

Preventive Cancer Screening: A Strategy to Reduce U.S. Healthcare Costs

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Submitted: 01 Oct 2020; Accepted: 09 Oct 2020; Published: 20 Oct 2020

Abstract

The Agency for Healthcare Research and Quality (AHRQ) estimated that the direct medical costs for cancer in the United States (U.S.) in 2014 was \$87.3 billion, and it is projected that the cost to the U.S. taxpayer will rise to \$173 billion in 2020 [1, 2]. In addition to the financial cost, cancer is the second leading cause of death in the U.S. [3]. Increasing access to and uptake of preventive cancer screenings could significantly reduce the burden of death and the cost of treating cancer in the U.S. We conduct a literature review to summarize knowledge about preventive cancer screenings in the U.S. including the burden of disease that currently exists in the population, the benefits of receiving preventive cancer screenings, the factors that act as barriers or predictors to receiving preventive care, cost effectiveness of selected preventive services, and the exploration of ways to increase the uptake of preventive services. Increasing preventive cancer screenings in the U.S. is an effective strategy to reduce health care costs.

Keywords: Patient Protection and Affordable Care Act (ACA), Preventive Services, Cancer Screening, Mammography, Colonoscopy, Pap Test

Introduction

In 2020, United States (U.S.) national health expenditures are projected to be over four trillion dollars [4]. This equates to roughly \$12,000 per person and represents an almost 20% increase from 2016 projections [4]. A significant portion of these costs come from the care and treatment of cancer, which is projected to cost the American taxpayer 173 billion dollars in 2020 [2]. This is a 98% increase from the Agency for Healthcare Research and Quality (AHRQ) projections of 2014 [1]. In addition to the significant financial cost, the Center for Disease Control and Prevention (CDC) has identified cancer as the second leading cause of death in 2020 [5].

As the American population ages, early detection and treatment of cancer becomes an important mechanism for saving lives and controlling cost growth. Increasing the uptake of preventive cancer screenings could significantly reduce the burden of death and the cost of treating cancer in the U.S. Three cancer screenings have shown particular promise, mammography, colonoscopy, and

cervical cancer screening. These screenings are rated as A or B by the United States Preventive Services Task Force (USPSTF), an organization that establishes health standards in the U.S. The rating indicates that based on published evidence there is a high likelihood the net benefit of screening is substantial (A) or moderate (B) [6]. The aim of this review is to understand the burden of disease that currently exists in the U.S. population, the benefits of receiving preventive cancer screenings, the factors that act as barriers or predictors to receiving preventive care, the cost effectiveness of selected preventive services, the exploration of ways to increase the uptake of preventive services, and the reduction of U.S. healthcare costs.

Discussion Burden of Disease

Cancer is a major public health problem and is a leading cause of death in the U.S. [3]. Using data from the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program since 1973, researchers have estimated the incidence, mortality and survival rates for cancers in the U.S [3]. The researchers

estimated that in 2020 there will be 279,100 new cases of breast cancer, 104,610 new colon cancer cases and 13,800 new cases of cervical cancer [3]. The researchers estimated there will be 53,200 deaths due to colorectal cancer, 42,690 deaths due to breast cancer, and 4,290 deaths due to cervical cancer in 2020 [3].

There are variations in the burden of disease among racial/ethnic groups, gender, age and regions of the country [3]. Breast cancer is the most common cancer among all racial and ethnic groups [3, 7]. Colorectal cancer (CRC) incidence and mortality rates are highest among African Americans, who lag behind Whites in CRC screening rates [8]. Cervical cancer incidence rates are higher among Hispanics than Whites or African Americans [3]. African American men have the highest overall cancer incidence and death rates, almost double those of Asian Pacific Islander men who have the lowest rates [3].

Regional variation in incidence and mortality of cancer exist as well. Colorectal cancer incidence rates in the U.S. vary widely by geographic area, with individuals living in the northeast having the highest prevalence of disease and screening [8]. Individuals living in the south have higher incidence rates of breast cancer [3]. The disparities are likely due to regional variations in risk factors such as tobacco use, diet, and access to screening and treatment, which are influenced by socio-economic factors, legislative policies, and proximity to medical services [3, 8].

Barriers and Predictors to Receiving Preventive Services

Several barriers prohibit many Americans from receiving preventive services. Disparities in preventive service utilization rates exist by race/ethnicities, income level, age and insurance status indicating the potential impact of several barriers [9, 10]. Barriers to receiving a colorectal cancer screening include cost, lack of access to health care, lack of health insurance, lack of knowledge about need for screening, income, education level, fear and embarrassment [8]. Similarly, barriers to receiving a mammogram include not having insurance, insurance not paying for the exam, age, lack of knowledge about need for screening, inadequate provider capacity, lack of accessibility to provider services, and health literacy [11-13]. Barriers to receiving cervical cancer screening include lack of insurance, high deductibles and copayments, lack of a usual source of care, lack of knowledge about screening or recommended screening intervals, lack of transportation, and lack of nearby providers [13, 14]. Inconvenience, search costs, cost of care and waiting times to see providers are all factors that can undermine a patient's willingness or ability to seek preventive care [15, 16].

Several researchers have investigated the barriers to receiving preventive services. Devoe et al. (2003) conducted a multi-variate analysis of Medical Expenditure Panel Survey data from 1996 to determine the association of insurance coverage and having a usual source of care on receiving preventive services [17]. The researchers reviewed preventive services that included breast exam/mammography, blood pressure and cholesterol checks, routine physical, and other services. They found a correlation between having insurance and a regular source of care and receiving these services; individuals with insurance were more likely to have received preventive services in the most recent 12 months than were those without insurance [17].

Lack of health insurance coverage has been shown to reduce the use of some preventive services, including periodic health exam, blood pressure screening, cholesterol screening, Pap smear, clinical breast exam, and screening mammography [18]. In a study conducted using data from safety net clinics in Oregon, researchers modeled associations between amount of time with insurance and rates of receipt of lipid screening, influenza vaccination, nephropathy screening (urine micro-albumin), and HbA1c (glycol-hemoglobin) screening [19]. The researchers found that persons with partial or no coverage during the 3-year study period were less likely to receive most preventive services compared with those with continuous coverage [19]. This shows the importance of insurance coverage in receiving preventive care services.

Several of the identified barriers also act as predictors of receiving a screening test. Research has identified several predictors of receiving preventive services including receiving a health maintenance visit, age, insurance coverage and type, number of visits in the last two years and marital status [20, 21]. Socio-economic status as indicated by education and income have been identified as important predictors for cancer screenings [21]. When reviewing predictors of receiving a mammogram or Pap test; specifically, researchers found that having health insurance coverage increased the likelihood of receiving a breast or cervical cancer screening [21]. Finally women who reported having a usual source of care were four times more likely to receive a mammogram or Pap test, showing the importance a primary care provider has in improving preventive service utilization rates.

Benefits of Preventive Services

Use of preventive care services provides an opportunity to assist adults to live longer healthier lives and reduce the prevalence and incidence of disease [9]. The Patient Protection and Affordable Care Act (ACA) makes preventive care services available for much of the population, including the previously uninsured. Reviewing use of preventive services is a logical step in determining the effectiveness of the ACA in improving the health status of individuals in the U.S. as well as reduce the nation's health care costs. This work focuses specifically on cancer screenings (breast, cervical and colorectal).

Screening mammography has been shown to reduce breast cancer mortality among individuals of certain age groups; increased detection of mammography drives breast cancer incidence rates [7, 22]. Increasing rates of screening mammography leads to a reduction in late stage breast cancer diagnosis and an increase in early stage cancer diagnosis [23]. Colonoscopy has been associated with a reduction of incidence of colorectal cancer in Whites [8]. Cervical cancer deaths in the U.S. have decreased dramatically since the implementation of widespread cervical cancer screening [24]. Estimates indicate that up to 49% of expected cases of cervical cancer may be prevented by using cervical cancer screening [25].

U.S. Health Care System

The health care system in the U.S. is comprised of several public and private options including private insurance, Medicare, and Medicaid. Private insurance, which is the main source of health care coverage, is obtained primarily through an employer sponsored plan or individuals purchasing their own private insurance, and is projected to cover 200 million Americans in 2020 [4]. Medi-

care, a federal government sponsored insurance plan, is available once an individual reaches the age of 65, becomes disabled or is diagnosed with End Stage Renal Disease. Medicare is separated into four parts, Part A includes hospital insurance, Part B includes medical insurance, Part C is an optional Part B supplement coverage, and Part D provides prescription medication coverage. Medicare is projected to cover 18.6% of the population (61.7 million) in 2020 [4].

Medicaid is an insurance safety net program for low income individuals, pregnant women, and individuals with certain disabilities. Medicaid is jointly funded by state and federal governments and is administered at the state level. In 2020 Medicaid is projected to cover 75.4 million Americans [4]. The ACA of 2010 expanded Medicaid coverage to 138% of the federal poverty limit (FPL). There are additional insurance options available for certain segments of the American population such as the Veterans Administration which provides insurance to veterans, Indian Health Services, which provides health care to Native Americans, and Tricare which provides insurance to members of the Department of Defense and their dependents.

Individuals who do not qualify for Medicare or Medicaid (who earn up to 400% of the FPL) have the option to shop for insurance via online marketplaces. These websites host comparable information about insurance plans such as co-pays, co-insurance, deductibles etc. The marketplaces, established by the ACA, were designed to reduce healthcare costs by providing a mechanism to compare health insurance plans. The marketplaces are organized at the county level, and several counties do not have sufficient competition to drive cost reduction [26, 27]. All plans sold in the U.S., including those sold on an ACA marketplace, are required to cover preventive cancer screenings including mammography, colonoscopy, and cervical cancer screening with no cost sharing to the individual.

Preventive Service Utilization and Insurance Type

Insurance coverage is an important predictor to receiving preventive care. Zhao et al. used the Behavioral Health Risk Factor Surveillance System (a national database of health survey related information) to examine the association between health insurance and receipt of preventive cancer screenings. They found that underinsured adults and never insured women were statistically significantly less likely to receive cancer screening for breast, and cervical cancer, and both underinsured and never insured men and women were statistically less likely to receive a recommended colorectal cancer screening compared to adequately insured adults [28]. Similar patterns have been identified for colonoscopy; individuals with traditional employer sponsored insurance are more likely to receive a colonoscopy than the uninsured or individuals with a private direct purchase plan [29, 30]. This demonstrates the need to have insurance coverage to increase the uptake of cancer screenings.

The ACA, in an effort to insure more individuals, includes an optional expansion (at the discretion of each state) of Medicaid to all individuals (age <65) earning less than 139 percent of the federal poverty level, with the provision of subsidies for individuals earning up to 400 percent of the federal poverty level [31]. The

ACA also allows college age individuals to stay on their parent's insurance until they reach the age of 26. Results of these initiatives in relation to cancer screenings have been mixed with some populations, such as the previously uninsured showing an increase in screenings [32]. While there were initial reductions in the number of uninsured, according to the U.S. Census Bureau there were 26.1 million people uninsured in the U.S. in 2019 [33]. Further intervention is needed to increase insurance coverage, especially for at risk populations.

Cost Effectiveness of Preventive Care

The cost effectiveness of preventive care depends on several factors including being targeted to the appropriate population and the frequency of screening. Much research has been done in determining the cost effectiveness of cancer screening. Cancer screening is based on the principle that it is best to detect disease early to maximize treatment effectiveness and reduce the cost of more aggressive care when the tumors are in their later stages. Determining the appropriate frequency of screening tests is important to minimizing the screening costs to the overall health care system and maximizing the health benefit for the patient.

The American Cancer Society currently recommends that women age 40 years or older have a yearly mammogram for as long as they are in good health, and that high-risk women (i.e., with a family history or genetic tendency) undergo both Magnetic Resonance Imaging (MRI) and mammography every year [34]. In meta-analysis early screening has been shown to be effective in reducing breast cancer mortality by between 20-35% in women age 50 to 69 and slightly less in women age 40 to 49 at 14 year follow up [35]. The earlier screening begins the higher the rate of false positive results. Researchers in California found that biennial screening starting at age 50 years was the most cost effective strategy for mammography screening (as opposed to annual screening starting at age 40) [36].

Colorectal cancer screening is recommended once every ten years beginning at age 50 [8]. The incidence of colorectal cancer is age dependent, both the effectiveness and cost of one-time colonoscopy depend on the age at which the initial screening is performed [37]. Researchers have found that screening for colorectal cancer appears cost effective compared to no screening [38]. Researchers have identified the most cost effective strategy for colorectal cancer screening as receiving a colonoscopy every 10 years or a combination of an annual fecal occult blood test and sigmoidoscopy every five years [38]. Ness et al. conducted a cost utility analysis and determined that colonoscopy screening between 50 and 54 years of age is cost effective compared to no screening or screening at older ages in both men and women [37].

The USPSTF recommends screening for cervical cancer in women aged 21 to 65 with a Pap test every three years [24]. Several studies have determined the cost effectiveness of cervical cancer screening by screening interval [39-41]. Mandelblatt et al. found that the maximum savings in lives were achieved by screening every two years until death beginning at age 20 [40]. The cost effectiveness of screening appears to reduce dramatically after age 65 [40].

Cost effectiveness analysis can provide important information on

the benefits of a procedure versus not receiving treatment. The decision to delay screening could lead to potentially unwanted medical expenses and reduced health outcomes. No preventive screening test is 100% efficacious and the decision to receive a screening could lead to unnecessary invasive procedures due to a false positive diagnosis. While the information obtained from a cost effective analysis is useful, any model is predicated on the assumptions input into the model; therefore, careful consideration should be made of the health situation of a patient.

Costs Savings as a Result of Early Screening

The economic burden of cancer in the U.S. is approximately 1.8% of the gross domestic product (19.41 trillion dollars as of second quarter 2020) [42, 43]. This equates to 349 billion dollars and includes losses due to morbidity and premature mortality. The most staggering number is losses from premature mortality, which accounts for roughly 150 billion dollars in the U.S. [43]. For many cancers, outcomes are more favorable when treatment is initiated at an earlier stage [44]. Significant cost savings can be achieved by identifying and treating cancers as early as possible.

In 2017, researchers conservatively estimated the U.S. could save up to 26 billion dollars/year from early cancer diagnosis [45]. Preventive cancer screenings could capture much of this cost by allowing treatment of cancer at an earlier stage. In a retrospective analysis of claims data from individuals with private insurance, the average cost allowed per patient in the 24 months after the initial diagnosis of breast cancer were \$71,909 for stage 0, \$97,066 for stage I/II, \$159,442 for stage III, and \$182,655 for stage IV, the most advanced diagnosis stage [46]. This pattern of higher costs at later stage of diagnosis is repeated for both colon cancer and cervical cancer [47, 48].

Preventive cancer screenings are cost effective for age appropriate individuals and can generate tremendous cost savings to a health system. Recent events have the potential to derail these cost savings. In a recent survey it was found that an estimated 40.9% of U.S. adults have avoided medical care as a result of the COVID-19 pandemic, including 31.5% who avoided routine care such as preventive cancer screenings [49]. This care avoidance could exacerbate the economic burden of cancer as more tumors will be detected at a later stage causing increased treatment costs. Further incentives may be required to drive utilization of these services under the present pandemic conditions.

Solutions to Increase Utilization

There are several potential solutions to increase primary and preventive care utilization rates including increasing reimbursement rates for primary and preventive care to promote physicians accepting new patients. Increasing reimbursement rates for office visits and preventive screenings, including cancer screenings, has shown mixed effect, but increases the odds of receiving a screening [50].

Lack of access to a primary care provider is a significant pitfall to achieving the ACA goal of expanding access to care. Because primary care providers render or provide referrals for the large majority of preventive care and wellness services, including cancer screenings to nonelderly adults, access to primary care providers is

often considered a prerequisite to increased utilization of preventive care [16]. Hofer et al. determined that between 4,307-6,940 new primary care physicians will be required to meet the new demand for health services from ACA Medicaid expansion alone [51]. Developing policies that maximize physician availability to medically underserved areas of critical need could dramatically improve preventive service utilization rates in areas with high poverty and low insurance coverage. Minorities are substantially more likely than Whites to be uninsured, live in poverty and report not having a usual source of care [21]. Further research is needed to provide tangible data to policy makers to drive decisions to push resources to these underserved individuals.

Cost sharing (the amount the consumer pays for healthcare services) has been shown to act as a barrier to receiving preventive services [52]. The ACA seeks to remove this barrier by providing several preventive services with no cost sharing to the consumer. The ACA has mandated that preventive care procedures rated as A or B by the U.S. Preventive Services Task Force, such as cancer screenings including colorectal, breast, and cervical, be covered at no cost to the individual [53]. In 2011 and 2012, 76 million Americans with private health insurance gained preventive service coverage without cost sharing, including nearly 30 million women and over 18 million children [54]. Individuals without insurance are eligible for these services after selecting a plan on a health insurance market place and submitting payment for the first month of coverage [55]. After the initial push for ACA enrollment there is still a significant portion of the American population uninsured [56].

The future of the ACA is not certain. In 2017, the Republican led Congress passed the Tax Cuts and Job Act, which reduced the tax penalty for the individual mandate to obtain minimum essential health coverage from 2.5% to zero percent [57]. In 2018, a federal judge in Texas struck down the individual mandate penalty of zero percent as unconstitutional, as it no longer can be sustained as an exercise of congress's tax power [58]. The judge then struck down the entire ACA stating it was impossible to sever the individual mandate from the rest of the law [58]. The battle over the constitutionality of the law is far from finished with several democratically controlled states challenging the ruling; the Supreme Court is expected to review the case in the future [58]. If the Supreme Court strikes down the ACA, millions of patients will have to pay for breast, cervical and colorectal cancer screenings out of pocket, which would create another barrier to receiving a screening.

Conclusion

In 2020, COVID-19 has wreaked havoc on the U.S. healthcare system. A large number of COVID-19 related job losses are projected to push the number of uninsured to 30 million [59, 60]. This large influx of uninsured will tax safety net systems and necessitate creative solutions to address coverage losses as the economy begins to reopen. In addition, COVID-19 has prevented consumers from seeking cancer screenings.

Policy makers have a great opportunity to drive uptake of preventive services in this environment by addressing barriers to receiving preventive care. Any policy created hoping to increase the utilization of health services needs to consider the implications of

socio-economic disparities in the decision to seek treatment. Socio-economic disparities prevent some individuals from receiving recommended preventive cancer screenings. When individuals, especially individuals in high-risk populations, do not receive preventive cancer screenings, the populations' health suffers.

Potential U.S. healthcare system strategies to address these disparities include crafting targeted public health communication campaigns to promote the benefits of cancer screenings to specific populations that have low utilization rates, providing screening incentives such as a free tote bag or gift card to a restaurant, or a workplace reimbursement to a health savings account. Providing ethnically sensitive information to the patient at time of enrollment in their insurance plan may increase knowledge of benefits and reduce disparities in the commercially insured population. Medicare, Medicaid, and other health care coverage options need to increase cancer screening promotion programs to high risked populations. Additional research is required to determine the most appropriate method for stratifying cancer risk and tailoring screening programs to those most at risk for developing invasive cancer. Preventive cancer screenings can detect disease at an early stage to maximize treatment effectiveness, reduce overall treatment costs and extend the life expectancy of cancer survivors.

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