the average annual cost of treating one cervical or breast case at different stages of

the disease. The formula for calculating direct health care costs was as follows:

$$DHC_{t,a} = C_{t,s,a} \times CR \times AC_{t,s}$$

Where

$DHC_{t,a}$ is the direct health care costs for cancer type t and five-year age group a

$C_{t,s,a}$ is the number of cases for cancer type t, at stage s, for five-year age group a

CR is the coverage rate, expressed as a percentage of the target population

$AC_{t,s}$ is the average cost of treating cancer type t at stage s.

Data on cancer stage distribution and coverage rates were gathered through a questionnaire sent to health ministry representatives in the 22 countries and territories in the Region. If data were unavailable, estimates from literature or open access databases were used (*16–20*). In the absence of specific coverage rates for breast cancer treatment, coverage rates for cervical cancer treatment were used as a proxy.

The average cost of treating breast cancer in each country or territory was determined using a four-step methodology that considered variations in health care costs and health care expenditures per capita in the 22 countries and territories. First, the average annual cost of treating breast cancer at stages I, II, III and IV was sourced from a study by Alghamdi et al. in Saudi Arabia (*21*). Drug expenses (86% of the treatment cost) were considered constant, while the remainder of the treatment cost (14%), including workforce, procedures and laboratory tests, was considered variable across countries. To address cost divergences, the ratio of inpatient visit costs in the reference country (or territory) to the target was applied to the variable portion of the costs. The cost of an inpatient visit in the 22 countries and territories was sourced from the WHO-CHOICE database (*22*) and adjusted for inflation based on the historical trend from 2011 to 2020, as reported by the International Monetary Fund (*23*). Health care expenditure variations were factored in by applying to the previously adjusted costs the ratio of health expenditures per capita in the reference country (or territory) to the target country (*9*). This yielded average annual treatment costs of approximately US$ 29 100 for Group 1, US$ 8700 for Group 2 and US$ 2000 for Group 3, across all stages of disease. These estimates were validated by comparing them with cost estimates provided by six health ministries in the Region.

Discounting

All the costs described above in the preceding sections (on estimating the economic burden) were discounted at a rate of 3%. The discounting period was adjusted for each year between 2020 and 2040 to reflect the time between the year the costs were calculated and the baseline year (2020). This adjustment ensures that all economic losses presented in this analysis are expressed as their net present value in 2020.

2.2.3 ROI and cost–effectiveness analysis of cancer interventions

The investment case emphasizes data-driven modelling and detailed economic assessment to evaluate the effectiveness and cost–effectiveness of cancer interventions in the Region, aiming to inform evidence-based health policy and resource allocation.

This integrated methodology aims to generate actionable insights and evidence to support informed policy decisions to enhance breast and cervical cancer control and reduce the burden of these diseases in the Region. By combining qualitative and quantitative approaches, this holistic assessment can guide resource allocation and prioritize interventions that offer the greatest health and economic benefits for the population.

Introduction to the model

The investment case employed an Excel-based cohort simulation model to evaluate the health and economic outcomes of interventions targeting cervical and breast cancer in the Region. The model simulated the life course of the cohort of girls born in 2020. It projected cancer incidence and mortality over 90 years, comparing scenarios with and without interventions. The model incorporated age-specific rates, survival data and other factors. The simulation introduced four interventions (HPV vaccination, comprehensive cervical cancer treatment, cervical cancer screening and comprehensive breast cancer treatment) in 2032, without a scaling-up period, allowing the number of deaths and incident cases prevented by each intervention to be estimated both independently and in combination. The analysis was conducted at the country group level (Table 1), using weighted average data to capture demographic variations. This approach facilitated a nuanced understanding of the interventions' effects on cancer prevention and treatment.

Interventions

Table 2 displays the four interventions included in the model, with their target populations and coverage rates. The coverage rates for cervical cancer interventions align with the targets of the regional cervical cancer elimination strategy (*3*). While the goal is to achieve these coverage rates by 2030, this investment case adopts a more conservative approach, allowing two additional years to reach them. For breast cancer treatment, a coverage rate similar to that for comprehensive cervical cancer treatment was applied, as GBCI targets are not specified in terms of coverage rates.

Table 2. Selected interventions, target populations and coverage rates

Intervention	Target population	Coverage rate
Cervical cancer		
Vaccination against HPV	Girls aged 12 years	90%
Comprehensive cancer treatment for stage I–IV	Women and girls with invasive cervical cancer	90%
Cervical cancer screening	Women aged 35 and 45 years	70%
Breast cancer		
Comprehensive cancer treatment for stages I–IV	Women and girls with invasive breast cancer	90%

Estimating the health impacts of the selected interventions

The following sections describe the parameters and assumptions used to model the effects of the four interventions on cancer incidence and/or mortality throughout the cohort's lifetime.

HPV vaccination

The HPV vaccination intervention in the model assumes vaccination with a single dose with 90% efficacy in reducing the risk of cervical cancer (*24*). At a 90% coverage rate, the model predicts an 81% reduction in the risk of cervical cancer starting from age 12.

Comprehensive cervical cancer treatment

The model incorporates adjustments to the five-year survival rates for cervical cancer, reflecting the outcomes achievable with comprehensive treatment. Using data from Canfell et al. (*16*), it compares current and expected survival rates if 90% of patients have access to treatment. With this level of access to appropriate therapies, the model predicts improved survival rates and decreased mortality across all stages of the disease, beginning in 2032.

Cervical cancer screening

Using odds ratios from Landy et al. (*25*), the model adjusts the incidence of cervical cancer based on the likelihood of disease detection in screened versus non-screened women during the three and five years following screening. At a 70% coverage rate, stage I incidence drops by 26% within three years post-screening. For stage II–IV cancers, incidence decreases by 76% within three years and 26% in the fourth and fifth years post-screening, attributed to early lesion detection and treatment. While this method offers a direct way to estimate incidence reduction post-screening, it may not fully capture cervical cancer's complex dynamics and screening's long-term impacts.

Comprehensive breast cancer treatment

The methodology for estimating the impact of comprehensive breast cancer treatment uses current treatment coverage rates and effect sizes for mortality reduction from the global action plan for noncommunicable diseases (*24*). This approach quantifies the benefits of expanding access to stage-appropriate, multimodal therapies, aiming for a treatment coverage of 90%. By scaling up treatment coverage, the model predicts mortality reductions across breast cancer stage I, II and III, starting in 2032.

Estimating the cost of the selected interventions

The following sections describe the parameters, assumptions and calculation methods used to estimate the costs of the four interventions for each group of countries.

HPV vaccination

The cost estimation for the HPV vaccination programme has two main components: the vaccine dose cost and the vaccine administration cost. Vaccine prices were obtained from the WHO HPV vaccine global market study (*26*), reflecting economic variations and Gavi, the Vaccine Alliance, subsidies in lower-income countries. The vaccine administration cost was calculated as the cost of one outpatient visit, using estimates from the WHO-CHOICE database adjusted for inflation trends from 2011 to 2020 (*27*), ensuring relevance to current health care costs in each group of countries.

Comprehensive cervical and breast cancer treatment

The direct health care cost estimates developed in the economic burden analysis were used to estimate the cost of managing cervical and breast cancer at different stages.

Cervical cancer screening

The cost per screened woman includes an HPV DNA test and loop electrosurgical excision procedure (LEEP) costs, assuming that 10% of screened women undergo LEEP. It also covers expenses for two outpatient visits, including screening and follow-up procedures. Costs for the HPV DNA test and LEEP were sourced from the OneHealth tTool costing module;[1] outpatient visit costs were based on data from the WHO-CHOICE database, adjusted for inflation trends from 2011 to 2020 (27).

Estimating the monetary value of the health benefits

This investment case assessed the economic benefits of interventions by (i) quantifying gains from reducing cervical and breast cancer mortality and (ii) estimating the direct health care costs saved as a result of reducing cervical and breast cancer incidence. Reduction in mortality was valued using the VSLY approach; the direct health care costs saved from reducing incidence were estimated as the number of cancer cases prevented over the lifetime of the cohort, multiplied by the average annual stage-specific treatment costs for each group.

Estimating the economic returns of the selected interventions

ROIs measure economic benefits against costs, aiding policy decisions. They are calculated as a number, guiding investment prioritization based on value for money. ROIs can be represented by the formula:

$$ROI = \left(\frac{benefits - costs}{costs} \right)$$

By employing the net present value of the benefits and costs in the calculation, the ROI calculated in this investment case took into account the time value of money, ensuring that future benefits and costs were appropriately weighted to reflect their value at baseline (2020).

---

[1] See the tool at: OneHealth Tool [online tool]. Geneva; World Health Organization; 2024 (https://www. who.int/tools/onehealth).
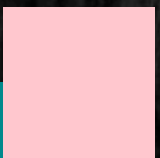
3. Findings

3.1 Economic burden analysis

3.1.1 Health burden

In 2020, breast cancer affected 81 900 women and cervical cancer affected 9500 women in the Eastern Mediterranean Region, resulting in approximately 60 000 deaths, predominantly from breast cancer (which accounted for 84% of the mortality burden for both cancers, as shown in Fig. 1–2). Projections suggest that by 2040, cumulative cases of these cancers will exceed 3 million, with over 2 million deaths. In 2020, Pakistan had the highest number of deaths (17 400) and Djibouti had the highest mortality rate (32 deaths per 100 000 women) relative to its population.
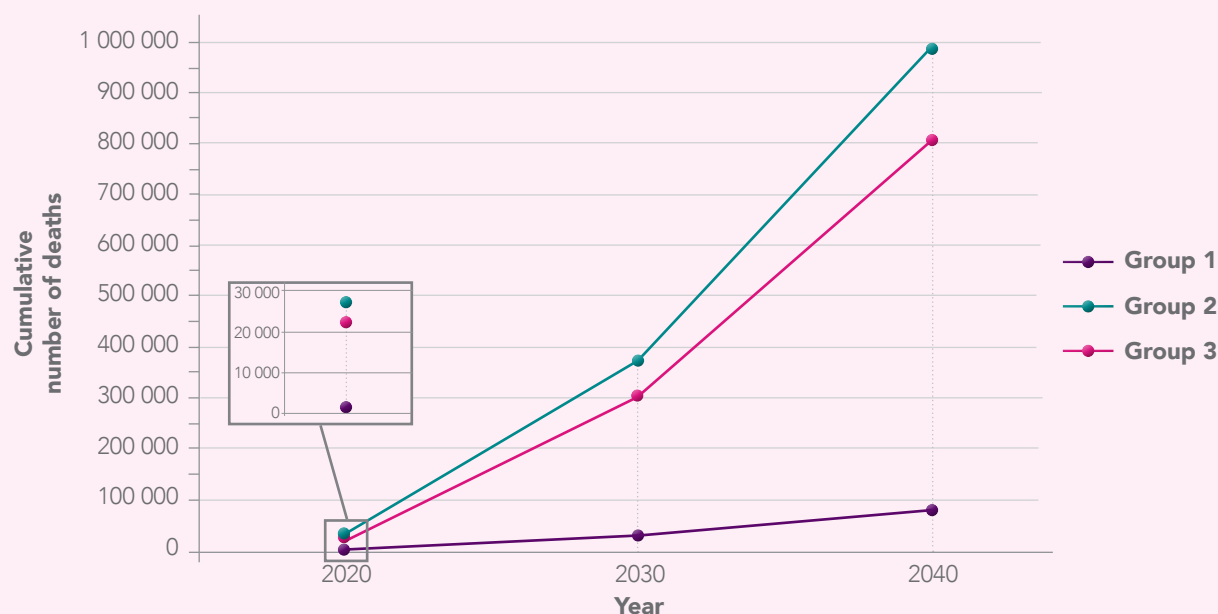
Fig. 1. Cumulative number of deaths in women caused by breast cancer in the Eastern Mediterranean Region, 2020–2040
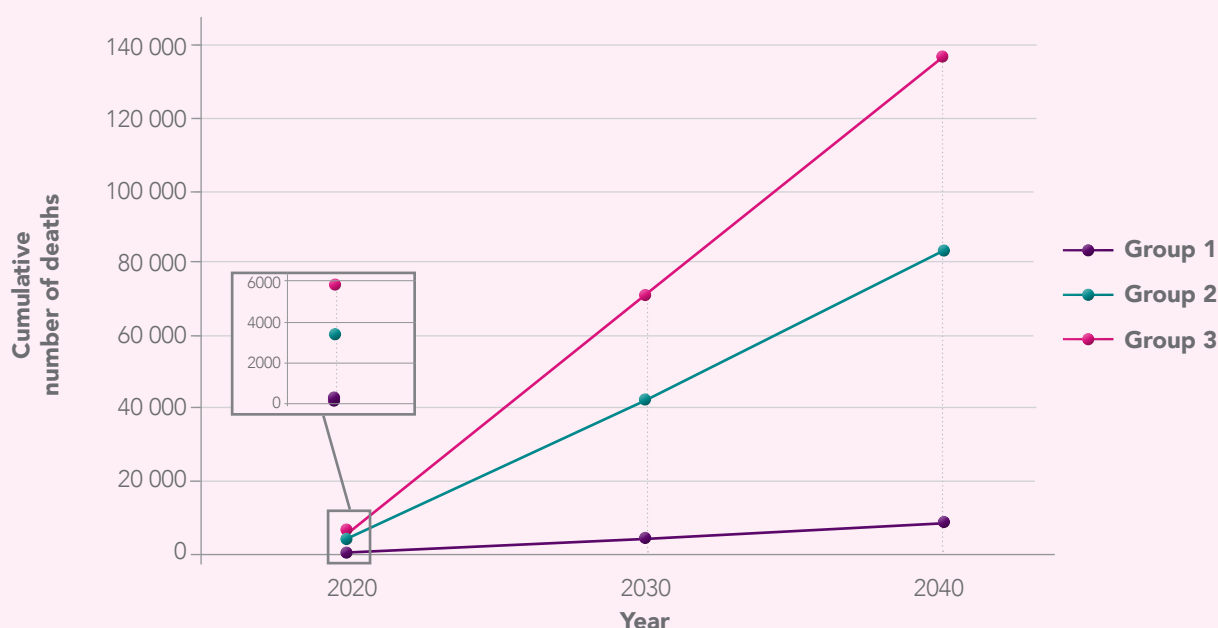
Fig. 2. Cumulative number of deaths in women caused by cervical cancer in the Eastern Mediterranean Region, 2020–2040

In 2020, cervical and breast cancer resulted in about 1.4 million YLL in the Region. By 2040, cumulative YLL from these cancers are estimated to exceed 45 million, with 95% of this burden concentrated in the 16 countries and territories classified as Groups 2 and 3. The detailed distribution of YLL across different groups is provided in Table 3.

Table 3. Cumulative YLL in women caused by cervical and breast cancer in the Eastern Mediterranean Region, 2020–2040

Time frame	Group 1	Group 2	Group 3
2020	61 382	717 950	582 760
2020–2030	878 440	9 633 616	7 825 247
2020–2040	2 248 511	23 751 885	19 494 287

3.1.2 Economic burden

Total economic burden

In 2020, cervical and breast cancer cost the Region US$ 15 billion, with US$ 13 billion attributed to cervical cancer and US$ 2 billion to breast cancer. Projections suggest this economic burden will rise to US$ 178 billion by 2030 and US$ 379 billion by 2040 (Fig. 3). The impact of these cancers on the Region's GDP averaged 0.44% during 2020–2022, varying significantly across country groups: 0.28% for Group 1, 0.65% for Group 2 and 0.51% for Group 3 (Fig. 4). The Islamic Republic of Iran had the highest economic burden attributable to cervical and breast cancer in the Region in 2020 (US$ 2.6 billion), followed by Saudi Arabia (US$ 2.2 billion) and Egypt (US$ 2.1 billion). Sudan's economic burden relative to GDP was notably high, at 1.69%, exceeding the average for Group 3 (0.51%).
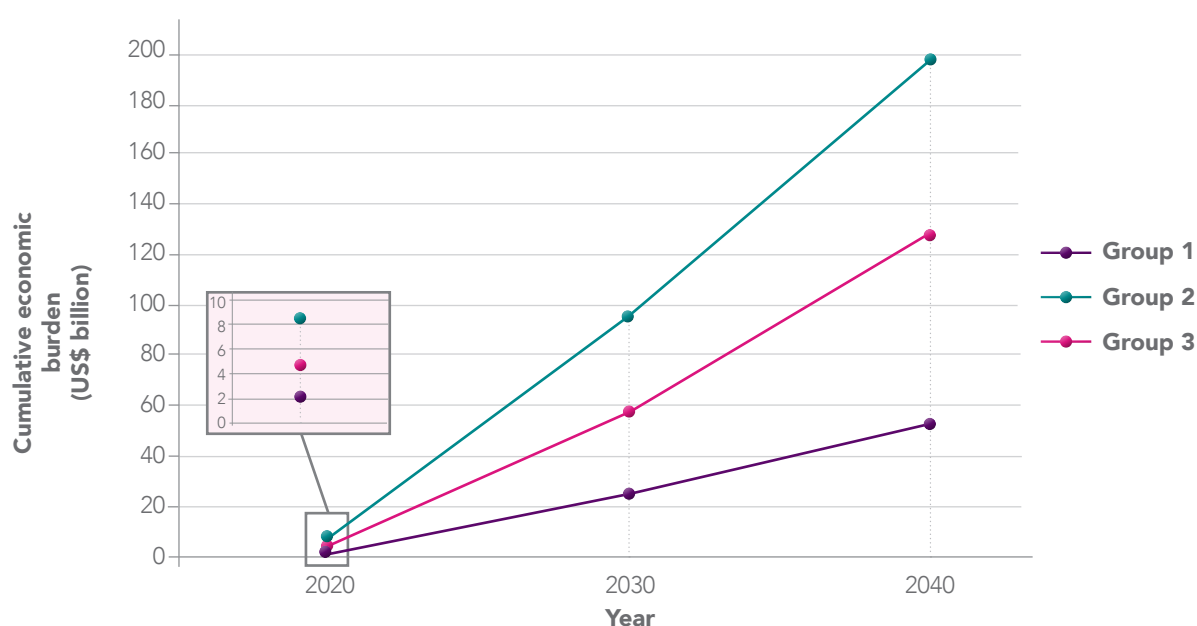
Fig. 3. Cumulative economic burden of cervical and breast cancer in the Eastern Mediterranean Region, 2020–2040
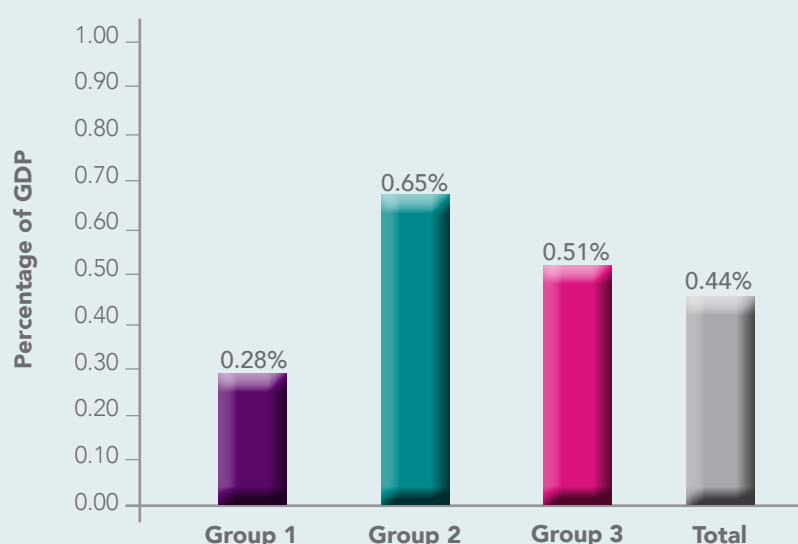
Fig. 4. Economic burden of cervical and breast cancer as a percentage of GDP, 2020–2022

Economic burden distribution

The economic burden of cervical and breast cancer in the Region is predominantly driven by the economic and social value lost due to premature mortality, accounting for 96.4% of the total burden. Absenteeism and presenteeism costs, reflecting the impact on workforce productivity, contribute minimally at 0.2% and 0.4%, respectively. Direct health care costs make up 3.0% of the overall burden. This distribution pattern is consistent across country groups (Table 4) and is determined by the use of a full-income approach to estimate premature mortality costs, which considers broader economic and social impacts beyond productivity. In contrast, absenteeism and presenteeism costs are estimated using the human capital approach, focusing on lost productivity, which shapes the distribution pattern discussed further in the report (see Limitations of the investment case).

Table 4. Distribution of the economic burden of cervical and breast cancer in 2020

Econonmic burden	Group 1	Group 2	Group 3
Economic and social value lost due to premature mortality (%)	95.1	96.5	99.0
Productivity lost due to absenteeism (%)	0.3	0.1	0.1
Productivity lost due to presenteeism (%)	0.7	0.3	0.2
Direct health care costs (%)	3.9	3.1	0.7

3.1.3 ROI and cost–effectiveness analysis

Cost of the selected interventions

Table 5 outlines the cohort size and total costs associated with implementing the selected interventions in the three country groups. The cohort consists of nearly 8.9 million girls, with 5.1 million in Group 3. HPV vaccination is the highest cost due to the large number of girls receiving the vaccine (90% coverage rate). Treatment costs for cervical and breast cancer are incremental and vary across groups, with Group 1 showing lower costs due to existing high treatment coverage. The difference in treatment costs reflects variations in cancer incidence, with breast cancer requiring more extensive resources due to higher incidence rates.

Table 5. Net present value of the costs of the selected cancer interventions

	Group 1	Group 2	Group 3
Cohort size	454 830	3 262 450	5 148 332
Cervical cancer			
HPV vaccination (US$)	55 307 558	54 495 327	34 448 611
Screening (US$)	32 404 232	54 735 935	48 357 288
Comprehensive treatment (US$)	160 945	3 523 652	9 243 665
Breast cancer			
Comprehensive treatment (US$)	1 482 146	47 536 229	47 361 587

3.1.4 Health benefits

Cervical cancer cases and deaths prevented

Fig. 5–6 show the impact of cervical cancer interventions in the Region, illustrating the number of cases and deaths prevented over the cohort's lifetime. Implementing all three interventions together is projected to prevent around 43 000 cases and 26 000 deaths across the Region, representing an 82% reduction in incidence and an 87% reduction in mortality compared with the status quo. Group 3 is expected to benefit the most, with 69% of prevented cases and 79% of prevented deaths occurring in this group.
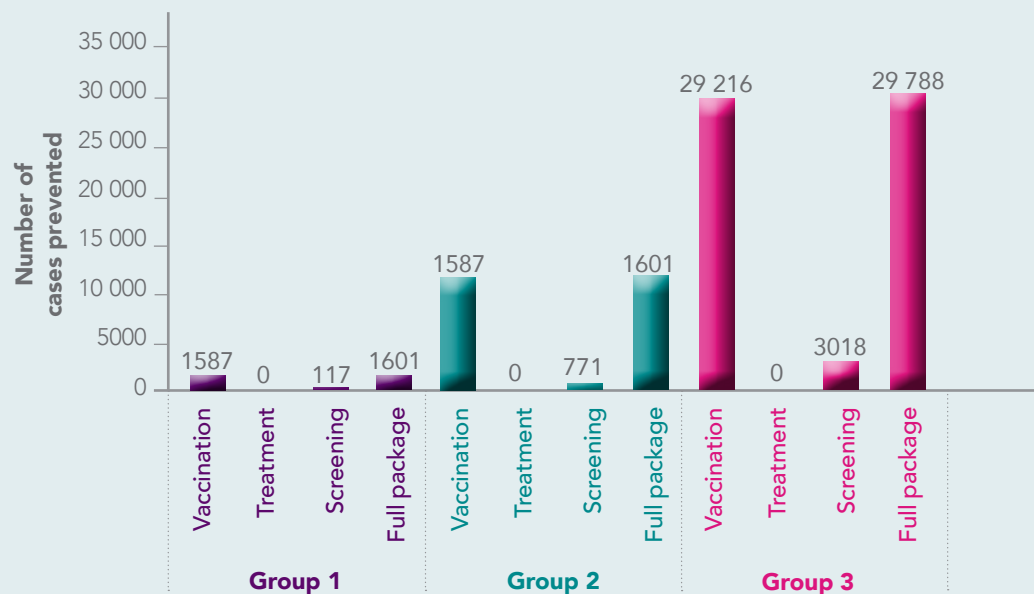
Fig. 5. Estimated cervical cancer cases prevented due to cervical cancer interventions
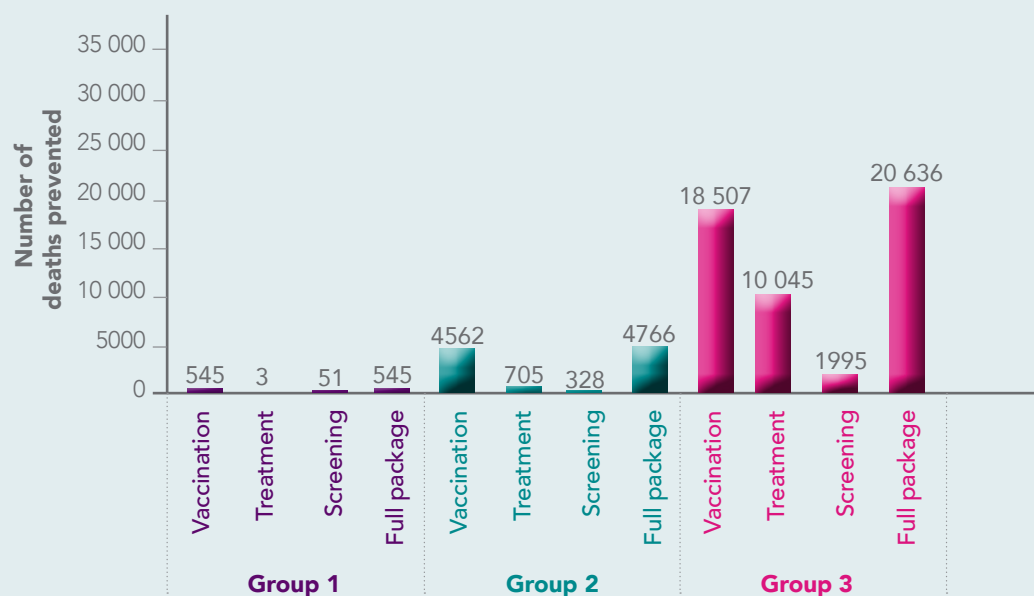
Fig. 6. Estimated cervical cancer-related deaths prevented due to cervical cancer interventions

Breast cancer deaths prevented

The breast cancer model assessed the impact of comprehensive treatment, targeting mortality reduction without directly affecting disease incidence. This intervention is estimated to prevent approximately 47 000 deaths in the Region over the cohort's lifetime – a 26% reduction in mortality compared to the status quo. The majority of these benefits (76%) is expected in Group 3 (Fig. 7).
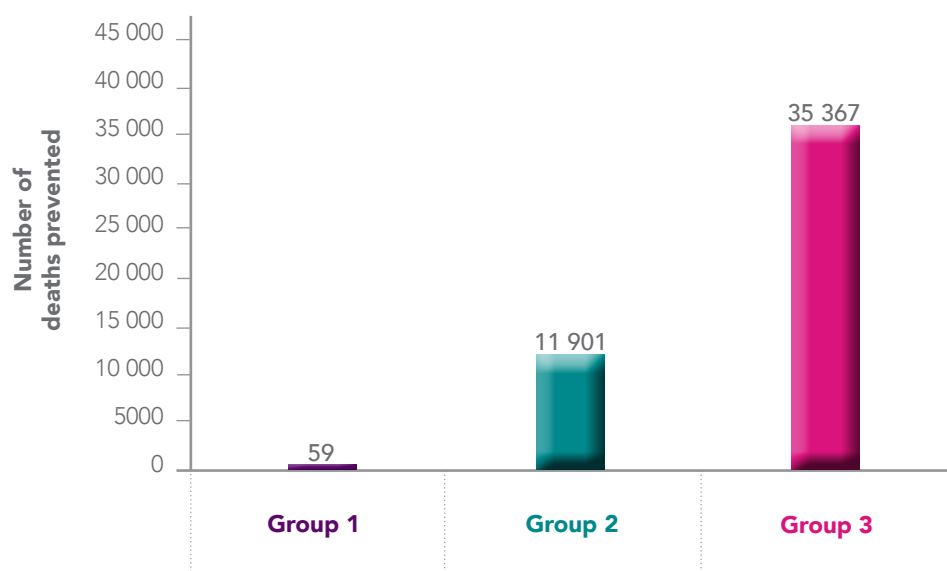
Fig. 7. Estimated number of breast cancer-related deaths prevented due to comprehensive treatment for breast cancer

3.1.5 Return on investment

Cervical cancer interventions

Table 6 shows the ROI for each cervical cancer intervention, assessed individually and together. HPV vaccination yields positive ROIs across all groups, ranging from 2.2 in Group 1 to 6.2 in Group 3. Comprehensive treatment offers substantial economic gains, with ROIs of 1.6 in Group 1, 5.1 in Group 2 and 11.5 in Group 3. Screening, however, shows negative ROIs in all groups, indicating that the costs outweigh the potential savings. Implementing all interventions together results in positive ROIs: 1.4 for Group 1 and Group 2, and 2.6 for Group 3.

Table 6. Return on investment of cervical cancer interventions

Group	Intervention	Intervention cost (US$)	Economic savings (US$)	ROI
Group 1	Vaccination	55 307 558	121 163 151	**2.2**
	Treatment	160 945	251 903	**1.6**
	Screening	32 404 232	20 346 677	**0.6**
	Full package	87 872 734	121 233 411	**1.4**
Group 2	Vaccination	54 495 327	152 448 640	**2.8**
	Treatment	3 523 652	18 141 132	**5.1**
	Screening	54 735 932	20 170 798	**0.4**
	Full package	112 754 912	160 090 243	**1.4**
Group 3	Vaccination	34 448 611	215 010 652	**6.2**
	Treatment	9 243 665	105 893 339	**11.5**
	Screening	48 357 288	36 352 608	**0.8**
	Full package	92 049 565	239 323 186	**2.6**

Intervention scenario
Cervical cancer

HPV vaccination
at age 12 (90%)
ROI 2.2–6.2

Screening at ages
35 and 45 (70%)
ROI 0.4–0.8

Early diagnosis and
comprehensive
treatment (90%)
ROI 1.6–11.5
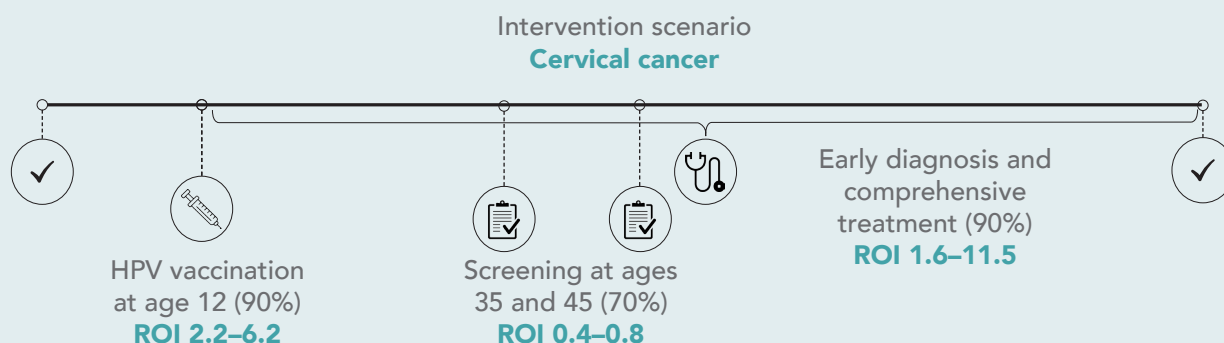
Breast cancer interventions

The ROI analysis of comprehensive breast cancer treatment reveals an ROI of 7.8 in both Group 1 and Group 2. In Group 3, the ROI is slightly lower, at 6.4, yet still represents a significant economic return (Table 7).

Table 7. Return on investment of breast cancer interventions

Group	Intervention	Intervention cost (US$)	Economic savings (US$)	ROI
Group 1	Treatment	1 482 146	11 558 906	**7.8**
Group 2	Treatment	47 536 229	373 025 782	**7.8**
Group 3	Treatment	47 361 587	302 520 889	**6.4**

Intervention scenario
Breast cancer

Early diagnosis and comprehensive treatment (90%)
ROI 6.4–7.8
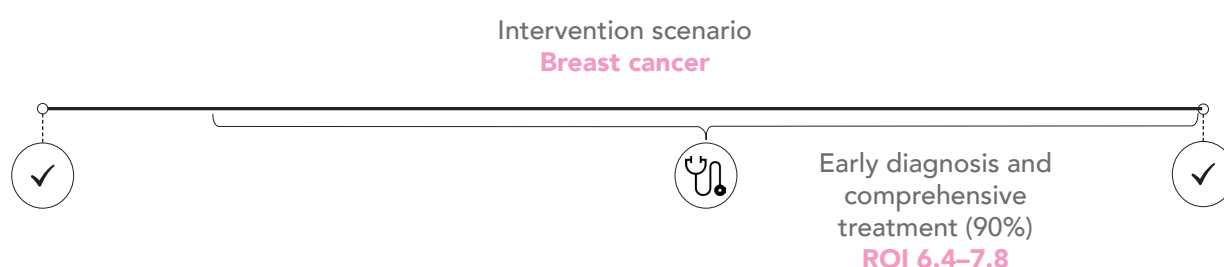
Cost–effectiveness analysis

Table 8 summarizes the cost–effectiveness of the four interventions in the Region. HPV vaccination for cervical cancer is highly cost-effective, with costs of US$ 3422 per case prevented and US$ 6109 per death prevented. Screening for cervical cancer is less cost-effective, particularly for preventing deaths (US$ 57 076 per death prevented). Comprehensive treatment for cervical cancer is cost effective, at US$ 1202 per death prevented. Breast cancer treatment costs US$ 2036 per death prevented.

Table 8. Cost–effectiveness of the cervical and breast cancer interventions in the Eastern Mediterranean Region

Intervention	Cases prevented	Cost per case prevented (US$)	Deaths prevented	Cost per death prevented (US$)
Cervical cancer				
Vaccination	42 151	3422	23 614	6109
Treatment	—	—	10 753	1202
Screening	3906	34 691	2374	57 076
Full package	42 881	6825	25 947	11 280
Breast cancer				
Treatment	—	—	47 327	2036

3.2 Situation analysis

Findings from the situation analysis were divided into (i) governance, including policies and strategies; (ii) prevention and management programmes; (iii) views and perceptions on women's cancers and interventions; (iv) country and territory case studies; and (v) a SWOT analysis.

3.2.1 Governance

In 2023, 14 of the 22 countries and territories in the Region reported having adopted a national cancer control plan. Further, 15 countries and territories in the Region have national policies, strategies or action plans relating to cancer, either exclusively or as part of a noncommunicable disease (NCD) or national health plan, policy or strategy (*28*). All dedicated cancer plans mention breast and cervical cancer. Six of the 16 countries and territories participating in the questionnaire have a unit, branch or department responsible for both breast and cervical cancer control, and a further six include these cancers in the remit of a cancer control or NCD unit. Ten countries and territories have a national policy, strategy or action plan for both early diagnosis of and screening for breast cancer, in most cases as part of a broader cancer or NCD policy, strategy or plan. The national policies, strategies or action plans in these 10 countries and territories include key performance indicators and up-to-date time frames. Only five countries and territories have a national policy, strategy or action plan for both early diagnosis of and screening for cervical cancer embedded in a broader cancer or NCD policy, strategy or plan.

3.2.2 Prevention and management programmes

Six countries in the Region had an HPV vaccination programme at the time the data collection was conducted.[1] Libya introduced HPV vaccination for girls in 2013, but the programme was discontinued. HPV vaccination programmes are also planned in Lebanon, Oman and Tunisia. The introduction of an HPV vaccination programme from age 15 in Pakistan is under way as part of the Expanded Programme on Immunization, with support from Gavi, the Vaccine Alliance. In Djibouti, there are firm intentions to accelerate cervical cancer elimination, including with the population-wide introduction of HPV vaccination.

Awareness and early detection programmes for breast cancer take place in virtually all countries in the Region but are often one-off governmental or nongovernmental initiatives or are annual but limited to the month of October. These programmes take the shape of promotional campaigns to improve knowledge of early symptoms and encourage eligible asymptomatic women to undergo early detection testing, and they may also provide clinical breast examination and/or mammography in PHC centres or dedicated mobile or stationary units.

Fifteen countries and territories in the Region have guidelines for the early detection of breast cancer, and 12 have guidelines for the early detection of cervical cancer (*29*). Only 10 countries have national guidelines, protocols or standards for early diagnosis of or screening for cervical cancer. Six report having a national organized breast cancer screening programme. Eight have opportunistic programmes, where women are offered breast cancer screening when they come in contact with the health care

---

[1] Bahrain, Kuwait, Morocco, Qatar, Saudi Arabia, United Arab Emirates.

system, and most of these programmes have defined criteria, four of which include mammography screening starting at age 40. How many women are actually offered screening is unknown and may vary widely, as offering screening is often left to the discretion of the health care provider.

3.2.3 Views and perceptions on women's cancers and interventions

Even in settings where most women are generally aware of cervical cancer and the availability of screening, knowledge about cervical cancer risk factors, including the role of HPV, is generally very low (*30–35*). Women and girls with lower socioeconomic status consistently have less knowledge and have heard and believe more conspiracy theories (*36–38*). Moderate to fair knowledge about breast cancer symptoms and the benefits of screening has been reported in several studies from the Region. Knowledge about cervical cancer symptoms is lower than knowledge about breast cancer symptoms. Several sources suggest both a low lifetime uptake of mammography and a low adherence to the recommended screening intervals among eligible women in countries of the Region where such rates had been studied. Reasons for not undergoing screening for both breast and cervical cancer overlap greatly among studies and most often included screening not being recommended by health care provider, not knowing where to go, fear of results and treatment, and low perceived risk. Also mentioned were concerns about the availability of female and Arabic-speaking physicians and the safety of mammography, as well as a lack of support from husbands and family.

Respondents to the questionnaire agreed that accurate and actionable information on breast cancer prevention and early diagnosis (risk factors, early symptoms, how to seek care) was made easily available and accessible to the public in all but two participating countries. Such information is mainly disseminated through media, social media and nongovernmental organization awareness campaigns (13 countries and territories for both). PHC was reported as a channel that disseminated information by 12 countries and territories, and specialists (such as gynaecologists) were reported as such a channel by 11. Though it is being brought more to the attention of the public, information on cervical cancer is more limited than information on breast cancer. In seven countries and territories, information on both cancers is made available through PHC, nongovernmental organization campaigns, media and gynaecologists, as well as university and school campaigns. However, information on both cancers from nongovernmental organizations or professional associations and university or school campaigns tends to be sporadic with limited reach. Information on cervical cancer mainly comes from gynaecologists, who provide opportunistic screening.

3.2.4 Country and territory case studies

Delivering women's cancer care in Punjab, Pakistan

In Punjab, Pakistan, the public health care system provides free services, but awareness of early cancer signs is low. An NCD control programme has been launched that includes women's cancer screening in clinics. Women aged 20 years or older are offered screening, with referrals for further tests if needed. The goal is to expand this programme, especially in rural areas, but funding is a challenge.

Patient navigation and coordination of services for women's cancers in the occupied Palestinian territory

In the occupied Palestinian territory, including east Jerusalem, women's cancer care is scattered and unclear due to donor dependency and resource shortages. Many patients are referred abroad for treatment. Early diagnosis is rare, and late-stage diagnoses are common due to a lack of facilities. A national committee on cancer exists, but more resources, clear pathways and multidisciplinary care are needed. The health system collapsed in 2023, leaving around 9000 cancer patients without basic care.

The need to include women's cancer care in a wider NCD package in Somalia

In Somalia, breast and cervical cancer are recognized but not prioritized by donors, leading to inefficient health services. Awareness is low, and early diagnosis is limited due to resource shortages. Only two mammography devices are available, and surgery is often the only treatment. Many women are diagnosed at late stages, without access to curative treatment. Improvements are needed in awareness, education, diagnostic services and treatment facilities. Women's cancers' care should be integrated into a national cancer control plan and a wider NCD policy. Once essential treatment is available, resource-appropriate screening could be considered. The country's updated Essential Package of Health Services 2020 includes cancer, providing a framework to include women's cancers and NCDs in routine care. The UHC service coverage index has been slowly increasing.

Closing the circle in breast and cervical cancer care in the United Arab Emirates

In the United Arab Emirates, breast and cervical cancer prevention and early diagnosis are prioritized. The national screening programme, Itmi'nan, targets adults with various preventive services. Women are offered screenings at health promotion centres, mobile units and private centres. Women with suspicious findings are referred for further testing. Community recruitment, charity support and screening reminders from insurance companies aid in screening efforts. Efforts are under way to link government-issued identification with the screening programme to reach more women. Despite initial pushback, the HPV vaccination programme has seen high uptake, with efforts to close gaps in coverage ongoing.

3.2.5 SWOT analysis

A Strength, Weakness, Opportunity and Threat (SWOT) analysis was conducted during the two-day regional expert consultation organized by the WHO Regional Office in November 2023. This analysis takes stock of the findings of the economic and situation analyses to highlight the regional policy landscape supporting (or potentially hindering) the implementation and scale-up of the WHO initiatives on women's cancers.

Strengths

Cancer in general, and women's cancers in particular, have been gaining increasing priority and political recognition in the countries of the Region. Such political recognition also tends to transfer quickly between countries of the Region due to shared media and regional organizations and initiatives. For example, the Pink Tank initiative launched in 2019 by the General Secretariat of the League of Arab States (whose membership largely overlaps with the WHO Eastern Mediterranean Region) and the United Nations Population Fund, in partnership with the WHO Regional Office for the Eastern Mediterranean, focuses on bringing together Region-wide efforts and best practices and encouraging country collaboration in training and research for breast cancer and, more recently, cervical cancer. Most of the countries in the Region have a strong infant and child vaccination infrastructure at PHC level, including uptake monitoring systems, which could be leveraged if countries decide to implement HPV vaccination.

Weaknesses

Existing screening efforts have not been able to achieve the uptake levels seen in organized programmes (*40–41*). It is questionable whether increasing awareness will eventually lead to high uptake without adopting further facilitators (such as personalized invitations and reminders) and removing barriers (such as improving geographical access year-round). A lack of health educators means that an already constrained health workforce of physicians and nurses needs to take on the educational role, or it might fall to well-meaning but untrained students or other lay people, who may not provide accurate information.

Among women who do undergo screening, there is low compliance with further investigation and treatment (*41*). The low success of screening programmes in the Region uncovers weaknesses in the integration of health systems. Screening is a dynamic process that relies on strong coordination between levels of health care, meticulous record keeping, defined catchment areas for PHC centres with good access to those covered by them, and continuous funding.

Opportunistic screening, which is, despite variation in implementation, the mainstay of screening in the Region, has been shown to be more costly and less effective than organized screening. In addition, opportunistic screening is often not grounded on equity principles, and the quality might be suboptimal. In most countries, early diagnostic services are available at no cost; however, continuous and/or easy access to these services remains a challenge as they may be limited geographically or temporally. Charities and nongovernmental organizations, and in some cases even the public sector, rely on irregular funding. The waves of screening that take place during October may not be feasible in terms of the capacity to screen or follow up with women who have a positive screening test. Infrastructure may be limited, and women

who need further services may incur large financial costs. In lower-middle-income countries, the cost of cancer screening can be as high as the average annual health care cost per inhabitant, which is clearly not feasible (*41*). Even when screening is externally funded by nongovernmental organizations and charities, this may not be the best use of limited funds, and the sustainability of such efforts is questionable unless reliably accompanied by follow-up of positive results and continuity of the programme.

Opportunities

HPV vaccine supplies have been improving, and product choice has been widening, offering more affordable options. A single-dose schedule has so far been shown to be highly effective and could further reduce programme costs and improve coverage. The highest burden of cervical cancer in the Region is in low-income countries, which are eligible for subsidized vaccines through Gavi, the Vaccine Alliance. In addition, HPV testing is becoming more available and less expensive and offers higher sensitivity, especially in settings with a lack of trained health care providers and pathologists. In low-risk settings, HPV testing could be used to reduce the number of cytological examinations, allowing samples to be analysed centrally by more experienced pathologists, leading to improved performance of cytology (*42*). COVID-19 PCR facilities could also be repurposed to facilitate the implementation of HPV testing. Self-collection of samples for cervical screening is becoming more widely available and may be more convenient for both the person being tested and health care providers. However, there are no studies to date from the Region on the acceptability and effectiveness of self-collection.

Threats

Wars and political unrest are the single greatest threat to progress in health care, and especially cancer care, given its complexity, cost and need for long-term and integrated care. The protracted regional instability has had negative consequences even on neighbouring countries due to: its effect on the flow of goods and services; the need for increased spending on security, which may reduce spending on health and education in those countries; and the increased pressure on health systems for those countries hosting large numbers of refugees (*43*). A market for counterfeit and low-quality oncology medicine has proliferated in areas where medicine is scarce and oversight is weak (*44*).

Furthermore, women's cancers' control is a highly politicized and commercialized topic that is often adopted as a cause by well-meaning but commercial entities. While these entities may contribute to raising awareness and shoulder some of the cost of much-needed awareness campaigns, their messaging may be vague, inaccurate or in conflict with existing programmes and resources.

In several countries in the Region, there are tens of nongovernmental organizations, civil society organizations and charities concerned with women's cancers, especially breast cancer. Lack of coordination may lead to duplication of efforts. There is also little quality control or monitoring and evaluation of these organizations' programmes and their impact on cancer prevention and treatment and on patient support.

4. Discussion

The economic and situation analyses presented in this investment case provide valuable insights into the health and economic impacts of cervical and breast cancer. The findings have profound implications for public health policy and resource allocation, emphasizing the urgent need for targeted interventions. However, the investment case is not without its limitations, which must be carefully considered when interpreting the results and planning future research. Future research should aim to address these limitations and enhance the robustness of future analyses. This will ultimately contribute to the development of more effective strategies to mitigate the escalating burden of women's cancers in the Eastern Mediterranean Region.

4.1 Limitations of the investment case

This investment case marks a pioneering effort to quantify the health and economic impact of women's cancers and the ROI of WHO-endorsed interventions for cervical and breast cancer in the Region. It delves into aspects of governance, financing and health service delivery, laying a comprehensive foundation for Region-specific recommendations. Despite the valuable insights provided, the investment case is subject to several limitations.

Limited data on the costs of treating cervical and breast cancer, stage distribution and treatment coverage across the 22 countries and territories could potentially impact the accuracy of direct health care cost estimates. The VSLY approach used to quantify the societal impact of cancer-related deaths, while comprehensive, affects the total economic burden and its distribution when used in conjunction with other methodologies. A human capital approach might have resulted in a lower economic burden but would have overlooked contributions from women not formally engaged in the economy.

The ROI analysis, conducted at the group level, relied on aggregated data, limiting the ability to capture nuances and variations across individual countries. Moreover, the estimation of the benefits of cervical cancer screening might not fully account for the long-term dynamics of cancer progression and the varied impacts of screening, possibly leading to an underestimation of the ROI.

The cost estimates for scaling up intervention coverage to 90% were based on current costs and did not factor in additional investments for infrastructure, equipment or technologies. This could result in an overestimation of economic returns.

The assessment of breast cancer was confined to one intervention, as the inclusion of screening would have necessitated advanced modelling techniques not feasible for this investment case.

In future research, enhanced data collection efforts could bolster the accuracy and reliability of economic burden and ROI estimates. The exploration of alternative economic valuation methodologies and modelling techniques could provide a more accurate depiction of the dynamics of cancer progression and the impacts of interventions. Detailed analyses specific to each country could offer a better understanding of variations in cancer burden and aid in the optimization of intervention strategies.

4.2 Implications for public health policy and resource allocation

The investment case underscores the significant health and economic burden posed by cervical and breast cancer in the Region. The projected mortality rates are staggering, with over 2 million deaths expected by 2040. The economic impact is equally significant, with estimates reaching US$ 15 billion in 2020 and being predicted to soar to US$ 379 billion by 2040. These figures highlight the immense pressure these cancers place on health care systems and economies in the Region, with breast cancer accounting for a significant portion of this burden.

The variations in cancer burden across different country groups within the Region further emphasize the need for tailored strategies. Groups 2 and 3 face a higher mortality burden, reflecting disparities in health care infrastructure, economic development and population demographics. These disparities necessitate strategies tailored to the specific challenges faced by each group.

The potential impact of WHO-recommended interventions, such as HPV vaccination, is another critical implication of the investment case. HPV vaccination stands out as a cost-effective intervention with a positive ROI across all country groups. However, the implementation of cervical cancer screening appears less cost effective. As with any other decision on policy-making, governments should consider different dimensions of the issue at stake and advance reasonable solutions to fill existing gaps and weaknesses. Countries are therefore recommended to contextualize, prioritize and design women's cancers' early detection programmes by taking full stock of respective cancer burden and current capacities.

The investment case provides crucial evidence to guide policy decisions and resource allocation in the Region. Emphasis should be placed on scaling up cost-effective interventions, like HPV vaccination, which offer significant economic returns and contribute to substantial reductions in cancer incidence and mortality. The findings also highlight the need for targeted investments in health care infrastructure and capacity-building to support comprehensive cancer care.

5. Recommendations

Integrated approach for women's health

Women's cancer control needs to be part of not only a wider cancer control plan but also a comprehensive health strategy. Breast and cervical cancers share risk factors with other NCDs and sexual and reproductive diseases; these factors include obesity, physical inactivity, unhealthy diets, tobacco use and sexually transmitted infections. For early detection to be effective, it must be integrated into PHC, supported by efficient and coordinated referral systems. Women's cancers cannot be addressed as siloed programmes. Given the multistep process of cancer detection and management, care through the continuum is crucial for an effective cancer control programme. Seamless care also requires improved communication between the public and private sectors, as women often move between these sectors during their treatment, as well as between different levels of care.

Several countries in the Region have maternal and child health policies. Expanding these to include "women's health" would provide a legal basis for women's right to cancer care, which could be leveraged for advocacy and mobilization of funding from governments and donors. Women's cancers could also be integrated into national youth policies and sexual and reproductive health policies. Insurance must be regulated to provide coverage for preventive and early detection services and sufficient coverage for treatment services, in line with national guidelines, keeping any co-payments to a minimum.

Advocacy and communication

Health communication and education should be appropriate for each target group, taking into consideration culture, language, age, education level, and existing beliefs and attitudes. Reaching women who are not in the workforce or in contact with the health care system should be considered in the design and planning of any awareness campaign. Community health workers could play an important role in supporting this effort and extending the reach of preventive programmes, especially in countries with health workforce shortages and in rural areas. Community health workers could also help overcome cultural barriers because they are best situated to understand their communities.

Primary prevention

HPV vaccination is a notably cost-effective intervention, demonstrating a high ROI and low cost per death prevented. These findings emphasize the considerable advantage of scaling up HPV vaccination initiatives, particularly in Group 3, where both ROI and cost–effectiveness are notably superior to alternative interventions. In 2022, the WHO Strategic Advisory Group of Experts on Immunization suggested that a single dose of this vaccine may offer sufficient protection for girls and women up to age 20. Coupling HPV vaccination with the administration of other vaccines, for instance tetanus–diphtheria, would improve programme efficiency. Schools have been shown to be the most successful platform for delivering HPV vaccination. Pre-marital counselling, a mandatory investigation for genetic and infectious diseases in several countries of the Region, has been suggested as a contact point for HPV vaccination catch up strategies for eligible girls and women beyond the age range.

Primary prevention for breast cancer is more challenging. It is estimated that only about one third of cases could be prevented by addressing known risk factors. Several of these risk factors, such as low number of children, have complex personal, societal and economic influences that are difficult to modify. However, decreasing excess body weight, avoiding tobacco and alcohol consumption, increasing physical activity and prolonging breastfeeding could reduce the incidence of breast cancer and several other cancers and NCDs. In addition, increased breastfeeding has benefits for infants. These measures should be encouraged not only on an individual and societal level but also on a policy level, by stipulating the design of walkable cities that increase safety for women and by implementing paid maternity leave and work environments that support breastfeeding mothers.

Screening and early detection

The results of the economic analysis indicate that cervical cancer screening may not be the most effective intervention. Across different country groups, the ROI for this intervention is below 1, suggesting that the economic return might be lower than the investment. This finding might be due to the low incidence of cervical cancer reported in most countries in the Region. The findings of the analysis underscore the need for a reassessment of resource allocation, with consideration given to alternative interventions that demonstrate higher cost–effectiveness and greater impact on reducing mortality. For instance, screening for cervical cancer by HPV DNA detection could be considered in low-incidence settings, due to its high sensitivity. WHO recommends HPV testing of women starting, in general, at age 30 and continuing every 5–10 years until age 50, provided the woman has two consecutive negative screening results.

Self-collection of samples for cervical screening may make screening more accessible to women in remote areas and in areas where there are shortages of human resources. However, while this method may preserve women's privacy and reduce the time and effort for both women and health care providers compared with a gynaecological examination, women may be reluctant to directly test for a sexually transmitted infection.

WHO recommends, for well-resourced settings, screening women at average risk of breast cancer every two years between ages 50 and 69. Several countries in the Region recommend starting mammographic screening from age 40 due to the perception that breast cancer occurs at a younger age in their population. This can lead to a higher false-positive rate, however, increasing the pressure on health systems in terms of workforce and resources and is therefore only recommended in well-resourced settings with rigorous monitoring and evaluation and with careful consideration of women's values and preferences. Thus, when designing a screening programme, it is important to prioritize women who are most likely to benefit at the lowest risk of negative consequences. Clinical breast examination may be beneficial as a screening method in countries where mammography screening cannot yet be implemented due to cost and lack of trained radiologists and where a high proportion of women present with advanced stage breast cancer. However, clinical breast examination has lower sensitivity and specificity and very low positive predictive value for breast cancer. Widespread screening with clinical breast examination therefore still requires preparedness of the health system for further diagnostic testing.

Early detection of breast and cervical cancers is of critical importance, but the diverse nature of cancer symptoms means that women are not always prompted to seek advice. Therefore, it is crucial that PHC staff and gynaecologists are trained to inquire about and recognize early signs and symptoms of cancer and to appropriately communicate with women about referral for further investigation, including what to expect.

Treatment

The treatment of both breast and cervical cancer demonstrates notable cost–effectiveness and positive ROI across diverse income groups. These findings underscore the considerable advantage of prioritizing and expanding cervical cancer and breast cancer treatment initiatives, particularly in Group 3 countries, where both the ROI and cost–effectiveness of comprehensive treatment are markedly superior to those of alternative interventions. The focus of treatment should be on ensuring that enough high-quality treatment facilities are accessible at low or no cost to all women within a short time (maximum of three months from initial presentation). Essential cancer medicines with proven efficacy and cost–effectiveness should be included in the national essential medicines list, and their availability should be ensured without interruption. Treatment guidelines developed for middle- and low-income settings should include interventions that provide the highest benefit within realistic cost levels. In addition, to optimize the role of PHC in cancer care, a clear definition is needed of the services (such as prevention, early detection, palliative care), essential medicines, and equipment to be provided by PHC, as well as supporting guidelines and protocols, referral systems, and information systems.

Countries with low incidence of cervical cancer

In light of the low incidence of cervical cancer in some countries in the Region, in some cases lower than the WHO elimination threshold, it may be more useful in those countries to set age- and country-specific targets that aim to prevent a certain number of new cases by a target date. The WHO threshold should not be viewed as a hard target but as an expert consensus on what is achievable in most settings given the current worldwide burden. In addition, due to insufficient incidence data, GLOBOCAN estimates for several countries in the Region are modelled based on available data, which may include earlier data from existing registries or the registries of neighbouring countries, as well as WHO mortality statistics. The level of confidence in these estimates is therefore variable.

Special groups

The incidence of cervical cancer may vary between population groups. Countries are hosts to large numbers of short- and long-term migrants, who may come from high-incidence countries and continue to carry that risk. But the HPV vaccine is often available only in tertiary health care centres and private health care facilities, to those less likely to benefit, and therefore with inequitable distribution. Identifying and targeting high-risk groups (including survivors of sexual and gender-based violence, HIV-positive women, and women with substance addiction) for more intensive cervical cancer screening, or prioritizing them for vaccination, may be considered, while ensuring they are not subjected to stigma and stereotyping.

Gaps in cancer registration

Several of the metrics against which the implementation of the WHO initiatives on cervical and breast cancer is assessed are lacking for most countries in the Region, such as screening uptake, time to diagnosis, time to treatment, completion of treatment, and cancer survival. There is especially miscommunication between Ministry of Health and private sector facilities. Weak communication between policy-makers and researchers limits the ability of researchers to conduct policy-relevant research and, therefore, the ability of policy-makers to use existing evidence. Facilitating access to and dissemination of cancer registry data could improve the registries' visibility and justify further investment in those registries.

Country context

Given the varying disease burdens, the vast differences in income and resources, and the cultural nuances among countries in the Region, a regional approach to women's cancers should not be adopted in a standardized way, and blanket recommendations should be avoided. However, this diversity still lends itself to a coordinated approach. Lower-income countries, or those that are later adopters of certain interventions, could benefit from the experience, knowledge and resources of higher-income or earlier adopting countries. Wide use of technologies (e.g. HPV testing) in one country could lead to a reduction in their cost and increase in their availability, especially if they are produced locally or if there are centralized purchasing and procurement systems for drugs, vaccines and devices established at regional or subregional levels. In addition, economic cooperation between countries, including employment, may increase the income of families and the economy as a whole, which is the prerequisite to any improvement in health care delivery and access.

References

1. Global Breast Cancer Initiative implementation framework: assessing, strengthening and scaling up services for the early detection and management of breast cancer. Geneva: World Health Organization; 2023 (https://www.who.int/publications/i/item/9789240067134). Licence: CC BY-NC-SA 3.0 IGO.

2. Global strategy to accelerate the elimination of cervical cancer as a public health problem. Geneva: World Health Organization; 2020 (https://iris.who.int/handle/10665/336583). Licence: CC BY-NC-SA 3.0 IGO.

3. Regional cervical cancer elimination strategy for the Eastern Mediterranean. Cairo: WHO Regional Office for the Eastern Mediterranean; 2023 (https://iris.who.int/handle/10665/369359). Licence: CC BY-NC-SA 3.0 IGO.

4. Global Cancer Observatory [online database]. International Agency for Research on Cancer, World Health Organization; 2023 (https://gco.iarc.fr, accessed 6 January 2023).

5. World population prospects 2022 [online database]. New York: United Nations Department of Economic and Social Affairs; 2022 (https://population.un.org/wpp).

6. Global Health Observatory [online database]. Geneva: World Health Organization; 2023 (https://www.who.int/data/gho).

7. Viscusi WK, Masterman CJ. Income elasticities and global values of a statistical life. J Benefit Cost Anal. 2017;8(2):226–50. doi:10.1017/bca.2017.12.

8. ILO modelled estimates [online database]. Geneva: International Labour Organization; 2023 (https://ilostat.ilo.org/methods/concepts-and-definitions/ilo-modelled-estimates).

9. World Bank open data [online database]. Washington (DC): World Bank; 2023 (https://data.worldbank.org).

10. Dubas-Jakóbczyk K, Kocot E, Seweryn M, Koperny M. Production lost due to cervical cancer in Poland in 2012. Med Pr. 2016;67(3):289–99. doi:10.13075/mp.5893.00378.

11. Lidgren M, Wilking N, Jönsson B, Rehnberg C. Resource use and costs associated with different states of breast cancer. Int J Technol Assess Health Care. 2007;23(2):223–31. doi:10.1017/S0266462307070328.

12. Sorensen SV, Goh JW, Pan F, Chen C, Yardley D, Martín M et al. Incidence-based cost-of-illness model for metastatic breast cancer in the United States. Int J Technol Assess Health Care. 2012;28(1):12–21. doi:10.1017/S026646231100064X.

13. Wan Y, Gao X, Mehta S, Wang Z, Faria C, Schwartzberg L. Indirect costs associated with metastatic breast cancer. J Med Econ. 2013;16(10):1169–78. doi:10.3111/13696998.2013.826228.

14. Daroudi R, Akbari Sari A, Nahvijou A, Kalaghchi B, Najafi M, Zendehdel K. The economic burden of breast cancer in Iran. Iran J Public Health. 2015;44(9):1225–33.

15. Łyszczarz B, Nojszewska E. Productivity losses and public finance burden attributable to breast cancer in Poland, 2010–2014. BMC Cancer. 2017;17(1):676. doi:10.1186/s12885-017-3669-7.

16. Canfell K, Kim JJ, Brisson M, Keane A, Simms KT, Caruana M et al. Mortality impact of achieving WHO cervical cancer elimination targets: a comparative modelling analysis in 78 low-income and lower-middle-income countries. Lancet. 2020;395:591–603. doi:10.1016/S0140-6736(20)30157-4.

17. Piñeros M, Ginsburg O, Bendahhou K, Eser S, Shelpai WA, Fouad H et al. Staging practices and breast cancer stage among population-based registries in the MENA region. Cancer Epidemiol. 2022;81:102250. doi:10.1016/j.canep.2022.102250.

18. Duggan C, Trapani D, Ilbawi AM, Fidarova E, Laversanne M, Curigliano G et al. National health system characteristics, breast cancer stage at diagnosis, and breast cancer mortality: a population-based analysis. Lancet Oncol. 2021;22(11):1632–42.

19. Saudi Health Council, National Cancer Center, Saudi Cancer Registry. Cancer incidence report in Kingdom of Saudi Arabia 2018. Riyadh: Saudi Health Council; 2022.

20. Cancer incidence report 2019. Doha: Qatar National Cancer Registry, Ministry of Public Health; 2022.

21. Alghamdi A, Balkhi B, Alqahtani S, Almotairi H. The economic burden associated with the management of different stages of breast cancer: a retrospective cost of illness analysis in Saudi Arabia. Healthcare (Basel). 2021;9(7):907. doi:10.3390/healthcare9070907.

22. WHO-CHOICE estimates of cost for inpatient and outpatient health service delivery. Geneva: World Health Organization; 2021 (https://www.who.int/publications/m/item/who-choice-estimates-of-cost-for-inpatient-and-outpatient-health-service-delivery).

23. Inflation rate, average consumer prices. In: World economic outlook [online database]. Washington (DC): International Monetary Fund; 2023 (https://www.imf.org/external/datamapper/datasets/WEO, accessed 6 June 2023).

24. Cancer interventions technical briefing. Technical briefing for Appendix 3 of the global action plan for non-communicable diseases. Geneva: World Health Organization; 2022.

25. Landy R, Pesola F, Castañón A, Sasieni P. Impact of cervical screening on cervical cancer mortality: estimation using stage-specific results from a nested case-control study. Br J Cancer. 2016;115(9):1140–6. doi:10.1038/bjc.2016.290.

26. MI4A, World Health Organization. WHO HPV vaccine global market study, April 2022. Geneva: World Health Organization; 2022 (https://www.who.int/publications/m/item/who-hpv-vaccine-global-market-study-april-2022).

27. Inflation rate, average consumer prices. Annual percent change. In: World economic outlook [online database]. Washington (DC): International Monetary Fund; 2023 (https://www.imf.org/external/datamapper/datasets/WEO, accessed 6 January 2023).

28. Assessing national capacity for the prevention and control of noncommunicable diseases. Report of the 2021 global survey. Geneva: World Health Organization; 2023 (https://www.who.int/publications/i/item/9789240071698).

29. Assessing national capacity for the prevention and control of noncommunicable diseases. Report of the 2019 country capacity survey in the Eastern Mediterranean Region. Cairo: WHO Regional Office for the Eastern Mediterranean; 2023 (https://iris.who.int/handle/10665/368287). License: CC BY-NC-SA 3.0 IGO.

30. Bendahhou K, Serhier Z, Diouny S, Ouadii K, Barkouk A, Niyonsaba A et al. Women's knowledge and attitudes towards cervical cancer screening in Morocco. Cureus. 2023;15(4):e37989. doi:10.7759/cureus.37989.

31. Yacouti A, Baddou R, El Mettat K, Guennouni M, El Got A, Aquil A et al. Moroccan women's attitudes regarding pap smear test and adherence to cervical cancer screening. J Cancer Educ. 2023;38(5):1649–55. doi:10.1007/s13187-023-02317-5.

32. Al Raisi M, Al Yahyai T, Al Kindi R. Knowledge and attitude regarding cervical cancer and human papillomavirus in Oman. Sultan Qaboos Univ Med J. 2022;22(4):493–500. doi:10.18295/squmj.9.2021.140.

33. Elshami M, Thalji M, Abukmail H, Al-Slaibi I, Alser M, Radaydeh A et al. Knowledge of cervical cancer risk factors among Palestinian women: a national cross-sectional study. BMC Womens Health. 2021;21(1):385. doi:10.1186/s12905-021-01510-2.

34. Dhaher EA. Knowledge, attitudes and practices of women in the southern region of Saudi Arabia regarding cervical cancer and the pap smear test. Asian Pac J Cancer Prev. 2019;20(4):1177–84. doi:10.31557/APJCP.2019.20.4.1177.

35. Akkour K, Alghuson L, Benabdelkamel H, Alhalal H, Alayed N, AlQarni A et al. Cervical cancer and human papillomavirus awareness among women in Saudi Arabia. Medicina (Kaunas). 2021;57(12):1373. doi:10.3390/medicina57121373.

36. Hweissa NA, Su TT. Awareness of cervical cancer and socio-demographic variations among women in Libya: an exploratory study in Az-Zawiya city. Eur J Cancer Care (Engl). 2018;27(1). doi:10.1111/ecc.12750.

37. Khalil J, Boutros S, Hassoun A, Hallit S, Barakat H. Human papillomavirus vaccine knowledge and conspiracy beliefs among secondary school students in Lebanon. BMC Pediatr. 2023;23(1):363. doi:10.1186/s12887-023-04177-w.

38. Mouallif M, Bowyer HL, Festali S, Albert A, Filali-Zegzouti Y, Guenin S et al. Cervical cancer and HPV: awareness and vaccine acceptability among parents in Morocco. Vaccine. 2014;32(3):409–16. doi:10.1016/j.vaccine.2013.10.069.

39. Charaka H, Khalis M, Elfakir S, Chami Khazraji Y, Zidouh A, Abousselham L et al. Organization and evaluation of performance indicators of a breast cancer screening program in Meknes-Tafilalt Region, Morocco. Asian Pac J Cancer Prev. 2016;17(12):5153–7. doi:10.22034/APJCP.2016.17.

40. El Fakir S, Najdi A, Khazraji YC, Bennani M, Belakhel L, Abousselham L et al. Breast cancer screening in Morocco: performance indicators during two years of an organized programme. Asian Pac J Cancer Prev. 2015;16(15):6285–8. doi:10.7314/apjcp.2015.16.15.6285.

41. Groot MT, Baltussen R, Uyl-de Groot CA, Anderson BO, Hortobágyi GN. Costs and health effects of breast cancer interventions in epidemiologically different regions of Africa, North America, and Asia. Breast J. 2006;12:S81–90. doi:10.1111/j.1075-122X.2006.00206.x.

42. Agorastos T, Dinas K, Lloveras B, de Sanjose S, Kornegay JR, Bonti H et al. Human papillomavirus testing for primary screening in women at low risk of developing cervical cancer. The Greek experience. Gynecol Oncol. 2005;96(3):714–20. doi:10.1016/j.ygyno.2004.11.042.

43. Ades A, Chua HB. Thy neighbor's curse: regional instability and economic growth. J Econ Growth. 1997;2(3):279–304.

44. Dehghan SK. Hope for Syrian cancer patients as cross-border treatment resumes in Turkey. The Guardian. 9 June 2023.
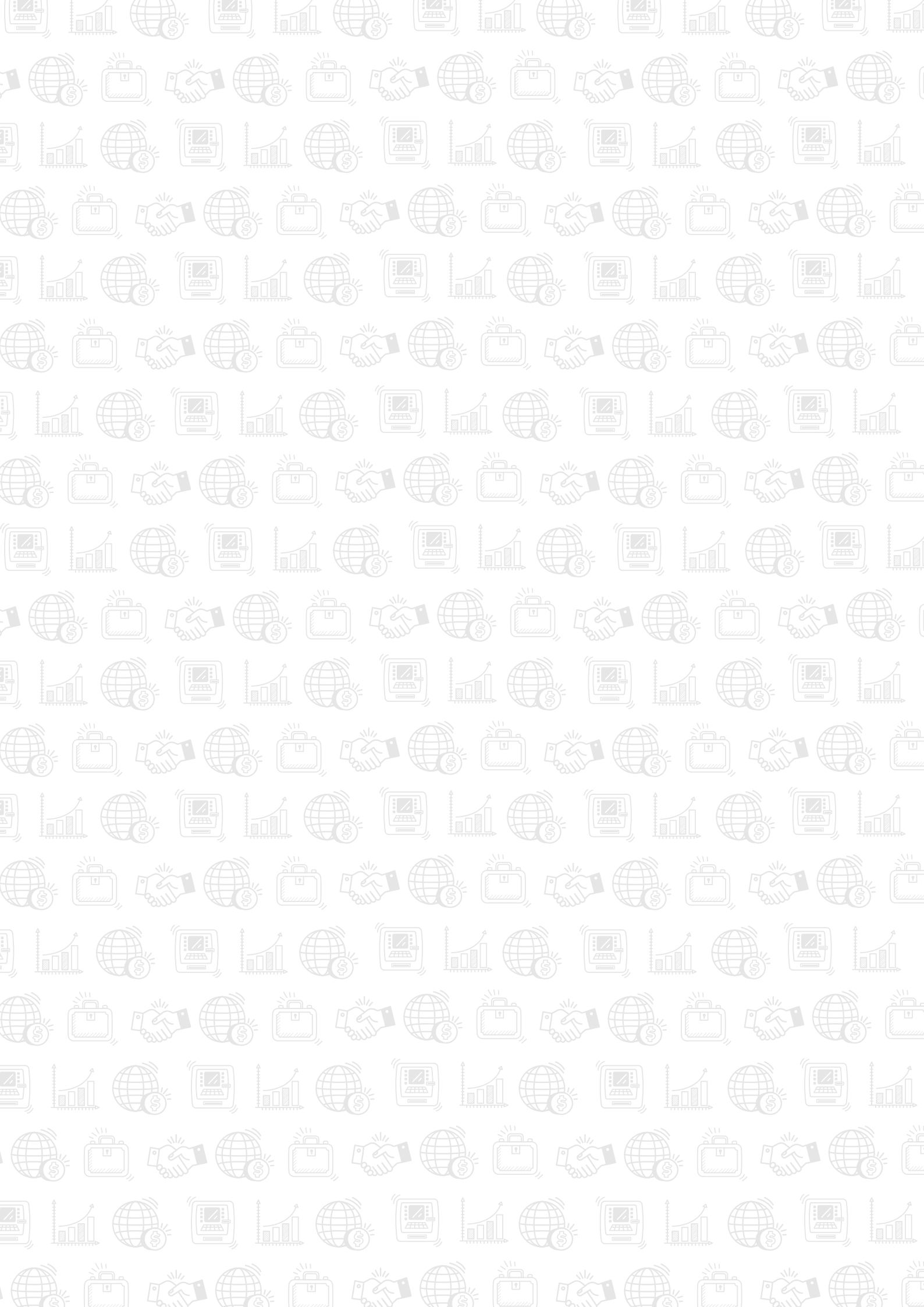
WHO Regional Office for the Eastern Mediterranean
Monazamet El Seha El Alamia Street
Extension of Abdel Razak El Sanhouri Street
P.O. Box 7608, Nasr City
Cairo 11371, Egypt